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# Malagasy Morphology: Basic Rules[†]

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We are concerned in this paper to characterize the morphophonological alternations used in the following *morphological derivational processes* (MDPs) in Malagasy:

1. *incorporation*
   of objects and "dispossessed" possessive heads into As and Vs; of adjectives into Ns,
2. *noun compounding* (= incorporation of Ns into Ns),
3. *reduplication* (Keenan and Razafimamonjy 1996),
4. *the formation of genitive constructions* (Paul 1996a)
   includes $V_{[-act]}$+Agent, N+Possessor, Prep+Complement (most Preps),
5. *(m)aN-* prefixation forming active verbs (Paul 1996b).

We refer to the morphophonological alternations and stress shifting common to these MDPs[1] as *Basic*. The purpose of this paper is to define *Basic*. *Basic* determines these MDPs to varying extents. The alternations used in *incorporation* and *noun compounding* are just those given by *Basic*. So to define these MDPs it suffices to state just which expressions they apply to and whether application is obligatory or optional. The alternations present in *reduplication* include all of those in *Basic* plus a few additions. *Genitive formation* and *(m)aN-* prefixations draw proportionately less on *Basic*. See Paul (op cit).

Our exposition owes much to Rajemisa-Raolison (1971) and Razafimamonjy (1988). For the relatively unstudied area of stress assignment in Malagasy we have drawn on Pearson (1995) and Erwin (1995) in addition to our own knowledge.

## Background: Phonology → Prosody

For practical reasons we limit ourselves to "official Malagasy", the language in which government documents and national newspapers are written. It draws heavily on the Merina dialect spoken in and around the capital Antananarivo, but has incorporated a variety of expressions from other regional varieties.

Examples are given in the standard orthography, except that we mark stress: ´ for primary stress, ` for secondary stress, and absence of marking for absence of stress. Orthography-phonology correspondences are as follows:

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**Phonology**  Malagasy has a four vowel system, orthographically represented as *i, e, o, a* with the expected pronunciation, save that *o* is [u]. Word final *i* is written *y*. Common diphthongs are *ai/ay* and *ao*, the latter often pronounced [o].

The consonant system of Malagasy is given in (1)[2] : the phoneme *dz* is orthographic *j*. It is the voiced counterpart of the phoneme written *ts*. *tr* and *dr* are single voiceless affricates articulated with the front part of the blade of the tongue against the alveolar ridge.

| (1) | nasals | stops | | affricates | fricatives | liquids |
|---|---|---|---|---|---|---|
| labial | m | b | p | | | |
| | | $^m$b | $^m$p | | | |
| labio-dental | | | | | v  f | |
| dental-alveolar | n | d | t | | | l |
| | | $^n$d | $^n$t | | | |
| alveolar | | | | j   ts | z  s | |
| | r | | | | | |
| | | | | $^n$j  $^n$ts | | |
| | | | | dr   tr | | |
| | | | | $^n$dr  $^n$tr | | |
| velar | | g | k | | | h |
| | | $^n$g | $^n$k | | | |

An orthographic *n* or *m* preceding a consonant C indicates $^n$C or $^m$C, a prenasalized C, even when separated by a hyphen indicating a morpheme boundary. The C vs $^n$C/$^m$C distinction is phonemic in all cases. Here is a minimal set of minimal pairs: *dóbo* 'pond' vs *dómbo* 'dull'; *tápoka* 'cut/dilute' vs *támpoka* 'suddenly'; *màndodóna* 'urge (imp)' vs *màndondóna* 'knocks (at a door)'; *éto* 'here' vs *énto* 'carry (imp)'; *majájana* 'completely separated' vs *majánjana* 'strikes hard'; *átsy* 'there' vs *ántsy* 'knife'; *sédra* 'a challenge' vs *séndra* 'meet (by accident)'; *atráno* 'be prepared (imp)' vs *an-tráno* 'at home'; *sóga* 'cotton clothe' vs *sónga* 'pulled back, cleft'; and *máika* 'rushed' vs *máinka* 'so much the more'.

Erwin (1995), who provides a much more fine grained phonological analysis of Malagasy than we do, presents two additional reasons for treating the C/prenasalized C distinction as phonemic:  (1) it reduces by more than half the number of phonotactic constraints needed in a description of Malagasy, and (2) it accounts for the fact that no consonants affect stress weight by position.  In addition Pearson (1994) notes that prenasalization does not block the rule that

palatalizes *k* and *g* following *i*.  Thus *maika* is pronounced [maik$^y$a] and *mainka* [mai$^n$k$^y$a]. Finally, Malagasy linguists (Rabenilaina in Keenan & Rabenilaina 1994 from which the above consonant chart is adapted) and Malagasy instruction manuals (Rajaobelina, 1960;107 and Rajaobelina 1987 (cited in Erwin 1995)) treat the distinction as phonemic.

It will be useful later to represent prenasalization as a function on the set of consonants:

(2) **Def** For all consonants c,

$$\text{prenasalize}(c) = \begin{cases} \text{mc} & \text{if } c = b \text{ or } p \quad \text{and} \\ \text{nc} & \text{if } c = d, t, j, ts, dr, tr, g, \text{ or } k \\ \text{c} & \text{otherwise} \end{cases} \quad \text{and}$$

So **prenasalize** maps *b* to *mb*, *dr* to *ndr*, etc.  By the "otherwise" clause it also maps *f* to *f*, *mp* to *mp*, and *ndr* to *ndr*.  Recall that *ndr* and *ntr* are single phonemes, even when written *n-dr* and *n-tr*, where the '-' represents a morpheme boundary.

**Syllable structure**  In native expressions all syllables are of the form (C)V, V a vowel or diphthong.  So all syllables are open and there are no consonant clusters, though one sometimes hears *st, sk, gl* and *gr* in borrowings.  Most CV combinations occur as syllables in most positions, though the prenasalized voiceless consonants do not occur word initially[3].  No root presents a sequence of three separately articulated vowels or diphthongs[4].

Those MDPs that build on *Basic* may nasalize onsets of certain syllables, a process we represent in (3) by the function, **nset**.  Here 'v' ranges over vowels and diphthongs, 'c' over consonants and the empty string, and '+', and juxtaposition are used for concatenation.

(3)  For all c,v as above,  $\text{nset}(c+v) = \begin{cases} \text{n+v} & \text{if } c \text{ is empty} \\ \\ \text{prenasalize}(c)+v & \text{otherwise} \end{cases}$

Thus **nset** maps *a* to *na*, *py* to *mpy*, *ra* to *ra* and *mba* to *mba* (and also *mpy* to *mpy* and *na* to *na*, as it applies to syllables with nasal onsets yielding those same syllables as values).

**Word structure**  Words are formed from *roots* by iterative application of MDPs[1].  Some roots are words, some are not.  The set of roots is defined by listing.  The best, and in fact very impressive, list (with thousands of roots) is the dictionary by Abinal and Malzac (1888).

Just one stress level distinction is phonemic both in roots (with few minimal pairs) and in derived forms.

(4) a.  Roots: *tánana* 'hand' vs *tanána* 'village, city'; *lálana* 'path' vs *lalána* 'law'; *irý* 'there (far)' vs *íry* 'desire'

(4)b.  Derived: *manása* 'is washing' vs *manasá* 'Wash! (imp)*; *míditra* 'is entering' vs *midítra* 'is being stubborn, ill behaved'

Stress in roots or words of two or syllables is typically penultimate and never farther back than antepenultimate. The following constraint is exceptionless: If primary stress in *w* is antepenultimate then *w* ends in a "weak" syllable: *-na*, *-ka*, or *-tra*. Subject to this constraint the rightmost v ∈ {*e*, *ai/ay*, *ao*}, the latter two diphthongs, carries primary stress. Vowels in unstressed syllables tend to devoice, especially word finally and especially in fast speech. But they are not completely neutralized, and still determine minimal pairs: *éntana* 'packages' vs. *éntina* 'carried', *ampánga* 'accusation' vs. *ampángo* 'crust (stuck to ricepot)', *manénona* (< *ténona*) 'weaves' vs. *manénina* (< *nénina*) 'repent, regret'.

In the formation of derived expressions constraints on syllable structure override morpheme boundaries with impunity. Slow speech tests provide striking confirmation of this fact. Here are three types of examples:

First, a few roots are historically derived by infixing *om* (= [um]) after the initial consonant (a process that is no longer productive). But *om* is not a possible syllable in (modern) Malagasy and the *m* syllabifies with the following vowel. (In the last example *om* interrupts the (non-productive) prefix *sa-*).

(5)  **root**           infix *om*                    *syllabification*

     séby    ⇒   soméby  'go back and forth'      so.me.by
     tány    ⇒   tomány  'cry'                    to. ma.ny
     sarítaka ⇒  sòmarítaka 'preoccupied'         so.ma.ri.ta.ka

Second, active verbs are productively derived from roots by prefixing *(m)aN*. The initial *m* is the present tense active prefix which alternates with *n* for past and *h* for future, and the *N* nasalizes the onset of the first syllable of the root. See Paul (1996b) for the surprisingly complicated details of *(m)aN* prefixation; see Urhbach (1988) for discussion of similar phenomena in many Indonesian languages).

(6)  **root** *r*   *(m)aN(r)*    *syllabification*

     léha   ⇒   mandéha      ma.nde.(h)a    'goes'
     záitra ⇒   manjáitra    ma.njai.tra    'sews'
     rára   ⇒   mandrára     ma.ndra.ra     'prohibits'
     óva    ⇒   manóva       ma.no.va       'changes'
     dáka   ⇒   mandáka      ma.nda.ka      'kicks'

Note that in the first three cases the initial consonants of the roots have changed to prenasalized stops or affricates. Recall that *ndr* in *mandrara* is a single phoneme.

These examples illustrate the general fact that infixing and prefixing do not shift stress.

By contrast suffixing processes shift stress to the right. And reduplication, compounding, incorporation, and possessive formation, which combine independent phonological words each with their own main stress, yield forms in which the main stress on the leftmost item reduces to secondary stress and the main stress on the rightmost item survives as the main stress of the derived form. Possessive formation in (7) is illustrative.

(7) a.  ny tráno na    Rabé  ⇒ ny trànon-dRabé       b.  ni.trà.no.ndra.bé
        the house gen   Rabe
        *Rabe's house*

The behavior of MDPs applied to a root depends crucially on its stress pattern and certain of its syllabic properties. We distinguish the pertinent classes of roots here.

### Prosodic classes of roots

**One syllable roots** (8) provides some examples which are grammatical words.

(8)  *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', *háy/káy* 'exclamation'

Certain of these, such as *sy* 'and' and *ny* 'the' never carry phrasal stress, whereas others, such as *ve* 'question particle' and *mba* 'in order to', often do. (9) provides some examples of one syllable roots which are bound morphemes.

(9)  *-ko* 'my', *-náo* 'your (sg)', *-ny* '3gen (his, her, their)', *-náy* 'our (excl)', *a-* 'passive', *ma-* 'adjective former'

The suffixes in (9) ending in diphthongs carry main stress, whereas *-ko* and *-ny* never do.

(10) a.  tráno 'house'   b.  tránoko 'my house'   c.  trànonáy 'our house'

(11) shows that Malagasy presents fairly many[5] one syllable roots which are content words (Stress on diphthongs is marked on the dominant vowel). Each may carry phrasal stress.

(11) *fe* 'thigh'; *fy* 'delicious'; *fo* 'heart'; *be* 'big, many, very'; *ra* 'blood'; *lo* 'rotten, spoiled'; *la* 'refusal', *mby* 'arrived'; *re* 'heard'; *ro* 'sauce'; *to* 'true, just'; *vy* 'metal'; *zo* 'rights'; *tsy* 'steel', *py* 'a blink', *ráy* 'father', *ráy* 'received', *fóy* abandoned', *vóy* 'action of rowing', *hóy* 'is said', *tóy* 'like', *ndre/ndry* 'interjection of surprise or pain', *táy*

'excrement', *máy* 'burnt, hurried', *láy* 'tent', *mbáy* 'step aside', *váy* 'a boil', *ndáo* 'let's go', *jáy* 'pride', *jáo* 'big; a big steer with long horns'

**Two syllable roots** overwhelmingly have penultimate main stress: *léla* 'tongue', *vády* 'spouse', *vítsy* 'few', *fótsy* 'white'. There are two sorts of exceptions: some borrowings: *zomá* 'Friday', *dité* 'tea (< Fr. *du thê*), *diváy* 'wine' (< Fr. *du vin*) and some native roots, especially demonstratives, ending in /i/ or /i/-final diphthongues: *itý* 'this (near)', *intý* 'here is', *erý* 'there (far, visible, non-past)', *izáy* 'that', *iráy* 'one', *iláy* 'the aforementioned'.

**Three syllable roots** may end in one of the *weak* syllables: *-na*, *-ka*, *-tra* usually with antepenultimate stress.

(12) *tánana* 'hand'; *tápaka* 'broken'; *vóhitra* 'hill'; *ídina* 'descend'; *íditra* 'enter'

There are a very few three syllable words with weak endings that are stressed penultimately:

(13) *tanána* 'village; *lalána* 'law'; *rehétra* 'all'; *baríka* 'barrel' (< Fr. barrique);

And there are fairly many three syllable roots which do not have weak endings. They never have antepenultimate stress:

(14) *omály* 'yesterday'; *karáma* 'salary'; *tanóra* 'young'; *raméva* 'camel'; *atsímo* 'South'

**Roots of four or more syllables** with weak endings have antepenultimate main stress, otherwise penultimate main stress. In both cases every second syllable working back from the one with main stress is assigned a secondary stress.

We group these roots into four categories: (A) borrowings: *làvarángana* 'verandah' (< Fr. 'la varangue'), *pàtalóha* 'pants' (< Fr. 'pantalon'), *latábatra* 'table' (< Fr. 'la table'). (B) words built from a root by the addition of a (non- productive) affix: *sarítaka* 'disorder' (prefix *sa-*); *barádaka* 'confusion in speaking' (prefix *ba-* or infix *ra*). (C) Frozen compounds of a great variety of sorts: *àntsipíka* 'pocket knife' (< *ántsy* 'knife' + *píka* 'snap, click'); *rènivóhitra* 'capital city' (< *rény* 'mother' + *vóhitra* 'hill, village'), *làlan-drá* 'artery' (< *lálana* 'pathway' + *rá* 'blood'). And (D), reduplicated roots where the base no longer functions as an independent root: *tàbatába* 'noise', *sàlasála* 'hesitation'.

Three stress levels are clearly heard in these examples, especially in frozen compounds and reduplications. As noted, secondary stress in roots is predicatable from the primary stress. But, anticipating, MDPs do not preserve this alternating pattern of secondary stresses. There are derived forms with adjacent stressless syllables and others with a secondary stress immediately preceding a main or another secondary stress.

**Weak and pseudoweak roots.** These classes are crucial in the functioning of MDPs:

**Def 1:** A root r is *weak* iff r ends in a weak syllable (*-na*, *-ka*, *-tra*), has three or more syllables and is stressed on the antepenult.

Thus the examples in (12) are weak and those in (13) and (14) are not. Weak roots behave in a characteristic way with respect to MDPs. Their endings *-na*, *-ka*, and *-tra* drop or are modified under MDPs which shift stress to the right.

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 suffixation then is historically illusory: the derived forms existed before the *-a* was added and 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. See for example Ross (1995) for instances from reduplication in Tagalog. (Erwin 1995 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).

In addition to the weak roots as defined there are a certain number of other roots with weak endings (*-na*, *-ka*, *-tra*) which behave like the weak roots with respect to MDPs even though they are not stressed antepenultimately. We call these roots *pseudo-weak*. The most common case are two syllable roots like *héna* 'diminish', *sáina* 'mind' and *fóka* 'absorb'. Also included are a few roots like *tanána* 'village' with three or more syllables but not stressed on the antepenultimate. More explicitly,

(15) A root r is *pseudo-weak* iff r =

*tanána* 'village', *lalána* 'law' *héna* 'diminish', *fóka* 'absorb', *zátra* 'accustomed', *trátra* 'caught', *poka* 'blow', *dóna* 'knock', *sáina* 'mind', *léna* 'wet, fresh', *fétra* 'limit', *dítra* 'naughty', *táitra* 'startled', *tsóka* 'blow', *rítra* 'dried up', *píka* 'snap', *tratra* 'caught'...

We define the pseudo-weaks by listing since, despite some additional regularities discussed later, membership in this class is not predictable on the basis of phonological and prosodic identity. For example, several pseudo-weaks have homophones which are not treated as weak by MDPs (and so are not in the list of pseudo-weaks). Examples are *héna* 'meat', *fóka* 'idiotic' and *saina* 'flag' (<Fr. *enseigne*) and *tratra* 'chest'. Some other examples of roots that have weak endings but are not pseudoweak are:

(16) *rehétra* 'all', *dáka* 'a kick', *lóka* 'bet', *téna* 'body', *sétra* 'brutal', *pítra* 'sad look'

It is tempting to speculate here that the two syllable pseudoweaks were historically formed by the addition of an *a* to a closed monosyllabic root ending in *k*, *n*, or *tr* and that the roots with weak endings that are not pseudoweak retain their original form, accidentally ending in *-na*, *-ka*, or *-tra*. But we have not attempted to verify this hypothesis.

**Basic** We develop a notation for stress marked syllables: v and v' range over vowels and diphthongs, c and c' over consonants and the empty string, k and k' over $\{0,1,2\}$.

**Def 2** A *stress marked syllable* is a pair (cv,k) where cv is a syllable and k = 0,1 or 2.

The intuition: Writing (cv,0) is our way of saying that the syllable *cv* is unstressed; (cv,1) says it has secondary stress, and (cv,2) says it has primary stress. In all cases except in formal definitions we use the following

(17) **Abbreviations:** For (cv,0) write *cv*; for (cv,1) write *cv̀*; and for (cv,2) write *cv́*.

*example* Represented as a sequence of stress marked syllables the word *elatra* 'wing' is $<$(e,2), (la,0), (tra,0)$>$. Using the abbreviations it is *élatra*. So the abbreviated form is just like the standard orthography except that primary and secondary stresses are marked. We also introduce a notation for the result of reducing primary stress to secondary stress:

**Def 3** We define a destressing function ˘ which maps primary stressed syllables to ones with secondary stress and leaves others untouched. ˘ maps a sequence of stress marked syllables to the sequence obtained by applying it to each syllable in the sequence:

a. If σ is a stress marked syllable (cv,k) then $\breve{\sigma} = \begin{cases} (cv,k) & \text{if } k < 2 \\ (cv,1) & \text{if } k = 2 \end{cases}$

b. If $\sigma = <\sigma_1,...,\sigma_n>$ is a sequence of stress marked syllables then $\breve{\sigma} = <\breve{\sigma}_1,...,\breve{\sigma}_n>$.

We now define *Basic* as a function mapping pairs σ,τ of sequences of stress marked syllables to a single such sequence. *Basic*(σ,τ) represents how σ followed immediately by τ is pronounced. The individual MDPs mentioned earlier will use *Basic* in their definition, usually limiting the choice of σ and τ: in reduplication τ is a partial copy of σ; in object incorporation σ may be a transitive verb and τ an $X_0$ level category functioning as its object. The segmental changes induced by *Basic* are given by the function *stop* below. It maps each *continuant* consonant *f*, *v*, *s*, *z*, *h*, *l*, *r* to its homorganic stop or affricate and maps all other consonants to themselves.

$$(18) \quad \begin{array}{cc} x & stop(x) \\ & stop \\ f & \longrightarrow p \\ v & \longrightarrow b \\ s & \longrightarrow ts \\ z & \longrightarrow j \end{array} \qquad \begin{array}{cc} x & stop(x) \\ & stop \\ h & \longrightarrow k \\ l & \longrightarrow d \\ r & \longrightarrow dr \\ c & \longrightarrow c, \text{ all other consonants } c \end{array}$$

*stop* is phonologically natural in that it preserves voicing. So for α = + or −, if a consonant c is α *voice* then so is *stop*(c).

The value of *Basic* at a pair $<\sigma,\tau>$ of syllable sequences varies with the prosodic and syllabic properties of σ and the phonological identity of the first syllable of τ. So *Basic* will be defined by cases. The first case, called *Vowel Elision*, is one in which $\tau_1$, the first syllable of τ, begins with a vowel. There are sub-cases within this case. The second case, *Consonant Mutation*, is one in which $\tau_1$ begins with a consonant. It also has sub-cases.

(19) **Def 4** *Basic* Let $\sigma = \sigma_1...\sigma_n$ and $\tau = \tau_1...\tau_m$ be n,m ≥ 1-ary sequences of stress marked syllables. We define *Basic*(σ,τ) by cases as follows (using '+' or juxtaposition for concatenation and using the variables c,c', v,v', and k and k' as before):

*Case 1 (Vowel Elison)* $\sigma_n = (cv,k)$ and $\tau_1 = (v',k')$

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

| *examples* | σ | τ | | *Basic*(σ,τ) | |
|---|---|---|---|---|---|
| | mandá 'refuse' | ázy 'him' | | mandà ázy | */mandázy/ |
| | mandá " | ólona 'people' | | mandà ólona | */mandólona/ |
| | mandá " | an'ío 'acc-that' | | mandà an'ío | */mandànío/ |
| | bé 'many' | élatra 'wing' | | bè élatra | */bélatra/ |
| | mànomé 'give' | itý 'this' | | mànomè itý | */mànomìtý/ |
| | mànkafý 'delect in' | itý 'this' | | mànkafỳ itý | */mànkafìtý/ |
| | mànkató 'obey' | ólona 'people' | | mànkatò ólona | */mànkatólona/ |
| | manasá 'Wash! (imp)' | akánjo 'clothes' | | manasà akánjo | */manasàkánjo/ |
| | mandoká 'Praise! (imp)' | andríana 'nobles' | | mandokà andríana | */mandokàndríana/ |

Note then that in the acceptable forms both the final stressed vowel of σ and the initial vowel of τ are heard with just the faintest hiatus between them. Attempts at vowel coalescence here are ungrammatical, as indicated.

*Case 1.2* k = 0 or 1 (In fact k can never be 1; secondary stress only arises before primary stress).

*case 1.2.1*   v = v' or v = a

Then $Basic(\sigma,\tau) = \breve{\sigma}_1,...,\breve{\sigma}_{n-1}, (cv',k'),\tau_2,...,\tau_m$

Thus the final vowel of σ elides if it is unstressed *a* or it is the same as the initial vowel of τ. Except for reduplication, Vowel Elision is not registered in the orthography of MDPs .

| σ | τ | | $Basic(\sigma,\tau)$ | |
|---|---|---|---|---|
| tápaka *broken* | élatra *wing* | ⇒ | /tàpakélatra/ *has a broken wing* | (orth: tapaka elatra) |
| sárotra *difficult* | ována *be changed* | ⇒ | /sàrotrována/ *hard to change* | (orth: sarotra ovana) |
| ólona *person* | éfatra *four* | ⇒ | /òlonéfatra/ *four people* | (orth: olona efatra) |
| mamíta *accomplish* | íraka *mission* | ⇒ | /mamìtíraka/ | (orth: mamita iraka) |
| áloka *shade* | áloka | ⇒ | àlokáloka *a bit of shade* | |
| ívy *spit* | ívy | ⇒ | ìvívy *spittle* | |
| óva *change* | óva | ⇒ | òvóva *little changes* | |

 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 roots.

*Case 1.2.2*   v ≠ v' and v ≠ a

Then $Basic(\sigma,\tau) = \breve{\sigma} + \tau$

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

| σ | τ | $Basic(\sigma,\tau)$ | |
|---|---|---|---|
| ántso 'call' | ántso | àntsoántso | */àntsántso/ |
| mijéry 'sees | ólona 'people' | mijèry ólona | */mijerólona/ |

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

*Case 2.1*   σ is neither weak nor pseudo-weak.  Then $Basic(\sigma,\tau) = \breve{\sigma} + \tau$ (as in Case 1.2)

| examples | σ | τ | $Basic(\sigma,\tau)$ | |
|---|---|---|---|---|
| | mànontány *asks* | závatra *something* | mànontàny závatra | (*mànontànin- jávatra) |
| | mànomé *gives* | vóla *money* | mànomè vóla | (*mànomèm-bóla) |
| | mikápa *cuts* | házo *wood* | mikàpa házo | (*mikàpa-kázo) |
| | máro *many* | ánaka *children* | marò ánaka | (*/maránaka/) |
| | mandá *refuse* | vóla *money* | mandà vóla | (*/mandàm-bóla/) |

*Case 2.2*   $\sigma = \sigma_1...\sigma_n$ is weak or pseudo-weak

*Case 2.2.1*   $\sigma_n = (ka,k)$ or $(tra,k)$.

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

Thus in this case $Basic(\sigma,\tau)$ is the result of dropping the last syllable $\sigma_n$ of σ, replacing the initial consonant of τ by its value under *stop*, and continuing with the rest of τ.  So if the initial consonant of τ is not weak all that happens is that *ka* /*tra* drops.  If the consonant is initial consonant of τ is weak then it changes to its corresponding stop or affricate.  We exemplify by deriving *mpivàro-kéna* 'meat seller' from *mpivárotra* 'seller' and *héna* 'meat'.

(20) *Basic*(mpivárotra, héna) = mpivàro + *stop*(h) + é +na   case 2.2.1
　　　　　　　　　　　　　 = mpivàro +k + é + na   Def *stop*, (18)
　　　　　　　　　　　　　 = mpivàro-kéna   orthography (stress marked)

Some further examples, the first three illustrating non-trivial application of consonant mutation (*stop*), the second three showing the mere loss of final *-ka* and *-tra*:

| σ | τ | Basic(σ,τ) |
|---|---|---|
| fántatra 'known' | Rakóto 'Rakoto' | fànta-dRakóto 'known by Rakoto' |
| sátroka 'hat' | fótsy 'white' | sàtro-pótsy 'white hat' |
| tápaka 'broken' | fé 'thigh' | tàpa-pé 'has a broken thigh' |
| matáhotra 'fears' | tódy 'retribution' | matàho-tódy 'fears retribution' |
| závatra 'thing' | nisého 'happened' | zàva-nisého 'event' |
| miáraka 'be together' | mandéha 'goes' | miàra-mandéha 'goes together' |

*Case 2.2.2* $\sigma_n = na$.

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

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

$$Basic(\text{mánana, vády}) = \text{màna} + \text{nset}(stop(v) + \text{á}) + \text{dy} \qquad \text{case 2.2.2}$$
$$= \text{màna} + \text{nset}(b + \text{á}) + \text{dy} \qquad (18), \text{def } stop$$
$$= \text{màna} + \text{mbá} + \text{dy} \qquad (3), \text{def nset}$$
$$= \text{mànam-bády} \qquad \text{orthography}$$
☺

Some further examples: the first six illustrate the other non-trivial consonant mutations (*stop*). The last 5 show the application of *nasal onset* when the consonant is not weak.

| σ | τ | Basic(σ,τ) |
|---|---|---|
| mánana *has* | zánaka *offspring* | mànan-jánaka *has children* |
| mihínana | fáry *sugar cane* | mihìnam-páry *eats sugar cane* |
| án(a) *at* | sáha *fields* | an-tsáha *in (the) fields* |

| án(a) *at* | hády *ditch* | an-kády *in (the) ditch* |
|---|---|---|
| án(a) *at* | ráno *water* | an-dráno *in (the) water* |
| án(a) *at* | lamósina *back* | an-damósina *in (the) back* |
| filaláovana *playing* | báolina *ball* | filalàovam-báolina *playing ball* |
| mánana *has* | pératra *ring* | mànam-pératra *has a ring* |
| mánana *has* | námana *friend* | màna-námana *has friends* |
| fitiávana *love* | téna *self* | fitiàvan-téna *love of oneself* |
| mánana *has* | dídy *rules* | mànan-dídy *has rules* |

Now consider a few cases with σ merely pseudo-weak. One sees that the pseudo-weaks (defined by listing, recall) behave just like the weak roots with respect to the *Basic*. Contrast the a-examples which are pseudo-weak with their b-homonyms, which are not pseudo-weak.

| (21) σ | τ | Basic(σ,τ) | |
|---|---|---|---|
| a. sáina 'mind' | záza 'child' | sàin-jáza | |
| b. sáina 'flag' | fotsy 'white' | saina fotsy | *saim-potsy |
| a. (mi)héna 'decrease' | vídy 'price' | mihèm-bídy | |
| b. héna 'meat' | léna 'fresh' | héna léna | *hèn-déna |
| a. (mi)fóka 'absorb' | ráno 'water' | mifò-dráno[6] | |
| b. fóka 'idiotic' | fóka 'idiotic' | fòkafóka | *fòpóka |

This completes the definition and illustration of *Basic*.

**A note on pseudoweaks** We see from (21) that the property of being pseudo-weak cannot be predicted from the phonological and prosodic composition of a root. But there are some non-

trivial morphophonological correlates of being pseudo-weak. Specifically,

(22) Let r be a two syllable root ending in *-na*, *-ka*, *-tra*. Then

    a. r is pseudo-weak if r forms non-active verbs that do not shift stress and do mutate the consonant in the final syllable

    b. r is not pseudo-weak if r forms non-active verbs which do shift stress and do not mutate the consonant.

In group (22a) we find:

(23)

| root | | passive | mutation |
|---|---|---|---|
| póka | 'a blow' | póhina | k ⇒ h |
| tsóka | 'blow' | tsófina | k ⇒ f |
| fóka | 'absorb' | fóhina | k ⇒ h |
| dóna | 'knock' | dómina | n ⇒ m |
| léna | 'wet,fresh' | lémana | n ⇒ m |
| trátra | 'caught' | trárina | tr ⇒ r |
| zàtra | 'accustom' | zàrina | tr ⇒ r |
| rítra | 'dried up' | rítina | tr ⇒ t |
| fétra | 'limit' | férana | tr ⇒ r |

And thus we have (noting that a syllable with secondary stress may immediately precede one with either primary or secondary stress):

| σ | τ | Basic(σ,τ) |
|---|---|---|
| póka 'a blow' | tándroka 'horn' | pò-tándroka 'a blow from a horn' |
| mandóna 'knocks' | vàravárana 'door' | mandòm-bàravárana 'knocks at the door' |
| trátra 'caught' | lóza 'misfortune' | trà-dóza 'suffers (is caught by) misfortune' |
| zátra 'used to' | rátsy 'bad' | zà-drátsy 'bad habits' |
| rítra 'dried up' | ráno 'water' | rì-dráno 'dried up of water' |
| tsóka 'blow' | ráno 'water' | tsò-dráno 'blessed' |
| léna 'wet' | ráno 'water' | lèn-dráno 'wet with water' |

fétra 'limit'    táona 'year'    fè-táona 'a year's limit'

By contrast in group (22b) we find:

(24)

| root σ | | non-active | τ | | Basic(σ,τ) | |
|---|---|---|---|---|---|---|
| dáka | 'a kick' | dakána | sáka 'cat' | | mandàka sáka *mandà-tsáka | |
| lóka | 'bet' | ilokána | vóla 'money' | | milòka vóla | *milò-bóla |
| fóka | 'idiotic' | (ha)fokáina | fihétsika 'behavior' | | fòka fihétsika | *fò-pihétsika |

There are of course other two syllable roots with weak endings that are not pseudo-weak:

(25)

| σ | | τ | | Basic(σ,τ) | |
|---|---|---|---|---|---|
| téna | 'body' | láva | 'long' | tèna láva | *tèn-dáva |
| sáka | 'cat' | rátsy | 'bad' | sàka rátsy | *sa-drátsy |
| trátra | 'chest' | bé | 'big' | tràtra bé | *trà-bé |

There is possibly a second sub-regularity concerning the identification of pseudo-weak roots. Namely,

(26) Of roots ending in *-na*, *-ka*, or *-tra* with n ≥ 3 syllables but not stressed on the antepenultimate, those ending in *-na* are pseudo-weak and those in *-ka* are not.

(26) is tentative at best as there are in fact few such roots (and not enough ending in *-tra* to even justify a guess). Our supportive data are given in (27).

(27)

| | | | | |
|---|---|---|---|---|
| tanána | 'village' | tanàm-bé 'big village' | *tanána bé[7] | |
| lalána | 'law' | lalàm-pirenénana 'constitution' | *lalána firenénana | |
| tsipíka | 'arrow' | *tsipì-maránitra 'arrow sharp' | tsipíka maránitra | |
| baríka | 'barrel' | *barì-pótsy 'barrel white' | barìka fótsy | |
| tsatóka | 'stake' | *tsatò-dáva 'stake long' | tsatòka láva | |

An interesting case here is the borrowing *dipáina* (< Fr. *du pain*) which just occurs as an adjective in *mofo dipaina* 'French bread' (as opposed to Malagasy bread). It seems that in the capital, where French bread is common, *dipaina* is treated as weak: *mofo dipain-dRabe* 'Rabe's French bread'. By contrast in a country setting, where speakers are less used to French bread, *dipaina* is not treated as pseudo-weak and one hears *mofo dipainan-dRabe*.

# Footnotes

1. Additional MDPs in Malagasy are examplified in (A) and (B) below. Erwin bases his work on those in (A), which do not build on *Basic* at all. The MDPs in (A) are purely suffixal and do not involve binding together two independently existing roots or words.

A.1. *imperative formation*
   suffixation of -(C)*a* for active Vs, the presence and choice of consonant C being
      selected by the verb root
   suffixation of -*o* (-*y*) to roots for non-active Vs
2. *non-active V formation*
   suffixation of -*ina*/-*ana* to roots forming certain passives
   suffixation of -(C)*ana* to active Vs forming circumstantial verbs (roughly, verbs whose
      subjects are obliques – instruments, benefactees, locatives, ...)

B.1. *theme passive formation*
   prefix *a*- to certain roots
2. *abstract noun formation*
   prefix *ha*- to certain adjectival roots
3. *reciprocal formation*
   prefix -*if*- to active tenseless verbs
4. *present tense formation*
   prefix *m*- to active verbs, ø- to non-active verbs

2. ŋ is phonemic in most regional varieties of Malagasy but not in official Malagasy.

3. The one counterexample we know is *ntaolo* 'old men, ancestors" seen in *Ny Anganon'ny Ntaolo* 'The tales of the Ancestors', an early collection from diverse regions in Madagascar. It is not the normal word (*razana*) for ancestors in official Malagasy and may come from a speech variety other than official Malagasy, though Richardson (1967) suggests a folk etymology *ny tao aloha* 'the past+there+not-visible before'.

4. In fact we know of just one root which forms derived forms with three syllabic vowels adjacent: *óitra* 'raise, as with a lever'. The active is *mióitra* and the passive is *aóitra*, which syllabify respectively to mi.o.i.tra and a.o.i.tra

5. 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. Impressionistically this is not insignificant.

6. This verb is also used in the sense of 'smoke' and here does not seem to host incorporation. One says *mifoka sigara* 'smoke cigars', not *mifo-tsigara*.

7. This form is acceptable in the meaning 'many villages'

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