Title: Stress change and initial consonant loss in Umpithamu: Cause or consequence?

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Stress change and initial consonant loss in Umpithamu: Cause or consequence?

1. Introduction

This study aims to reconstruct a change in the system of word stress in Umpithamu, a Middle Paman (< Paman < Pama-Nyungan) language of Cape York Peninsula, in northeastern Australia. The change involves a shift in parsing direction, from a left-aligned system as found in most Pama-Nyungan languages, to a system anchored at the right edge. The process of change is reconstructed using evidence from changes in root structure and root size in the language, in combination with specifics of the synchronic system of word stress. The broader context for the analysis is a well-known hypothesis about stress shift as the cause of initial consonant loss – a typologically rare phenomenon that is found in areal patterns in Australia, including Umpithamu and neighbouring languages (see Blevins 2001, 2007). The basic idea, represented in (1) below, is that a shift of stress away from the first syllable has led to weakening and subsequent loss of root-initial consonants (Hale 1964, 1976b; Blevins & Marmion 1994, Blevins 2001), and then on to a whole suite of changes in phoneme inventory and word structure (e.g. Hale 1976b, c; Verstraete 2018a, b).

(1) Stress shift model

Step 0: C-initial roots & initial stress	#ˈCV…
Step 1: Stress shift	#CVˈC…
Step 2: Initial weakening & loss	#(C)VˈC…

This model works well for languages where initial consonant loss has run its full course (including most of Umpithamu's neighbours), but crucially not for Umpithamu, where initial loss is partial rather than complete. In this sense, a language like Umpithamu demonstrates that the actual processes of stress shift and initial loss may be quite different from what their end point suggests, and that the classic stress shift model should be refined in a number of ways.

More specifically, the analysis makes three points. First, Umpithamu does not have the simple onset-sensitive stress system that would be expected in the stress shift model in (1), i.e. with stress on the first consonant-initial syllable in the root. This is illustrated in (2), which contrasts Umpithamu with its southern neigbour Umbuygamu. Umbuygamu has full initial loss, and nicely conforms to the stress shift model as shown in (2a), with a simple onset-

sensitive stress system. By contrast, stress in Umpithamu is not determined by the shape of the onset, as shown in the contrast between (2b) and (2c); instead, the argument developed in this paper shows that stress should be analysed as anchored at the right edge. In other words, the shift in Umpithamu does not involve a change from a simple left-aligned system to an onset-sensitive one, but from a left-aligned to a right-aligned system, i.e. a shift in parsing direction.

(2)		#VˈC…			#ˈCV…	
Umbuygamu	a.	abal ‘king parrot’	/aˈbal/	vs	belbɛl ‘cut’	/ˈbɛlbɛl/
Umpithamu	b.	apil ‘hawk sp.’	/aˈpil/	vs	katha ‘rotten’	/ˈkat̪a/
		BUT			BUT	
	c.	aawan ‘hold’	/ˈaːwan/		kitharri ‘sharp’	/kiˈt̪ari/

Second, the reconstruction of the change suggests that the relation between stress shift and initial consonant loss is more complex than a simple causal one, and that the shift in parsing direction in Umpithamu is actually a consequence of initial consonant loss rather than its cause. Some kind of linear stress shift like (1) may still be involved at the start of the process, but overall the relation between initial loss and stress shift is more complex than traditionally assumed.

Finally, it is also shown that an Umpithamu-style system can develop into the expected onset-sensitive system in a relatively simple way, based on further changes in root structure attested as following initial consonant loss. This demonstrates that a system like the one found in Umpithamu is a potential precursor of the simple onset-sensitive systems predicted by the stress shift model, and that a language like Umpithamu can give us an insight into the complexity of the actual processes that lead to an apparently simple and uniform end point.

The evidence for the analysis comes from three sources. The first is a synchronic analysis of the Umpithamu lexicon (as documented in Verstraete 2020), including not just its stress system but also specific properties of root shape and root size. The second is a diachronic analysis of root structure in Umpithamu, specifically of the loss of initial consonants and developments in root size. The third is typological, comparing the Umpithamu system to stress systems in neighbouring languages as well as to broader generalisations about Pama-Nyungan languages. Taken together, this evidence allows us to develop a fairly detailed reconstruction of stress shift in Umpithamu, which is not just relevant to the question of initial loss, but also adds to what we know about Australian stress systems and their development.

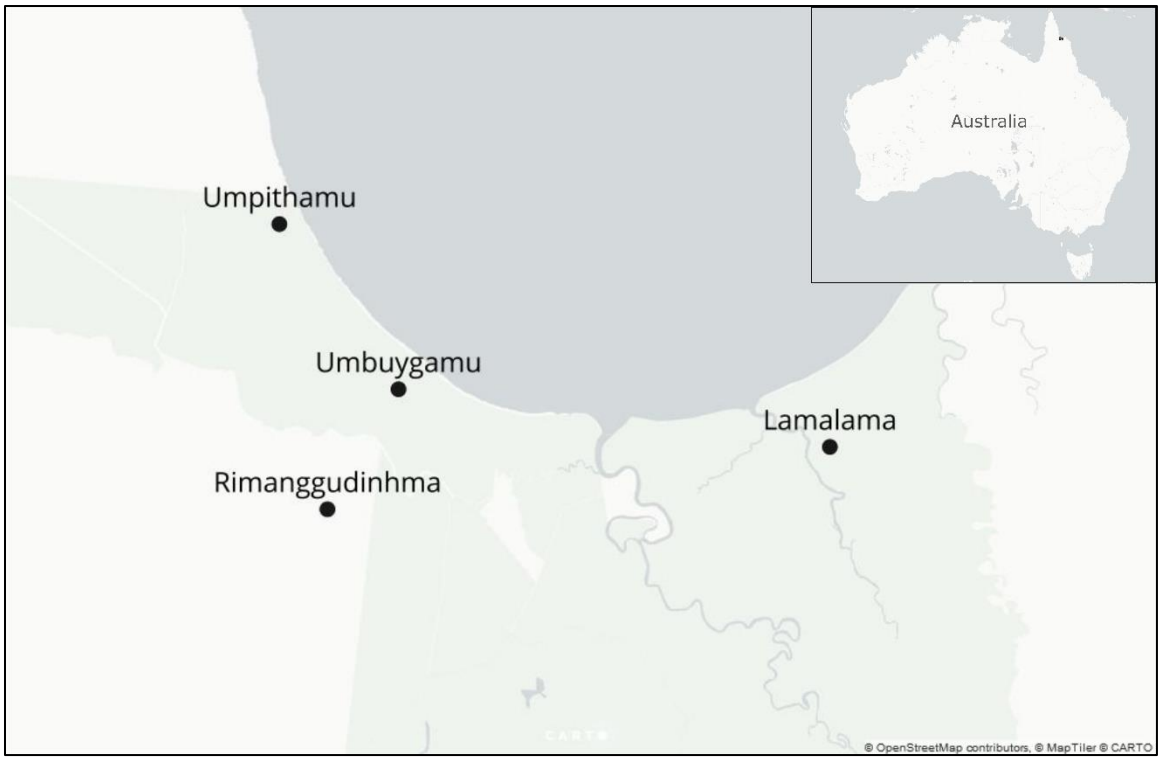
This study is structured in four sections. Section 2 introduces some relevant properties of Umpithamu, including synchronic and diachronic aspects of root structure. Section 3 develops a synchronic analysis of the system of word stress in Umpithamu, which together with evidence about the original stress system suggests that stress change in Umpithamu was a matter of a shift in parsing direction rather than a simple linear stress shift. Section 4 then proposes a reconstruction of how the shift in parsing direction could have happened, using evidence from root shape, root size, and the distribution of root types over the lexicon. Specifically, the reconstruction suggests that the major shift in Umpithamu's stress system is a consequence of initial loss rather than its cause. Section 5 briefly examines implications for the classic stress shift model, by comparing Umpithamu with languages with full initial consonant loss. The analysis suggests that an Umpithamu-style system can be a precursor to the expected onset-sensitive system, and that further developments in root structure may trigger further stress shift in a cyclical pattern, which demonstrates that Umpithamu provides genuine insight into processes linking stress shift and root structure. Section 6 rounds off with a conclusion.

2. Umpithamu

This section introduces some basic facts about Umpithamu, the data used for this study, and the structure of the Umpithamu lexicon, specifically aspects of root shape and root size.

2.1. Basics and data

Umpithamu is a language of the east coast of Cape York Peninsula, in the northeast of Australia. Genetically, it belongs to the Middle Paman subgroup of Paman languages (Hale 1964, 1966, 1976b), which themselves form a subgroup of Pama-Nyungan (Alpher 2004a, b; Bowern & Atkinson 2012). The analysis will also refer to languages from a neighbouring subgroup of Paman, viz. the Lamalamic languages Umbuygamu, Lamalama and Rimanggudinhma (see Verstraete 2018a on subgrouping), all located to the south of Umpithamu. Map 1 shows the approximate location of the four languages.



Map 1: Relative location of languages

The Umpithamu data used for this study are taken from Verstraete (2020), a comprehensive lexicon that provides broad phonetic transcriptions, cognates within and beyond Middle Paman, as well as Proto-Paman and Proto-Pama-Nyungan reconstructions. Lamalamic data are from the author's fieldwork on Umbuygamu and Lamalama, as well as transcriptions of archival materials for all three Lamalamic languages (see Verstraete 2018a, b for more details). Reconstructions cited in this study are from Hale (1976a, b, c) for Proto-Paman, and Alpher (2004b) for Proto-Paman (PP) and Proto-Pama-Nyungan (PPN), as well as a set of 'local' reconstructions without a clearly determined level of reconstruction from Alpher (2019).

Tables 1 and 2 below illustrate Umpithamu's phoneme inventory, with orthographic representations between angle brackets.

	Bilabial	Lamino-dental	Apico-alveolar	Lamino-palatal	Velar	Glottal
Plosive	p <p>	t̪ <th>	t <t>	c <ty>	k <k>	ʔ <'>
Nasal	m <m>	n̪ <nh>	n <n>	ɲ <ny>	ŋ <ng>	
Lateral			l <l>			

Trill			r <rr>			
Approximant	w <w>		ɹ <r>	j <y>		

Table 1: Consonant inventory

	Front	Back
Close	i <i>, iː <ii>	u <u>, uː <uu>
Open-mid	ɛ <e>, ɛː <ee>	ɔ <o>, ɔː <oo>
Open	a <a>, aː <aa>	

Table 2: Vowel inventory

Within the set of consonants, voicing is not contrastive for plosives, but the distribution of voiceless and voiced allophones is conditioned by stress, as will be discussed in more detail in section 3.2. Within the set of vowels, long vowels are only found in initial syllables and not beyond, as in most Australian languages (see, for instance, Dixon 1980). The orthography used is a standard Australianist orthography, i.e. with digraphs for lamino-dentals (<th>, <dh>, <nh>), lamino-palatals (<ty>, <dy>, <ny>), velar nasals (<ng>) and trills (<rr>, versus <r> for alveolar glides), as well as <’> for glottal stops and <y> for palatal glides. Homorganic nasal-plosive clusters are orthographically simplified, e.g. <nth> instead of <nhth>. Lamalamic languages have relatively large consonant inventories for Australian languages (see Verstraete 2018a, 2019a, 2019b for details): special symbols used are <f>, <θ>, <sh> and <h> for bilabial, dental, palatal and glottal fricatives, respectively, as well as <rh> for voiceless trills and <ð> for dental glides. In reconstructed forms, <c> and <ñ> represent the reconstructed laminal set (following Alpher 2004a: 107).

2.2. Root structure in Umpithamu

Proto-Paman and Proto-Pama-Nyungan roots are commonly assumed to be uniformly consonant-initial and predominantly bisyllabic (O’Grady 1998, Alpher 2004a). Umpithamu shows significant changes in root shape and in root size, both of which are relevant to the analysis of word stress in the following sections.

First, Umpithamu shows pervasive loss of initial consonants, resulting in a lexicon with about 40% vowel-initial roots.[1] The presence or absence of an initial consonant is one of the relevant factors in the location of word stress, as will be discussed in the following section. Initial consonant loss is phonetically systematic in Umpithamu: as shown in Verstraete (forthcoming), historical-comparative analysis and synchronic distribution suggest that initial obstruents are largely lost or lenited while initial sonorants are largely retained, with velar plosives in between, showing both loss and retention. This is illustrated in (3) below, with reconstructions or cognates demonstrating the nature of the initial consonant that is lost or lenited in Umpithamu. A full analysis can be found in Verstraete (forthcoming).

(3) a. *p lost or lenited

PP *paangkal ‘shoulder’ (Hale 1976b)	aangkal ‘shoulder’
PP *parrpu ‘maggot’ (Verstraete 2020)	warrpurru ‘maggot’

b. *t lost

PP *taakurr ‘ground’ (Alpher 2004b)	aakurru ‘ground’

c. *c lost or lenited

PP *cuci ‘bird’ (Hale 1976b)	otyirri ‘bird’
PPN *cuwa ‘child (to woman), sister's child’ (Alpher 2004b)	yuwatha ‘child (mother speaking)’

d. *k lost or retained

PP *kalu- ~ kali- ‘carry’ (Alpher 2019)	kalin ‘take’
PPN *kacin ‘digging stick’ (Alpher 2004b)	athin ‘digging stick’

e. *m retained

*maru ‘black’ (Alpher 2019)	ma’u ‘cloud’

f. *n (insufficient data)

g. *ñ retained

*ñuñu ~ ñuña ‘3rd singular accusative’ (Alpher 2019)	nhunha ‘other’

h. *ng retained

PPN *ngaani ‘what’ (Alpher 2004b)	ngaani ‘what’

i. *w retained

[1] Numbers cited in this section (and beyond) are based on counts of 755 roots in Verstraete (2020), excluding any derived or compound forms.

		PP *wulul ‘blowfly’ (Alpher 2019)	wolol ‘fly’
j.	*y	retained	
		PP *yupa ‘bye-and-bye’ (Hale 1976b)	yupa ‘today’

Further aspects of phonotactic structure are most easily described in terms of a word template: as in most Pama-Nyungan languages, restrictions in the distribution of consonants and consonant clusters are associated with specific positions in the root rather than generalisable in terms of syllable structure (Dixon 1980, Hamilton 1996, Baker 2014). The first intervocalic position allows the full range of single consonants and consonant clusters, while the root-initial position and further intervocalic positions are more restricted. Thus, for instance, the root-initial position does not allow any liquids or consonant clusters, and the second or third intervocalic positions are mostly restricted to single consonants, with rare exceptions of clusters most likely indicating historical boundaries (see further in sections 3.1 and 4.3 for examples).

Second, Umpithamu also shows significant developments in root size. Proto-Pama-Nyungan and Proto-Paman roots are assumed to be predominantly bisyllabic (O’Grady 1998, Alpher 2004a).[2] By contrast, the Umpithamu lexicon (755 roots) has 41% trisyllabic roots, against 50% bisyllabic roots (the remainder are roots of four and five syllables, mostly diachronically complex, and two monosyllabic interjections). Such differences in root size are again an important factor in determining word stress, as will be discussed in the next section. Moreover, there is an interesting interaction with root shape: about 2/3 of vowel-initial roots are trisyllabic, while only 1/3 of consonant-initial roots are trisyllabic. This is a significant element in reconstructing the effects of stress shift in Umpithamu, as will become clear in section 4.

3. Word stress and stress shift

This section develops a synchronic analysis of word stress in Umpithamu. Section 3.1 presents the basic patterns of stress assignment using the root properties discussed in the previous section, and section 3.2 proposes a partial metrical generalisation, with right-

[2] To give some idea, no more than 7% of Proto-Paman reconstructions in Hale (1976b) are trisyllabic, and over half of these have the third syllable as an optional element in the reconstruction. Percentages of reconstructions should be taken with a grain of salt, but they do give an indication of the predominance of bisyllabic roots.

alignment of feet as the most important feature. Section 3.3 then discusses its diachronic relevance, as a preparation for the diachronic analysis of stress shift in section 4.

3.1. Basics

The basic diagnostic criterion for word stress in Umpithamu is that primary stress is the (potential) location of the primary pitch movement in the utterance, which in lexical elication coincides with the word. As in many cases, there is no study of native speaker judgements to confirm this, but this is the way word stress has been diagnosed in many Australian languages (see Fletcher & Butcher 2014), including in the region (e.g. Verstraete & Rigsby 2015); as will be discussed below there is also segmental evidence supporting this analysis. The analysis also posits secondary stress, which is mainly justified in terms of its consistent behaviour in metrical generalisations. The relevance of secondary stress is further supported by frequent misperception as primary stress in the author's initial fieldwork, as well as typological parallels.

Table 3 below lists all possible stress patterns for bisyllabic and trisyllabic roots in Umpithamu, which as mentioned earlier together make up over 90% of the lexicon. Stress is morphologically insensitive (unlike in Umpithamu's closest relative Yintyingka, see Verstraete & Rigsby 2015), so the patterns below are not influenced by suffixation, except in occasional instances of lexicalisation of suffixed forms.

	Shape	Example	
1	V(C).ˈCV(C)	ikan 'fat'	/iˈkan/
2	ˈV:(C).CV(C)	uuku 'language'	/ˈu:ku/
3	ˈCV(C).CV(C)	katha 'rotten'	/ˈkat̪a/
4	ˈCV:(C).CV(C)	ngaani 'what'	/ˈŋa:ni/
5	Vˈ(C).CV(C).CV(C)	ilantyi 'cold'	/iˈlaɲci/
6	ˌV:(C).ˈCV(C).CV(C)	aaliman 'galah'	/ˌa:ˈliman/
7	CV(C).ˈCV(C).CV(C)	koloyi 'taipan'	/kɔˈlɔji/
8	ˌCV:(C).ˈCV(C).CV(C)	kaarrimpa 'pied heron'	/ˌka:ˈrimpa/

Table 3: Stress patterns in Umpithamu

The relevant surface factors governing these stress patterns are the presence of an onset, the length of the first vowel, and the size of the root. The relevance of onsets is reflected in bisyllabic roots: roots starting with a short vowel like *ikan* have second-syllable stress, while roots starting with a consonant like *katha* have first-syllable stress. Incidentally, this is also the pattern that is predicted by the stress shift model outlined in (1) above. However, this simple picture is further complicated by root size and by vowel length (which as already mentioned is restricted to the first syllable). The relevance of vowel length is reflected in the difference between second-syllable stress for roots like *ikan* and first-syllable stress for roots like *uuku*, as well as secondary stress for the first syllable in *aaliman* and *kaarrimpa*. The relevance of root size is reflected in the location of primary stress on the second syllable for all trisyllabic roots, regardless of onset or vowel length.

There are two sets of exceptions to the patterns in Table 3. One concerns roots of type 3 that end in laterals, which can attract stress to the second syllable, especially if the root starts with an approximant. Stress attraction of this type is not available for all relevant roots, and if it is, it is mostly a matter of free variation. In some roots, it does appear to be fixed, as in the examples in (4) below.

(4) a. yayil ‘type of stingray’ /jaˈjil/
b. wukal ‘cheek’ /wu'kal/

The second set of exceptions concerns quadrisyllabic forms, most of which are diachronically complex. One subtype are compound-like forms consisting of two bisyllabic items, which take primary stress on the first item and secondary stress on the second. This is illustrated in (5) below, with a reduplication in (5a) and a form that looks composite on phonotactic grounds in (5b) (with a consonant cluster towards the end).

(5) a. koorokooro ‘clean’ /ˈkɔːɹɔˌkɔɹɔ/
b. kopupinta ‘night heron’ /ˈkɔpuˌpinta/

The other subtype are trisyllabic forms with some kind of historical increment as a fourth syllable, which follow the basic stress pattern of the trisyllabic form. The extra syllable can originate in a suffix, as with *-ntyi* in (6a) and *-mun* in (6b), most likely comitative and ablative though the form is not otherwise transparent; or it can originate in a phonological process, like

-*rra* in (6c), which originates in a vowel-copying process specific to Umpithamu (see further in section 4.3 below for more details).

(6)	a. maytukuntyi ‘stingray sp.’	/majˈtukuŋci/
	b. yaantyintyimun ‘cocky apple’	/ˌjaːɲˈciɲcimun/
	c. upatharra ‘cotton tree’	/uˈpat̪ara/

Given that most quadrisyllabic forms appear to be diachronically complex, with stress rules that can be reduced to bisyllabic and trisyllabic patterns, the few cases where a final lateral appears to attract final stress are the only genuine exceptions to the patterns in Table 3. In this sense, a generalisation that covers the patterns in this table can be said to be a valid one for the lexicon as a whole.

3.2. Right-aligned feet

As already mentioned, the simple onset-based generalisation predicted by the stress shift model in (1) does not work for Umpithamu: vowel- and consonant-initial roots do not form uniform categories with respect to stress assignment. Within vowel-initial roots there is a difference between long and short initial vowels, as shown in (7), and within consonant-initial roots there is a difference between bisyllabic and trisyllabic ones, as shown in (8).

(7)	ikan ‘fat’	/iˈkan/
	uuku ‘language’	/ˈuːku/
(8)	katha ‘rotten’	/ˈkat̪a/
	koloyi ‘taipan’	/kɔˈlɔji/

The stress shift model in fact has two features that do not work well for Umpithamu:[3] (i) it is linear, assuming a uniform rightward shift for onsetless roots, regardless of any other properties of the root like size or vowel length, and (ii) it is aligned to the left edge rather than to the right edge. By contrast, the Umpithamu patterns suggest a generalisation that is aligned to the right edge, and relies on feet rather than on a simple linear analysis to capture all

[3] I thank Aditi Lahiri for gently guiding me towards this analysis, first through crucial comments on a talk, followed by extensive discussions of word stress in Cape York languages.

relevant root properties. Right alignment immediately captures the fact that all patterns except the first one have stress on the penultimate syllable. Attempts at a left-aligned generalisation fail because of the many surface factors involved, as shown in the previous section, but a right-aligned analysis supports a generalisation in terms of penultimate stress. Still, this does not yet capture the effect of two further relevant root properties, namely the distinct behaviour of long and short initial vowels (patterns 1 versus 2), and of long vowels in trisyllabic words (patterns 6 and 8). In order to capture these, assuming feet as intermediary constituents seems to be necessary (Hayes 1995, Lahiri 2001), leading to a metrical generalisation as in (9) below.

(9) Metrical generalisation

a. Foot type:

Moraic trochee: (x .) or (x)

Weight criterion: (V:) = heavy

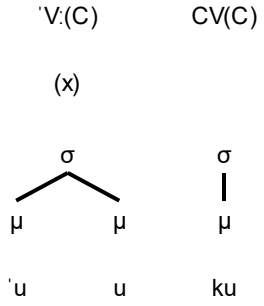
b. Parsing:

Right-to-left parsing

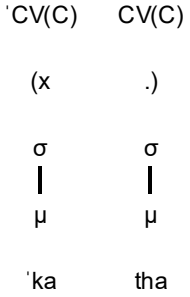
Rightmost stress rule

The penultimate generalisation suggests a right-aligned trochee, and the behaviour of syllables with long vowels suggests that the trochee is weight-sensitive or moraic, with vowel length as the weight criterion. The location of primary and secondary stress, finally, suggest a rightmost stress rule. The formalisation in (10) shows how this works out for the patterns in Table 3 above, except for the first one, which is discussed in more detail below.

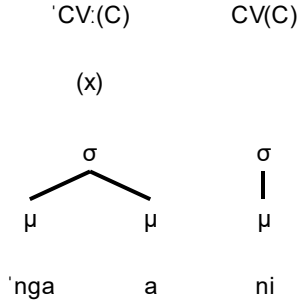
(10) a. Pattern 2: uuku ‘language’



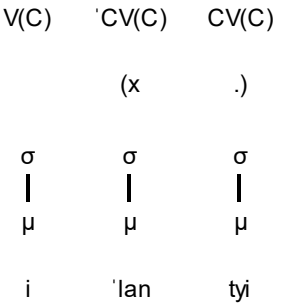
b. Pattern 3: katha ‘rotten’



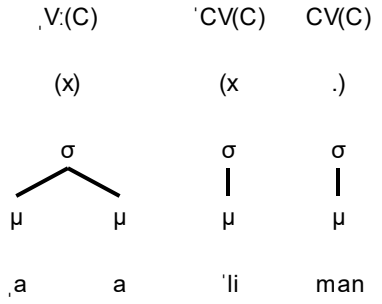
c. Pattern 4: ngaani ‘what’



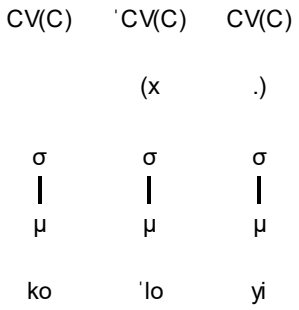
d. Pattern 5: ilantyi ‘cold’



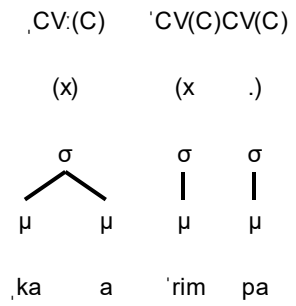
e. Pattern 6: aaliman ‘galah’



f. Pattern 7: koloyi ‘taipan’



g. Pattern 8: kaarrimpa ‘night heron’



This metrical generalisation has some further advantages, but also one remaining problem, which will become crucial in the diachronic analysis in section 4. Beyond capturing the stress patterns, the foot-based analysis in (9) can also help to make sense of segmental phenomena like the distibution of plosive voicing, which as already mentioned is not contrastive in Umpithamu. Single plosives can only be voiced within a foot but not at its edges, as shown in (11): /t̪/ in *apatha* and /p/ in *kotyopa* can be voiced, but not /p/ in *apil*, *aapirri* or *apatha*, nor /k/ or /c/ in *kotyopa* (see further below on the metrical structure of (11a)).

(11) a. apil ‘hawk sp.’ (x)
a ˈ**p**il

b. aapirri ‘lady apple’ (x) (x .)
ˌa: ˈ**p**iri

c. apatha ‘older sister’ (x .)
a ˈ**p**a**ḏ**a

d. kotyopa ‘tree sp.’ (x .)
kɔ ˈ**c**ɔ**b**a

Plosives in nasal-plosive clusters can be voiced within a foot, or immediately following a foot, but not elsewhere, as shown in (12): /p/ can be voiced in *aampan* and *aampulmpun*, but not in *ampula* and *kamparra*.

(12) a. ampula ‘fine sand’ (x .)
am ˈ**p**ula

b. kamparra ‘fast’ (x .)
kam ˈ**p**ara

c. aampan ‘bury’ (x)
ˈa:m**b**an

d. aampulmpun ‘tree sp.’ (x) (x .)
ˌa:m ˈ**b**ulm**b**un

The same phenomena could in principle also be generalised in a linear model, i.e. as post-tonic and post-long voicing, but assuming feet as intermediate constituents provides a more elegant generalisation, using one single concept from which both stress and voicing can be derived.

Given the comparative focus of this paper, I do not develop a full generative analysis of the synchronic system, but the analysis proposed so far does leave at least one problem open, and that is how to deal with roots of pattern 1, i.e. bisyllabic roots starting with a short vowel. The fact that stress is on the second syllable suggests the initial short vowel is unfooted, but it is not clear why or how this would be the case. One way to deal with this would be to invoke extrametricality for short initial vowels (compare Davis 1985, Halle & Vergnaud 1987), which is a technical possibility but without further motivation merely

(re)labels the problem. Invoking degrees of syllable weight may be a way to go beyond a simple restatement of the problem. Syllable weight has traditionally been associated with properties of the nucleus, or the rhyme as a whole, rather than with the onset. Rhyme-based weight distinctions are typologically dominant, as confirmed by the survey in Gordon (2016), but there is evidence that onsets can also play a role in some languages, as shown, for instance, by Gordon (2005), Topintzi (2010) and Ryan (2014). From this perspective, short initial vowels could be regarded as constituting an extra-light syllable type as opposed to equivalents with an onset and/or a long vowel (the latter property making a syllable heavy, as mentioned above). This would actually make sense from the perspective of the characteristics of initial consonant loss in Umpithamu: as mentioned in section 2, obstruents are largely lost or lenited, while sonorants are largely retained. The overall effect of this is a largely sonorant-initial lexicon, within which initial syllables consisting of a short vowel stand out, as against long initial vowels or sonorant initials. In other words, there could be a hierarchy like (13) below, with weight determined first by onset and then by nucleus (coda appears to be largely irrelevant, except in the case of root-final laterals discussed in the previous section; see also footnote 4 below).

(13)	V	<	CV	<	(C)V:
	extra-light		light		heavy
	extrametrical		single mora		double mora

Within this hierarchy, short initial vowels are unfooted, and bisyllabic roots with such initials form ‘degenerate’ feet (Hayes 1995: 86-105) with stress on the only remaining stressable syllable, viz. the second one. Degenerate feet are typically avoided (e.g. Kager 2007), but the systematicity of the moraic trochee in the rest of the system leads to the need to posit them to account for pattern 1 (which, with about 9% of all roots, is relatively marginal in the current system).[4] The reality of this type is also reflected in specific effects of root shortening like the one illustrated in (14).

[4] A reviewer points out that codas may play a role in repairing degenerate feet for pattern 1. Roots of this pattern include both forms with and without codas, so codas are not required in this context. However, codas are found in the majority of these roots, which suggests that the presence of a coda could have some effect. In combination with the occasional effect of final laterals in approximant-initial bisyllabic roots (mentioned in section 3.1 above), this could be generalised as a non-systemic coda effect for bisyllabic roots with short initial vowels or initial approximants.

(14) a. iilatha ‘younger sister’ /ˌiːˈlaṯa/

b. iila ‘younger sister’ /ˌiːˈla/

c. /iˈla/

The base form *iilatha* ‘younger sister’ in (14a) consists of two feet, with secondary-primary stress assignment following pattern 6. There is, however, also a shortened version *iila*, which occurs in two variants, listed in (14b, c). The reduced form in (14b) retains the stress pattern of the base form, with stress on the second syllable. This is prosodically irregular, however, given the heavy initial syllable with a long vowel: the effect of this is a variant with a short initial vowel, as in (14c), effectively creating a degenerate foot to maintain the link with base form stress rather than shifting stress to create a full foot. The ‘degenerate’ nature of footing in these roots will become an important element in the diachronic argument developed in section 4.

3.3. Diachronic implications

Regardless of any residual problems with the metrical generalisation, the analysis in the previous section has shown that a right-aligned analysis offers the best explanation for Umpithamu, even in linear analyses of the system. In this section, I briefly survey the evidence which shows that the original system was a left-aligned one. This suggests that the change in Umpithamu involved a shift in parsing direction, from a left-aligned to right-aligned system.

There are three indications that the original stress system in Umpithamu must have been one that was left-aligned, with a leftmost stress rule. The first indication is local, relating to Umpithamu’s closest relatives. Most other Middle Paman languages for which we have a reliable description of word stress have a system of this kind: this is the case, for instance, in Wik Mungkan (Kilham 1974), Kugu Nganhcara (Smith & Johnson 2000), Wik Ngathan (Sutton 1978) and possibly also Umpila (Thompson 1988).[5] Umpithamu’s closest relative Yintyingka has a different system, but crucially this language also shows partial initial loss, as discussed further in section 6 below. The second indication about the original system is

[5] There are some complications in Umpila relating to syllable weight (due to the occurrence of vowel length beyond the first syllable).

broadly typological, based on Australia-wide surveys of word stress. As argued in Fletcher & Butcher (2014) and Baker (2014), Pama-Nyungan languages typically have a system with primary stress on the first syllable. Some descriptions also report secondary stress on alternate syllables following the primary one (Fletcher & Butcher 2014), but there is work suggesting that this second feature may be due to 'stress ghosting' for some languages (reflecting the analyst's native stress system; Tabain, Fletcher & Butcher 2014). Regardless of the issue of secondary stress, however, the overall tendency towards primary stress on the first syllable appears to be quite robust across Pama-Nyungan, with exceptions noted only in regions with initial consonant loss (Baker 2014; see further below). A final indication for an original left-aligned system can be found in proposals about the system of word stress for reconstructed stages, like O'Grady's (1998) argument that Proto-Pama-Nyungan had stress on the initial syllable (based on differences in vowel quality between initial and non-initial syllables).

To conclude, then, if the original system was a left-aligned one, the major change in Umpithamu was a shift in parsing direction, from the original left-aligned one to the right-aligned system described in the previous section. This, of course, raises the question how exactly this change took place. The next section outlines a reconstruction of the different steps that could have been involved in shifting the parsing direction.

4. Reconstructing stress shift in context

When trying to reconstruct changes in Umpithamu's stress system, we have three elements to work with: the change in parsing direction outlined in the previous section, but also the changes in root shape (initial consonant loss) and root size (root incrementation) described in section 2. I will argue that all of these changes are interrelated, though not necessarily in the way predicted by the classic stress shift model in the case of initial consonant loss. The scenario outlined in this section still assumes that there was a simple linear shift at the very start of the change, but in this scenario the major change in the stress system occurred as a consequence of initial consonant loss rather than as its cause. Section 4.1 summarises the elements we have to work with, and sections 4.2-4.4 outline the three steps in the scenario of change.

4.1. Elements

What we know about the trajectory of stress shift is its likely starting point and its end point. The starting point was most likely a system with left-aligned stress, and uniformly consonant-initial and predominantly bisyllabic roots, summarized in (15).

(15) Starting point

a. Stress: Left-to-right parsing, leftmost stress rule
b. Root shape: Uniformly consonant-initial
c. Root size: Predominantly bisyllabic

The end point, i.e. the current Umpithamu system, is one with right-aligned stress, partly vowel-initial roots, and a large proportion of trisyllabic roots, especially for vowel-initial roots, summarized in (16).

(16) End point

a. Stress: Right-to-left parsing, rightmost stress rule
b. Root shape: 40% vowel-initial roots
c. Root size: 41% trisyllabic roots (and 50% bisyllabic roots)
   - V-initial roots: 2/3 trisyllabic
   - C-initial roots: 2/3 bisyllabic

Thus, there are three elements to work with in reconstructing the change: stress, root shape, and root size. In what follows, I will outline a scenario in three steps, in which all of these changes are causally interrelated.

4.2. Step 1: Partial initial loss, linear stress shift

The first step assumes partial loss of initial consonants, accompanied by linear stress shift for roots with short initial vowels, resulting in the patterns outlined in Table 4 below. The forms are organised in terms of the patterns of Table 3, but the trisyllabic patterns 5-8 most likely represent a relatively small set at this point (see section 4.1 above), so the major change at this step is in pattern 1.

Patterns after step 1	Similarity to surface stress in final system

Bisyllabic	1	V(C).ˈCV(C)	=
	2	ˈV:(C).CV(C)	=
	3	ˈCV(C).CV(C)	=
	4	ˈCV:(C).CV(C)	=
Trisyllabic	5	V(C).ˈCV(C).CV(C)	=
	6	ˈV:(C).CV(C).CV(C)	≠
	7	ˈCV(C).CV(C).CV(C)	≠
	8	ˈCV:(C).CV(C).CV(C)	≠

Table 4: Stress patterns after step 1

There are several reasons to assume this as an initial step. First, we know from historical-comparative evidence that there was partial loss of initial consonants in Umpithamu, mainly affecting obstruents and leaving sonorants largely intact (see section 2.2 above). Second, as already mentioned, this type of development results in a lexicon that is largely sonorant-initial, in which short initial vowels are the odd one out in terms of weight. Third, if there is some link between initial loss and second-syllable stress (as suggested by their widespread association in neighbouring languages in which initial loss has run its full course), then roots with extra-light initial syllables are the best candidate to be associated with stress shift.[6] Fourth, assuming this association as a first step brings us relatively close to the final system: 5 out of 8 patterns already have the same surface structure as the final system, as shown in the second column of Table 4, including all of the bisyllabic ones, which we know form the majority of tokens in the initial state (see section 4.1 above).

Crucially, however, the stress system at this point is imbalanced, in two ways. First, there is a relatively large number of degenerate feet: the pattern in 1 is degenerate not just in a right-aligned system as argued above, but also in the left-aligned system which we assume to be the initial state. And secondly, the original left-aligned generalisation is no longer possible

[6] As suggested by a reviewer, generalised shift for onsetless roots could also be assumed, with primary stress subsequently shifting back (or secondary stress added) to long initial vowels following a weight-based principle. This analysis is possible in theory, but it is less parsimonious and, perhaps more importantly, less in line with what we know about languages that have undergone full initial consonant loss and simple linear stress shift (see section 5 below for Lamalamic languages, and Hale 1976a on Northern Paman languages). All of these have lost vowel length, which suggests that stress shift typically induces loss of weight distinctions, and that stress shift followed by weight-based adjustment is less likely than weight preventing stress shift in the first place.

unless short initial vowels are taken to be extrametrical, including in trisyllabic forms. This imbalance in the system leads on to the second step postulated in the reconstruction.

4.3. Step 2: Root expansion

The second step in the reconstruction assumes a process of root expansion, which repairs the large number of degenerate feet created in step 1, through a process of rightward expansion of the root with an extra syllable, schematically represented in (17).

(17) V(C).ˈCV(C) → V(C).ˈCV(C).CV(C)

Note that this does not affect the stress system as such, but it does shift the balance between pattern 1 (degenerate bisyllabic roots) and pattern 5 (trisyllabic roots): the number of tokens in pattern 1 is reduced, and the number of tokens in pattern 5 is expanded.[7]

There is good evidence to assume that root expansion was an actual step in the development of the language. First, there is the structure of the lexicon. As already mentioned, Umpithamu has a surprisingly large number of trisyllabic roots, especially when compared with the assumed initial state. And what is more, there is a clear link with vowel-initial roots: 2/3 of all vowel-initial roots are trisyllabic, while 2/3 of all consonant-initial roots are bisyllabic, which suggests an association between initial loss and root expansion. Stating this in terms of the patterns in section 3.1 above: trisyllabic vowel-initial roots (patterns 5 and 6) outnumber their bisyllabic equivalents (patterns 1 and 2) by a factor of about 2 to 1, while trisyllabic consonant-initial roots (patterns 7 and 8) are outnumbered by their bisyllabic equivalents (patterns 3 and 4), again by a factor of about 2 to 1. All of this suggests an association between initial loss and root expansion, such that especially vowel-initial trisyllabic roots have grown at the expense of their bisyllabic equivalents.

Second, there are subclasses within the lexicon that show a specific association between initial consonant loss and root expansion. This is the case, for instance, for kin-terms and pronouns. Almost all kin-terms have lost initial consonants,[8] including sonorants which are

[7] The same applies to patterns 2 and 6, but these are less numerous as long vowels are generally rarer than short ones.

[8] The only exceptions, *yaami* ‘mother in law’ and *yuwatha* ‘child (mother’s perspective)’ show historical lenition: compare PPN **caami* ‘wife's mother's brother’ (Alpher 2004b) and PPN **cuwa* ‘child (to woman), sister's child’ (Alpher 2004b).

not normally affected, as shown in (18c-d), suggesting some kind of paradigmatic pressure (see further in Verstraete forthcoming).

(18)	a.	amitha ‘mother’	PPN *kami ‘mother’s mother’ (Alpher 2004b)
	b.	apitha ‘mother’s father’	PP *papi ‘father's mother’ (Hale 1976b)
	c.	iilatha ‘younger sister’	PP *wiila ‘younger sister’ (Verstraete 2020)
	d.	apatha ‘older sister’	PPN *yapa ‘sister (older)’ (Alpher 2004b)

At the same time, all kin-terms bar one are trisyllabic (the exception is *yaami* ‘mother in law’, one of the lenited items), usually with diachronic incrementation. Most involve recognisable increments, the most common one being -*tha*, as shown in (18), which is probably an old first person possessive marker (see Verstraete 2020).

The same pattern can be found in pronouns, all of which have lost initial consonants (again including classes that are not normally affected), and most of which show optional increments in the nominative, of the form -*ya* (i-final stems), -*wa* (u-final stems) and -*mpa* (one a-based stem), as illustrated in (19).

(19)	a.	aliya ‘you and me’	PPN *ngali ‘we inclusive dual’ (Alpher 2004b)
	b.	inuwa ‘you’	PPN *nyinu ‘2nd singular oblique’ (Alpher 2004b)
	c.	antyampa ‘we, not including you’	PP *ngantyan ‘we exclusive’ (Hale 1976b)

The precise distribution of these increments is not yet understood, but they are always present in elicitation.

Finally, there are also generalized phonological processes involving root expansion, like vowel copying in trill-final stems or the addition of an entire syllable consisting of a trill and a copied vowel, as shown in (20).

(20)	a.	ungkarra ‘north’	PP *kungkarr ‘north’ (Hale 1976b)
	b.	otyirri ‘bird’	PP *cuci ‘bird’ (Hale 1976b)
	c.	aakurru ‘ground’	PP *taakurr ‘ground’ (Alpher 2004b)

These are ‘signature’ processes in Umpithamu, which allow one to identify loans from Umpithamu into neighbouring languages. This type of process is blind to root shape or size

and therefore also affects a number of trisyllabic roots (see section 3.1 above for some examples), but again its main effect is on bisyllabic roots.

In addition to these more productive or more clearly describable processes, there are various other indications of diachronic incrementation in trisyllabic forms. This includes apparent bits of old morphology in forms that are not otherwise transparent, like an apparent ablative *-mun* in (21a), or *-ntyi* in (21b) which functions as a comitative in a neighbouring language, but also phonotactic indications like heavy consonant clusters that are not usually found beyond the first syllable boundary, like *-lngk-* in (21c).

(21) a. oorrkorrmun 'brown whistleduck'
b. oothintyi 'girl'
c. uumpulngka 'Torres Strait pigeon'

To conclude, then, there is good evidence for a whole range of processes, of different origins, that have the cumulative effect of expanding the set of trisyllabic roots at the expense of bisyllabic ones, especially but not exclusively for vowel-initial roots. There is no real 'smoking gun' evidence for a preference for vowel-initial roots, but there are strong indications in the structure of the contemporary lexicon, as well as a number of specific word classes. All of this is suggestive of a stage in the development of the language that involved some kind of prosodic pressure towards root expansion, as posited in step 2. As already mentioned, this step again brings us closer to the final system, not through a major change in the system, but in the balance of tokens in the different categories, with an increase in patterns 5 and 6 at the expense of patterns 1 and 2.

4.4. Step 3: Reanalysis

Reshuffling of numbers leads on to the third step, which assumes a process of reanalysis that produces the eventual shift in parsing direction. The crucial point here is that there is an ambiguity in terms of parsing direction in the system, as illustrated in the second column of Table 5 below. Such ambiguities can become important factors enabling processes of reanalysis and change in stress systems, as shown by Lahiri (2015).

Patterns after step 2			Parsing compatibility	Reanalysis	Patterns after step 3
Bisyll	1	V(C).ˈCV(C)	Neither	New right-hand generalisation	V(C).ˈCV(C)
	2	ˈV:(C).CV(C)	Left & right		ˈV:(C).CV(C)
	3	ˈCV(C).CV(C)	Left & right		ˈCV(C).CV(C)
	4	ˈCV:(C).CV(C)	Left & right		ˈCV:(C).CV(C)
Trisyll	5	V(C).ˈCV(C).CV(C)	Right		V(C).ˈCV(C).CV(C)
	6	ˈV:(C).CV(C).CV(C)	Left	Stress shift	ˌV:(C).ˈCV(C).CV(C)
	7	ˈCV(C).CV(C).CV(C)	Left		CV(C).ˈCV(C).CV(C)
	8	ˈCV:(C).CV(C).CV(C)	Left		ˌCV:(C).ˈCV(C).CV(C)

Table 5: Stress patterns after step 2 and 3

In a system of moraic trochees, bisyllabic forms are compatible with either left-hand or right-hand parsing (in the case of patterns 2-4), or with neither (in the case of pattern 1). Trisyllabic forms, by contrast, are compatible with only one parsing direction for moraic trochees: right-hand parsing for pattern 5 (penultimate surface stress), and left-hand parsing for patterns 6-8 (initial surface stress). This is essentially the same situation as after step 1, but importantly the numbers have changed: trisyllabic forms have become more prominent, and patterns 5 and 6, in particular, have grown at the expense of patterns 1 and 2 due to root expansion, as described in section 4.3 above. Between patterns 5 and 6, moreover, pattern 6 would have remained comparatively small, as long vowels are rarer than short ones in Proto-Paman reconstructions (as well as in the contemporary Umpithamu lexicon). This reshuffle is what may have tipped the balance in the system, leading to a reanalysis with right-hand parsing as the new generalisation. Given that bisyllabic roots are compatible with either parsing direction, a growth in the exclusively right-hand pattern 5 could have produced a new ‘right-hand’ generalisation, which could then have led to stress shift via analogical change in the numerically smaller trisyllabic patterns 6-8. As shown in the right-hand column of Table 5 above, this brings us to the contemporary system.

This final step remains largely hypothetical, of course, especially because we do not have any actual numbers to substantiate the relative prominence of patterns in the past. However, the scenario of reanalysis does lead to the final system as the end point of a series of motivated steps. Moreover, shifts in parsing direction have been attested elsewhere in the development of stress systems, for instance in the history of English, as shown in detail in

Lahiri (2015). Interestingly, reanalysis also appears to have played an important role in the case of English, with inherently ambiguous forms being reanalysed because of other changes in the system, including the introduction of Romance forms.

4.5. Conclusion

To conclude, the scenario outlined in sections 4.2-4.4 proposes a reconstruction of how a shift in parsing direction could have occurred in Umpithamu's system of word stress, in interaction with what we know about changes in root shape and root size. The scenario as a whole is necessarily hypothetical, but most aspects are motivated by a reconstructable or observable feature of the language, leading in a plausible way from what we know to be the initial state to what we know to be the end point. The ordering of steps is also motivated, with partial initial loss necessarily as a first step, since general prosodic processes like root expansion or parsing shifts could hardly have led to loss of specific classes of consonants. Root expansion then follows on from the considerable number of degenerate roots created by initial loss, and itself feeds into reanalysis and shift in parsing direction.

The plausibility of this particular ordering of steps is also supported by the fact that any alternative ordering is problematic. Assuming a change in parsing direction as the first of three steps is problematic for two reasons. First, as just mentioned it is unclear how a generalised prosodic process would lead to a loss of a specific class of initial consonants rather than affecting all of them. Second, it is not clear how this would affect a lexicon largely consisting of bisyllabic roots, which as we know from section 2 is the likely initial state. In a trochaic system, most bisyllabic roots are compatible with either parsing direction, and the real locus of change are trisyllabic roots, which suggests that a change in parsing direction necessarily feeds off a prior process of root expansion. Assuming a process of root expansion as a first step is equally problematic. First, it is unmotivated as a first step, unlike in the scenario sketched above where it can be linked to the creation of degenerate roots following initial loss. And second, it is again unclear how loss of a specific class of initial consonants could follow from a generalised prosodic process like root expansion. In short, all three processes are independently observable or reconstructible, but the ordering proposed in sections 4.2-4.4 is the most plausible one, starting with the process that can least easily be motivated in terms of the others, and then following the path that can most easily be motivated in terms of causal relations.

5. Umpithamu stress shift in a broader context

Put in a broader context, the analysis in the previous section shows how Umpithamu deviates from the predictions of the classic stress shift model, both in the nature of the stress shift involved and its interaction with initial loss. As already mentioned, the reason is most likely that Umpithamu shows partial initial loss, and therefore reveals the complexities of the actual process of change more clearly than languages with full initial loss, which are at its end point. Such languages do seem to be largely in line with the classic stress shift model, as is the case for the Lamalamic languages, Umpithamu's immediate southern neighbours (see Baker 2014 for other languages, including the well-known but somewhat controversial case of Arandic). The question arises, therefore, whether an Umpithamu-style system could be regarded as a genuine precursor to the more well-behaved systems with full initial loss. To round off the analysis, I briefly examine this on the basis of the Lamalamic languages, for which there is sufficient synchronic and diachronic analysis to allow an informed comparison (see Verstraete 2018a, b; 2019a, b).

As already mentioned, there are three Lamalamic languages, viz. Umbuygamu, Lamalama and Rimanggudinhma. All three show full initial consonant loss, and all three largely conform to the typical onset-sensitive system predicted by the classic stress shift model, i.e. stress on the first consonant-initial syllable in the root, as illustrated in (22).

(22) Umbuygamu (Verstraete 2019a)

a. abal 'king parrot' /aˈbal/

b. belbel 'cut' /ˈbɛlbɛl/

Lamalama (Verstraete 2019b)

c. arrfarr 'fishnet' /arˈɸar/

d. ngganham 'hammer' /ˈŋgan̪am/

Rimanggudinhma (Verstraete 2017)

e. arho 'arm' /aˈr̥ɔ/

f. thamba 'woman' /ˈt̪amba/

Furthermore, Lamalamic languages are also characterised by the typical structural consequences of full initial loss, like extended phoneme inventories associated with the original medial consonant position (see further in Verstraete 2018a), and far-reaching changes in phonotactic structure and root structure (see further in Verstraete 2018b).

So could the processes identified in Umpithamu eventually develop into a Lamalamic-style system? I do not want to suggest a teleological model where Umpithamu is necessarily heading towards this type of system, but it is instructive to examine the possibility. A comparison of patterns suggests that without positing any change in surface stress location, the changes in root structure that we know occurred in the Lamalamic languages are in fact sufficient to create an onset-sensitive system. Taking an Umpithamu-style system as the starting point, there are two changes in common between all Lamalamic languages: full loss of initial consonants (as just mentioned), and a loss of contrastive vowel length (see Verstraete 2018a). Assuming no change in stress location, this reduces the eight patterns in Table 5 above to two, viz. V'CV for bisyllabic roots, and V'CVCV for trisyllabic roots, as shown in the second column of Table 6 below. The table and the discussion below use simplified representations without codas, for the sake of readability.

<table>
<tr><th colspan="3">Umpithamu-style system</th><th>Lamalamic</th><th>Rim</th><th>LL</th><th>Umb</th></tr>
<tr><td rowspan="4">Bisyllabic</td><td>1</td><td>V'CV</td><td rowspan="4">V'CV</td><td rowspan="2">V'CV</td><td rowspan="4">(aL)'CV</td><td rowspan="4">V'CV</td></tr>
<tr><td>2</td><td>'V:CV</td></tr>
<tr><td>3</td><td>'CVCV</td><td rowspan="2">(aL)'CV</td></tr>
<tr><td>4</td><td>'CV:CV</td></tr>
<tr><td rowspan="4">Trisyllabic</td><td>5</td><td>V'CVCV</td><td rowspan="4">V'CVCV</td><td rowspan="2">V'CVCV</td><td rowspan="4">'CVCV</td><td rowspan="4">V'CVCV</td></tr>
<tr><td>6</td><td>ˌV:'CVCV</td></tr>
<tr><td>7</td><td>CV'CVCV</td><td rowspan="2">'CVCV</td></tr>
<tr><td>8</td><td>ˌCV:'CVCV</td></tr>
<tr><td colspan="4">Compounding</td><td>'CVCV</td><td>'CVCV</td><td>'CVCV</td></tr>
</table>

Table 6: Developments in Lamalamic (L stands for a liquid, Rim for Rimanggudinhma, LL for Lamalama and Umb for Umbuygamu)

Further developments in root structure in each of the three languages then diversify the situation again, as shown in the third, fourth and fifth column of Table 6. What follows is a summary: more details can be found in Verstraete (2018b). In Rimanggudinhma, the remaining initial vowels can be lost or retained, leading to V'CV, 'CV, V'CVCV and 'CVCV. Word minimality requirements also seem to play a role, in that monosyllables can be 'repaired' though the addition of an empty prefix consisting of a low vowel and a liquid, which adds aL'CV to the inventory. Examples of each pattern can be found in (23).

(23) Rimanggudinhma

a. VˈCV	ako ‘bone’	/aˈkɔ/
b. ˈCV	dharr ‘saltwater crocodile’	/ˈd̪ar/
c. VˈCVCV	ilatyarr ‘black ibis’	/iˈlacar/
d. ˈCVCV	mbana ‘own’	/ˈmbana/
e. aLˈCV	alnggol ‘hole’	/alˈŋgɔl/

In Lamalama, all remaining initial vowels are lost, leading to ˈCV and ˈCVCV; however, monosyllables are again often ‘repaired’ with an empty prefix, again adding aLˈCV(C) to the inventory, illustrated in (24).

(24) Lamalama

a. ˈCV	thal ‘bone’	/ˈt̪al/
b. ˈCVCV	maya ‘mother’	/ˈmaja/
c. aLˈCV	arrbal ‘hair’	/arˈbal/

In Umbuygamu, finally, initial vowels are retained, leading to VˈCV and VˈCVCV, illustrated in (25). There are no indications of aL-prefixation, probably due to the fact that the retention of initial vowels blocks the creation of monosyllables.

(25) Umbuygamu

a. VˈCV	alir ‘leaf’	/aˈliɹ/
b. VˈCVCV	orhawarr ‘big mob’	/ɔˈr̥awar/

Furthermore, all three languages have a set of polysyllabic consonant-initial forms that most likely originate in a process of compounding, which deletes any initial vowel in the first element of the compound (see Verstraete 2018b for phonotactic and other evidence). This is represented in the final row of Table 6 above. Most of these forms have initial stress, but there is an interesting wrinkle in the small minority of trisyllabic forms (discussed further below).

This survey demonstrates how developments in root shape can easily turn a fairly complex Umpithamu-style system into a simple onset-sensitive one, characterised by stress on the first consonant-initial syllable. If we start out from the Umpithamu patterns and do not assume any change in surface stress location, full initial consonant loss and full or partial

initial vowel loss are sufficient to create fully onset-sensitive systems. In this sense, the Umpithamu system is a plausible precursor for the Lamalamic-style onset-sensitive types, and the processes identified in Umpithamu can be regarded as a good model for what the processes leading towards an end point of onset-sensitiviety could look like.

There is one interesting complication in the Lamalamic systems, which further confirms the relevance of the Umpithamu model. In spite of initial erosion, which in principle would lead to ever shorter roots, all Lamalamic languages have polysyllabic consonant-initial roots, including a minority of trisyllabic ones (see Verstraete 2018b for some numbers). As already mentioned, these most likely originate in morphologically complex forms like compounds, probably as a response to word minimality requirements just like the prefixation process described above (Verstraete 2018b). Bisyllabic consonant-initial roots conform to the onset-sensitive pattern, with stress on the first syllable, but trisyllabic ones vary between first- and second-syllable stress: some have only initial-syllable stress, some only second-syllable, and some genuinely vary, as illustrated in (26).

(26) Lamalama

a. dandhawarr ‘bird species’	/ˈdan̪d̪awar/
b. danyawirr ‘fish net’	/daˈɲawir/
c. kandawarr ‘red-belly snake’	/kanˈdawar/, /ˈkandawar/

Trisyllabic consonant-initial forms are a small minority in all Lamalamic languages, and the precise distribution and explanation of this stress variation remains unclear.[9] However, their deviant pattern does suggest that changes in root structure seed instability and change in the system, just as we observed for Umpithamu. It is probably not a coincidence that stress variation crops up precisely in new forms that do not fit in with the rest of the system. In other words, processes comparable to the ones identified in Umpithamu could occur again, in a cyclical way, with moving ‘windows’ of stress assignment adjusting to changes in root shape and size.[10]

[9] For instance, one open question is how these stress patterns relate to the specific stress pattern of the compound structures that are their likely origins. Answering this question would require etymological work that is beyond the scope of this paper (and remains to be done).
[10] This also raises the question in how far metrical generalisations, i.e. assuming feet as intermediary constituents, are possible or necessary for Lamalamic-style languages, a question that is not further explored here. Their simple onset-sensitive system can easily be dealt with in a simpler linear analysis, and the predominantly short roots probably make a

6. Conclusion

If we go back to the stress shift model outlined at the start of this paper, the analysis of Umpithamu has shown three things. First, stress shift in interaction with initial consonant loss is not necessarily a matter of simple linear shift leading to an onset-sensitive system, but can also involve other types of change, like the change in parsing direction observed for Umpithamu. Second, interaction with initial consonant loss is not necessarily unidirectional: stress shifts can be the consequence of initial consonant loss as well as its cause. As already mentioned, the likely reason why Umpithamu produces such a different picture is that it has partial rather than full initial loss, and thus may represent an intermediate point in the process rather than its end point. Even if languages at the end point of the process are compatible with the stress shift model, a language like Umpithamu shows that the actual process may be quite different from what its end point would suggest. Finally, an Umpithamu-style system can be regarded as a genuine precursor to languages with full initial loss and simple-onset sensitive systems, with changes in root shape all that is required to get from one to the other. This demonstrates that a language like Umpithamu provides genuine insight into the complex processes linking stress shift and root structure.

In addition to the results above, this study also raises quite a few questions that remain unanswered. To round off, I would like to highlight two of these. The first is in how far the Umpithamu model can be generalised, i.e. if there are any other languages with partial initial loss that show similar stress patterns, and may therefore have gone through similar changes. There are definitely other languages with partial initial loss in the region (see Alpher 1976, who coined the term ‘sporadic initial dropping’ for them), but none have a sufficiently detailed analysis of their stress system to compare with Umpithamu. The best candidate is probably Yintyingka (Verstraete & Rigsby 2015), which has a relatively small percentage of vowel-initial roots (13%, versus 40% in Umpithamu), which seem to originate in borrowing rather than any internal phonetic process (as argued in Verstraete forthcoming). Interestingly, however, what can be reconstructed of the stress system looks like that of Umpithamu, with

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metrical generalisation hard. However, stress variation in new trisyllabic roots suggests that once changes in root size come into play, feet may again play a role as intermediary constituents. In other words, metrical versus linear analyses may not simply be a matter of alternative (interchangeable) analytical options, but a genuine typological distinction, with feet as intermediary constituents only becoming necessary when changes in syllable weight and root size play a role.

an apparent right-hand generalisation (see patterns in Verstraete & Rigsby 2015, though the right-hand analysis is not spelled out there). Unfortunately, the data available are too poor to allow any strong conclusions (mainly archival data, with only a small subset of field recordings). But the possibility of a right-hand analysis is tantalising, because it suggests that regardless of origins, once a lexicon has a sufficient number of vowel-initial roots, relevant changes can be set in train.

The second question concerns the status of the initial 'linear' stress shift posited in the reconstruction. Even though the change in parsing direction is the major shift in Umpithamu, the reconstruction proposed in section 4 still had to assume some kind of linear shift, in line with the classical model, to get the whole suite of processes started. So the question remains how that shift relates to initial loss. I believe this is a question that requires detailed phonetic work, not just on Umpithamu but also on other Middle Paman languages. Two properties that may be relevant here are the nature of the initials that are lost, and segmental effects of primary stress like post-tonic consonant lengthening. Blevins (2001) suggests that post-tonic lengthening of consonants would create uniformly long rhymes, which in turn could trigger compensatory shortening for onsets, phonetically leading to hypoarticulation (and possibly lenition and loss). From this perspective, it is interesting that Umpithamu has mainly lost obstruents, and seems to have lost post-tonic consonant lengthening, which is found in most of its Middle Paman relatives (like Umpila and Yintyingka). In other words, post-tonic lengthening could have led to hypoarticulation and loss for intrinsically short obstruents following Blevins' (2001) hypothesis, and subsequently disappeared through syllable reassignment. This is only speculation, of course, but I hope that phonetic analyses may become available that would allow us test this and other hypotheses.

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