Metrical structures: A neglected property of Nilotic (and other African language families)

Gerrit J. Dimmendaal

Abstract

There appears to be a widespread assumption that metrical structures do not play a role in tonal languages, since prominence is associated with frequency or pitch instead of amplitude, as in languages using stress. Studies of tonal languages in Africa and elsewhere over the past decade or so, however, have shown that this assumption is not correct. Presented below is an initial survey of morphophonological phenomena involving foot structures in the Nilotic branch within Nilo-Saharan. More specifically, it is shown how mora counting and the creation of bimoraic units at the word level became prominent in Eastern Nilotic after vowel length was lost. It is furthermore argued that the nature of segmental reduction in Western Nilotic languages becomes more transparent if preferred metrical patterns are taken into account. Metrical rules also help to solve a long-standing analytical problem in Southern Nilotic Kalenjin, namely length dissimilation for vowels as a rule accompanying inflectional and derivational processes. Finally, metrical rules play a role with Nominative case assignment by way of tonal inflection, as argued below.

1. *The rhythmic units of language*

That segmental units may be grouped into larger units of speech sounds such as syllables has been known for some time now. In a typical Nilotic language, the syllable onset tends to consist of a consonant or a consonant plus glide, whereas the nucleus may be filled by a short vowel, a long vowel, or even an extra-long vowel, depending on the language. The coda may either be empty or occupied by a sonorant (in particular within a word), although a number of Nilotic languages also allow for obstruents in this position.

There is disagreement among linguists whether the nucleus and the coda form a unit within the syllable or not. There are arguments in favour of both positions, which suggests that the actual structure of the syllable depends on the language involved.
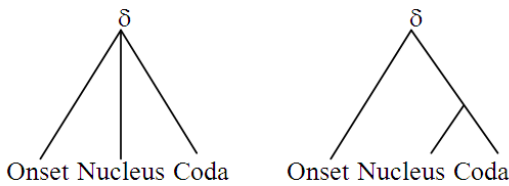
In addition to the syllable, the mora as a timing unit or unit of phonological length has been shown to be relevant with respect to a range of languages. As argued by McCawley (1978), "[t]here is only one workable universal definition of "mora": something of which a long syllable consists of two and short syllable of one." In Japanese, for example, accent in recent borrowings goes on the syllable containing the third from last mora:

(1)   buráziru   'Brazil'   kuudétaa   'coup d'etat'

        wasínton   'Washington'   rekóodo   'record'

For a long time, metrical structures were studied primarily with respect to languages using primary (and secondary) stress at the word level. Qualitative meter, based on stress patterns (i.e. stressed versus unstressed syllables coming at regular intervals) is known to play a central role in different Indo-European languages, e.g. English. Quantitative meter on the other hand is based on syllable weight or mora counting. Such a pattern, with short/long distinctions, is found in Indo-European languages like Greek or Latin, or Classical Arabic. "Long" in such cases means a long vowel, a diphthong, or nucleus followed by one or more consonants.

   Both with qualitative and with quantitative meter, prominence is determined by the relations between nodes in a branching tree, in which one node is strong (S) and the other node or nodes are weak (W). The best known foot types relevant to spoken language are presumably disyllabic patterns involving an iambic and a trochaic foot:
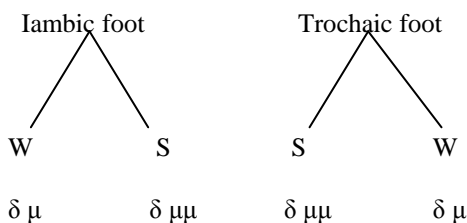
Alternative patterns, primarily known from poetry, whose relevance for metrical patterns in spoken language nevertheless cannot be excluded on *a priori* grounds, include the following:

iamb:	short-long	(˅ ‾)
trochee:	long-short	(‾ ˅)
dactyl:	long short-short	(‾ ˅ ˅)
spondee:	long long	(‾ ‾)
anapest:	long-short-short	(‾ ˅ ˅)
amphibrach	short-long-short	(˅ ‾ ˅)
pyrrhic	short-short	(˅ ˅)

As we shall see below, spondaic and pyrrhic structures do in fact play a role in metrical structures in Nilotic.

Since in a classical tonal language (simply whether belonging to the contour type or to the register type) each vowel or each syllable may carry its own distinctive tone(s), it is sometimes assumed that metrical structures do not play a role in languages with this type of prosodic structure. But in actual fact they do, as has been shown in Chinese languages, for example; see Duangmu (1999) for a discussion of deletion or spreading of tones in Shanghai Chinese, a process conditioned by foot structure within a word.

In an African context, Leben (2002), Akinlabi and Urua (2003), Bickmore (2003), and Weidman and Rose (2006) are pioneering studies on this topic. Green (2010) explores the processes of vowel syncope and velar consonant deletion that conspire to minimize Colloquial Bambara words by removing segmental material. Instances of failed segmental deletion can be attributed to constraints on the language's prosodic structure and the types of deletion that can or cannot occur (or co-occur) within a specified prosodic domain. Noted restrictions on the processes of word minimization in Colloquial Bambara stem from the language's overall avoidance of iambic sequences, as argued by Green (2010).

Pearce (2006) shows that in the Chadic language Kera vowel allophones, duration and quantity indicate the difference between a head vowel (underlined in the formula below) and a non-head vowel. Moreover, the vowel harmony and the tonal systems use the foot as a domain for spreading in Kera. The following are possible foot structures in this language:

Monosyllabic:	<u>CVV</u>	<u>CVC</u>
Disyllabic:	CV.<u>CVV</u>	CV.<u>CVC</u>

In Kera, the tone bearing unit is the syllable in shorter verbs, whereas for longer verbs the tone bearing unit is the foot, and tone is realized on the head.
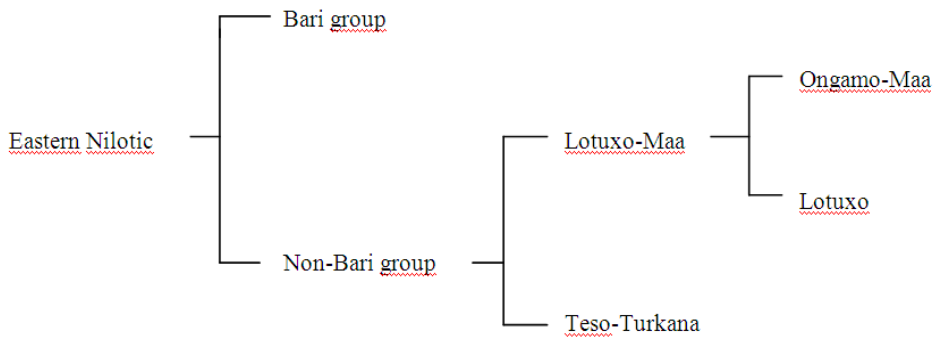
Below, we present a first survey of metrical phenomena in the three primary branches of the Nilotic family, Eastern, Western and Southern Nilotic. The purpose of the present contribution is not to present an exhaustive listing of all phenomena where foot structures play a role in this family. Rather, this brief

survey should show that we are dealing with a hitherto neglected property of Nilotic languages which deserves a more in-depth in-vestigation.

2. *Evidence from Eastern Nilotic*

The most widely accepted sub-classification of Eastern Nilotic today is based on the classic contribution by Vossen (1983), who, by using the comparative method, arrives at a binary division between Bari languages on the one side and a Non-Bari branch on the other. The latter branch, also referred to as the Lotuxo-Maa-Teso-Turkana group, divides further into a number of subgroups:

One of the innovations setting Eastern Nilotic apart from other Nilotic groups is the loss of distinctive vowel length (Dimmendaal 1988), as the following correspondence sets between Eastern Nilotic Bari and Southern Nilotic Päkoot help to show:

	Bari	Päkoot	
(2)	ɗoŋ	ɗoŋ	'smash'
	ɗuŋ	ɗuŋɗuŋ	'cut'
	mɪŋɛ	mɪɲ	'deaf'
	man	maan	'hate, be hostile to'
	kʊt -	kʊʊt	'blow'
	kɔŋɛ	kɔɔŋ	'eye'
	mɔrɪn	mɔɔrɪn	'finger'

As these cognates show, vowel length must have been lost in Bari. As other Eastern Nilotic languages also have short vowels as a reflex in cognate forms, the loss of vowel length is probably a shared innovation. A number of Eastern Nilotic languages nevertheless do have phonetically long vowels as a result of intervocalic loss of consonants, for example in the root for 'locust' (reconstructed as *mayat- by Vossen 1982: 391):

4

(3)   mayat-ti   'migratory locust' (Bari)

        ɔl-maat-i   'locust' (Maasai)

Thus, even though vowel length is contrastive in these Eastern Nilotic languages, phonetically long vowels are best analyzed as sequences of two short vowels, instead of vowels with a distinctive feature [+long], as in Southern or Western Nilotic languages. As argued by de Chene (1979), loss of intervocalic consonants (followed by syllable coalescence) is a common way in which languages acquire vowel length. And:

> "...[w]hen a language without distinctively long vowels acquires them through coalescence, syllable-counting rules are automatically transformed into mora-counting rules, since coalescence of sequences of vowels that result from intervocalic consonant loss involves coalescence of syllables as well. Conversely, we may hypothesise that mora-counting never occurs except as the result of such a change" (de Chene 1979:97).

As we shall see next, this is exactly what can be observed in different Eastern Nilotic languages.

2.1. Mora counting in Teso-Turkana

Across the Nilo-Saharan family (with the exception of the Central Sudanic branch) one finds a pattern of number inflection for nouns in which either the singular or the plural (or collective) constitutes the morphologically simplest form. With the first pattern, a corresponding plural is marked for number (usually by suffixes). In the second pattern, the collective is the base form, a corresponding singulative may be added to form a singular; in addition, replacement may occur, i.e. number marking both in the singular and in the plural.
  This pattern is also common in Eastern Nilotic languages. Number marking on nouns in Teso-Turkana is characterized by a degree of morphological and phonological complexity also manifested in other Nilotic languages. But in Teso-Turkana the choice of plural markers is, to a large extent, determined by the moraic structure of nominal roots (Dimmendaal 1983a, 1987). Here, it is primarily vowels which play a role in mora counting. Monomoraic nominal roots in Turkana, i.e. roots containing one vowel, almost always take the number suffix -ɪn/-in (the alternation being determined by vowel harmony rules in the language):

	Singular	Plural	
(4)	é-cóm	ŋí-cóm-ín	'baboon'
	é-pém	ŋí-pém-ín	'bed'

Bimoraic nominal roots, on the other hand, take the number suffix -ɪ/-i (depending on vowel harmony rules):

	Singular	Plural	
(5)	á-pɔ̀ɔ́	ŋá-pɔ́ɔ́-ɪ́	'hare'
	á-wùnó	ŋá-wúnó-í	'rope'

As the examples for 'hare' and 'rope' show, it is irrelevant whether a root is monosyllabic (as with 'hare') or disyllabic (as with 'rope'), i.e. whether a consonant intervenes. With bimoraic nominal roots ending in a consonant, the number-marking suffix tends to be –a/-ɔ/-o, whereby the alternation itself again is determined by vowel harmony rules in the language.

	Singular	Plural	
(6)	á-kíɲáŋ	ŋá-kìɲàŋ-á	'crocodile'
	ɛ́-ŋátʊ̀ɲ	ŋí-ŋàtʊ̀ɲ-ɔ́	'lion'
	á-tápén	ŋá-tàpèn-ó	'guineafowl'

A bimoraic foot equals the minimal word in Turkana, except with high frequency verb forms (e.g. specific imperatives or verbs with a high frequency in narrative or procedural discourse):

(7)   tó-lót   'go!'

        bwá   'come!' (not **tó-bwá)

Words playing a role in expressive language, such as interjections, attitude markers or ideophonic adverbs, are not subject to the bimoraic constraint either. The vowels in such words may be lengthened in order to express intensity. They may be emphasized or their tones may be raised to extra high, in order to create an interpersonal effect.

(8)	è-gógóŋ	tá	è-réŋ	púúúúú
	3-be.hard	IDEO	3-be.red	IDEO
	'it's hard as a stone'		'it's blood red'	

In all other cases, monomoraic words are avoided in Teso-Turkana, and forms containing just one vowel as a moraic unit (such as prepositions or relative clause markers) cliticize onto neighbouring constituents to form a phonological word.

  With respect to verbs in most Eastern (and Southern) Nilotic languages, it is useful to make a distinction between two morphological classes which have come to be known as Class 1 and Class 2 verbs (Dimmendaal 1983b). Historically, this distinction corresponded to a class with basic (non-derived) verb roots, and a second class with a causative prefix ɪ- / i-. This function is still attested with a number of verbs in Southern Nilotic Kalenjin (Dimmendaal 1983a).

In Eastern Nilotic languages, however, the two classes simply constitute two distinct conjugational classes. The allocation of verbs in Class 1 as against Class 2 has consequences for their behaviour, for example in that they take different imperative markers:

	Class 1		Class 2	
(9)	tó-rém	'spear (it)!'	k-ìkám	'catch (it)!'

With Class 1 verb infinitives, a prefix kɪ-/ki- is inserted only if the root is monomoraic (i.e. contains one vowel only).

(10)	á-kí-rém	'to spear'	á-ŋáám	'to sigh'

Class 1 verbal roots may be expanded with different derivational suffixes, which leads to one or more vowels being added. In such derived stems, the prefix kɪ-/ki- is also absent, as in the following example with the Ventive marker:

(11)	á-rém-ùn	'to spear this way'

These examples show that Turkana foot structure is quantity-sensitive, and that verb stems have to be at least bimoraic. A parallel system can be observed in other Teso-Turkana languages.

With Class 2 verbs, infinitives always take this prefix. Note that the initial high vowel of such verbs carries a low tone, whereas the following vocalic segment carries a high tone.

(12)	á-k-ìkám	'to catch'	á-k-ìkám-ùn	'to catch this way'

Noske (1991) discusses the link between reduplication and metrical structures in Turkana and shows that the preservation of foot structure plays a role with Intensive verb formation.

	Simple stem		Intensive form	
(13)	á-ki-póc	'to pinch'	á-póc-ó-póc	'to pinch repeatedly'
	á-kɪ-dá	'to flog, beat'	á-dá-í-dá	'to thrash'

As pointed out by Noske (1991), the insertion of the vowel -ɪ- in the stem for 'thrash' is not governed by the need to satisfy syllable-structure constraints, because a sequence -dá-dá would be permissible in Turkana. Instead, it is governed by the need to satisfy a foot template for the stem. Parallel to the Intensive form for 'pinch', the insertion of the vowel helps to create a trochaic foot, as claimed in the present contribution.

2.2. The ubiquitous movable k- again

As Vossen (1982: 203-204, 301-306) shows in his historical investigation of the phonological and morphological structure of Eastern Nilotic languages, there are "prefix-like" elements. Phrased differently, there are nominal segments without any discernible function in present-day Eastern Nilotic languages which can also be reconstructed for the earliest stages of this Nilotic branch. With respect to these petrified morphs, a first set involves nouns where the former prefix is present both in the singular and the plural. Compare the following Proto-Eastern Nilotic reconstructions derived from Vossen (1982):

(14)   *ŋa-dʸɛp-a   'tongue'

         *kɔ-dʸaŋ-a   'fly'

These petrified elements belong to a set of "empty morphs" in Turkana and other members of the Teso-Turkana cluster (Dimmendaal 1983a: 253). The element *ŋa- probably is the reflex of a former relative clause marker (as well as the question word 'who'). Consequently, words like 'tongue' or 'fly' in the Turkana example above constitute former attributive phrases which were reinterpreted as nouns. The word for 'fly' also appears to go back to an attributive construction involving a third person cross-reference marker, still attested with this form in Teso.[1]

  In a number of other examples reconstructed by Vossen (1983) for Proto-Eastern Nilotic, the prefixes seem to constitute an innovation of this Nilotic branch, as no prefix is found in cognate forms in Southern or Western Nilotic. Reconstructed roots below are based on (Vossen 1982), whereas the proposed reconstructions for Proto-Nilotic are based on Dimmendaal (1988).

	Proto-Eastern Nilotic	Proto-Nilotic		
(15)	*kɪ-tɛŋ	*dhɛŋ	'cow'	
	*kɪ-tʊ(k)	*tuk	'cows'	
	*kɪ-ma	*mac	'fire'	
	*ki-nedʸ	(no reconstructed root)	'goat'	(Cushitic: na'ɪ in Beja)
	*ki-riŋ	*riŋ	'meat'	

The prefixation of *kɪ-/*ki-, rather than some other element, presumably was based on the high frequency of this prefix with other nouns, and consequently was selected by analogy with these

---

[1] See the discussion of classifiers in Storch (2005: 388 -390, ad passim) in Western Nilotic.

frequently occurring forms.[2] Whereas in the examples above ('cow(s)', 'fire', 'goat', 'meat') all members of the Eastern Nilotic branch show a prefix kɪ-/ki-, the root for 'water', reconstructed as *-pi by Vossen (1983: 441-442), only shows a prefix ki- in the Non-Bari branch; the form reconstructed for Proto-Nilotic by Dimmendaal (1988) is *piR. This type of variation within Eastern Nilotic suggests that the prefixation of *kɪ-/*ki-was already initiated at the Proto-Eastern Nilotic stage, i.e. after vowel length was lost as a distinctive feature. But it was extended in the Non-Bari group (in particular in the Teso-Turkana group), even though the prefixation was interrupted or became obsolete in the Bari group. The motivation for the prefixation of *kɪ-/*ki- to monomoraic roots presumably was the creation of bimoraic units, which is a metric-based phenomenon. In languages belonging to the Bari group monosyllabic or monomoraic words are, in fact, common. In this respect, members of this cluster are more similar to neighbouring Central Sudanic languages. There is independent evidence that these latter languages influenced members of the Bari group, for example at the phonological level. See Dimmendaal (1996) on the origin of labial-velar stops in Bari varieties such as Kakwa. Also, the loss of cross-reference marking for subjects on the verb in the Bari group may be due to shift-induced interference from Central Sudanic.

Synchronically, the prefix kɪ-/ki- is absent in various Eastern Nilotic languages if a number suffix follows the nominal root, because the presence of such a suffix results in the creation of a bimoraic stem, and consequently no prefix is required.
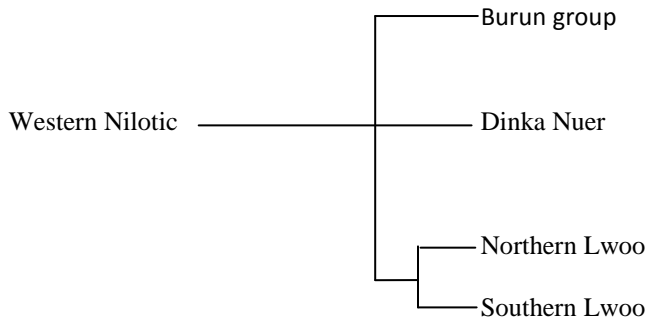
(16)

	Singular	Plural	
Lopid:	xʊ-tʊn	tuɲ-i	'python'
Turkana:	á-kî-rîŋ	ŋá-rìŋ-ó	'meat'

The gender prefixes of Teso-Turkana are a more recent innovation within Eastern Nilotic, as shown in Heine and Vossen (1983).

3. Examples from Western Nilotic

While no monograph comparable in detail to Vossen (1982) for Eastern Nilotic or Rottland (1982) for Southern Nilotic is available for Western Nilotic, Andersen (e.g. 1990) provides a range of observations on the historical development of this latter branch in particular with respect to vowel systems. In addition, Reh (1985) presents a first inventory of common Western Nilotic roots in an unpublished manuscript. This branch of Nilotic is usually divided into three subgroups:

---

[2] The prefix itself goes back to an archaic property of Nilo-Saharan languages, a preposition kɪ-. At the syntactic level, this preposition may introduce a range of semantic roles (e.g. instrument or manner), whereas at the nominal level it introduces attributive phrases.

```
                          ┌─── Burun group
                          │
Western Nilotic ──────────┼─── Dinka Nuer
                          │
                          │    ┌── Northern Lwoo
                          └────┤
                               └── Southern Lwoo
```

The fusional nature of many Western Nilotic languages as against the more agglutinative morphology found in Eastern and Southern Nilotic languages was one of the criteria used by Tucker and Bryan (1966) to distinguish between "Nilotic" (i.e. Western Nilotic) and "Para-Nilotic" (or "Nilo-Hamitic" at an earlier stage). Meanwhile, we know that languages of the Burun group within Western Nilotic have retained a considerable degree of agglutinative morphology. Consequently, the typological classification of Western Nilotic by these authors essentially applies to the Dinka-Nuer group and the Lwoo cluster. A comparison of cognate   morphemes with inflectional and derivational morphology in these Western Nilotic groups with cognate morphemes elsewhere in Nilotic makes clear that internal morphology in the Lwoo cluster and the Dinka-Nuer cluster within Western Nilotic is the historical result of fusion processes between lexical roots (e.g. for nouns and verbs) and suffixes. The following section addresses the historical development of one of these suffixes reconstructable for the earliest stages of Nilotic, in order to show that metrical rules played a role in this historical restructuring process in Western Nilotic languages.

3.1 Reducing segmental structures: The pluractional marker as an example

Also attested in Nilotic is the widespread lexical-derivational process in African languages whereby verbs express the involvement of a plural (as against a singular) subject in the case of intransitive verbs and repetition of some action as applied to plural objects (as against a singular object) in the case of transitive verbs. Reh (1991) reconstructs a Pluractional (Frequentative) suffix *-cVn for Proto-Nilotic, primarily by applying internal reconstruction in Western Nilotic Anywa. However, she supports her reconstruction with reflexes in Southern Nilotic, where a suffix -cen occurs in Kalenjin, and Eastern Nilotic (e.g. Teso-Turkana -(y)enen and other allomorphs).[3]
   Reflexes of the pluractional marker in modern Anywa (and Päri) are conditioned by the presence of a long vowel (or diphthong) as against a short vowel in the root preceding the Frequentative marker (examples adapted from Reh 1991):

---

[3] The same full suffix form is found in the Western Nilotic Burun group, where it functions as a first person plural exclusive marker, -ɔnɔn (Dimmendaal To appear).

	Verb root		Frequentative		Verb stem
	C_1VC_2-	+	*-CVN	->	$C1VVN_2N_2$-
But:	C_1VVC_2-	+	*-CVN	->	$C_1VVC_2C_2$

The result of this historical contraction process is the creation of heavy syllables. Examples showing this synchronic alternation with short root vowels in Anywa include the following:

	root		pluractional stem	
(17)	jap-		jaamm-	'open'
	lɔt-		lɔɔnn-	'roast'
	cac-		caaɲɲ-	'look for'
	cak-		caaŋŋ-	'name'

On the other hand, with roots consisting of a long vowel or diphthong the resulting pluractional stem consists of a long vowel plus geminate obstruent, rather than a geminate nasal.

(18)	ɲʊɔp-		ɲɔɔpp-	'make beer'
	tiet-		teett-	'speak'
	waac-		waacc-	'speak'
	gʊɔk-		gɔɔkk-	'guard (cattle)'

The segmental reduction process in Pre-Anywa and the emerging syllable structure apparently was bounded and restricted by higher prosodic structures in the language; the metrical foot. Exactly the same contraction process can be observed for other members of the Lwoo cluster within Western Nilotic; it therefore probably constitutes an innovation of their common ancestor, Proto-Lwoo. Andersen (1988) gives a detailed account of consonant alternation accompanying verbal inflection and derivation (including pluractional marking) in Päri. The reduction of verbal roots plus suffixes into verbal stems with alternating consonants (as in the pluractional verbs above) as well as vowels and tone resulted in the creation of heavy syllables (themselves going back to a pyrrhic structure, more specifically a sequence of two syllables containing short vowels). Such a heavy syllable constituting the verbal stem may be preceded by an aspectual marker (marking a completive) and/or followed by pronominal reference markers (or a verbal focus marker), as in the following example from Päri (based on Andersen 1988):

(19) á-cɔ̀ɔk-ɛ́   'he deceived him'

C-deceive-3SG

Similar patterns of internal morphology can be observed for the Dinka-Nuer cluster. Here, the drift towards non-concatenative (vertical) morphology was extended towards pronominal subject markers whenever the latter were vowel-initial. Compare the following paradigm in Dinka (based on Andersen 1990: 20):

1SG	à-tiề̱eŋ	'I am watching him'
2SG	à-tì̱ŋ	'you ware watching him'
3SG	à-tì̱iŋ	'he is watching him'
1PL	à-tí̱iŋ-kù̱	'we are watching him'
2PL	à-tié̱ŋ-kà̱	'you are watching him'
3PL	à-tí̱ŋ-kì	'they are watching him'

The common drift or slant observable in verbal (as well as nominal) stems (i.e. forms excluding prefixes) in these Western Nilotic languages again is a historical process resulting in the creation of trochaic feet.

Additional phenomena in the Lwoo cluster of Western Nilotic may too be reinterpreted as manifestations of metrical structures too. According to Noonan (1992: 54), high-tone spreading in Lango is tied in with stress patterns in this Western Nilotic language. One could also interpret the syllable carrying the stressed vowel as a strong metrical position; stress itself would then be a consequence or manifestation of rhythmic structures in the language. The tonal rules of Lango further illustrate that lexical tone and metrical accent or prominence may interact and coexist in the same prosodic system, a property also observed for neighbouring Bantu languages such as Luganda (Hyman and Katamba 1993).

A number of other tonal phenomena in the Lwoo cluster suggest a link between prosodic and syntactic structures, i.e. tonal rules beyond the world level. As pointed out by Hieda (2011: 32) in his account of (double) downstep in Acooli, "[t]here is a suprasegmental boundary after a topicalized noun phrase, which blocks the application of tone sandhi rules" otherwise applying across word boundaries.

3.2 Vowel lengthening in the Lwoo cluster

The distinction between short and long vowels is a property which is reconstructable for the earliest stages of the Nilotic language family which been retained as such in Western Nilotic (Dimmendaal 1988). Andersen (1990: 16-25) has shown how the extra long vowels of Dinka historically derived from the anticipation of a vowel following a stem with a long vowel, thereby developing a ternary length contrast. Examples from Andersen (1990: 17)

	Päri	Dinka	
(20)	pàaj́-ɔ́	ba̰aj	'home'
	t̲ièn̲-ò	t̲eɛ́en	'evening'

Whereas Päri retained the original vowel length in the examples above, it underwent a number of other vowel changes. Andersen (1989: 13) reconstructs a historical vowel lengthening rule for Pre-Päri stems:

$$*ε, *ɔ, *e, *o \quad > \quad εε, ɔɔ, ee, oo$$

Andersen (1989, 1991) further shows that the historical vowel changes reconstructed for Pre-Päri on the basis of language-internal evidence is shared with Luo, and thus may go back to their common ancestor, Proto-Lwoo. This rule applied after the original *εε, *ɔɔ, *ee, *oo had diphthongized (suggesting a pull chain change).The result was the creation of new strong positions or heavy syllables in verb stems, i.e. a historical process which paralleled the anticipation of derivational suffixes in verbal morphology (as discussed above).

	Class I (root -L- tone)		Class II (root -LH- tone)	
(21)	tiŋ	'lift'	tiic	'make'
	ɣɪk	'repair'	rɪɪth	'sew'
	cam	'eat'	waaŋ	'burn'
	nεεn	'see' (< nεn)	pɪεm	'oppose' (< pεεm)
	keel	'shoot' (<keel)	gwieth	'bless' (< gweeth)

Reh (1991) also points out that in Anywa (which is mutually intelligible with Päri) the mid vowels εε, ɔɔ, ee, and oo behave segmentally like the other phonetically long vowels, i.e. remain unchanged, but *tonally* they behave like the phonetically short vowels. This presumably is an indirect reflex of the historical vowel lengthening of specific stem vowels.

4. Examples from Southern Nilotic

As argued by Rottland (1982), the Southern Nilotic branch of Nilotic clearly divides into two branches:
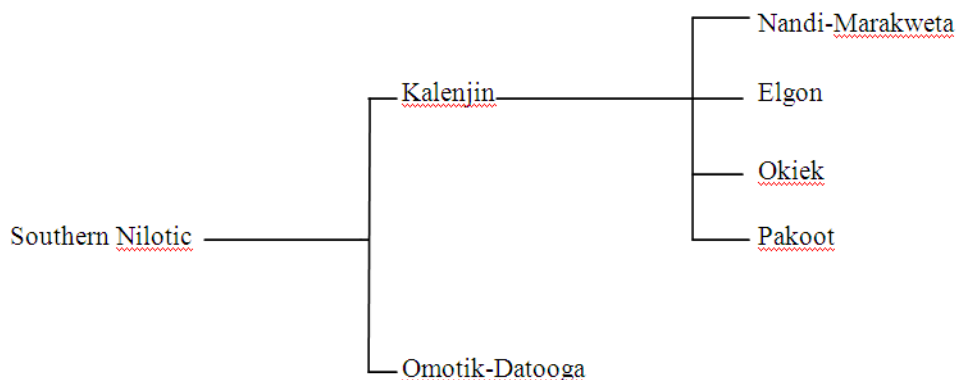
Within the Kalenjin cluster an additional subgrouping can be arrived at by using shared innovations as a criterion, although there is also evidence for the areal diffusion of features (see Dimmendaal 2011: 160-162 for a discussion). One common property shared by all members of the Kalenjin cluster, and thus most likely going back to their common ancestor, is a complex system of segmental and tonal alternations accompanying inflectional and derivational processes. Below, this phenomenon is discussed with respect to number inflection for nouns.

4. 1 Disentangling complex morphophonemic alternations in Kalenjin

One of the most intricate phonological properties of Nilotic languages, apart from the three-way vowel length alternations in the Western Nilotic Dinka-Nuer cluster, is the morphophonological alternation accompanying morphological processes in the Kalenjin cluster. Apart from the more common alternation between [-ATR] and [+ATR] vowels in roots and affixes as well as tonal alternations, additional complications occur involving the omission of word-final segments as well as vowel shortening under specific conditions. These processes are illustrated with number inflection below. As argued here, the role played by metrical structures in these alternations again appears to have been neglected.

   Number marking for nouns in the Kalenjin cluster is typical of Nilotic (and many other Nilo-Saharan branches) in that a tripartite division occurs between singulative marking, plural inflection and replacement (Dimmendaal 2000). This tripartite division is illustrated with examples from Nandi below (data from Creider 1982). The semicolon in these and other Nandi examples derived from Creider (1982) indicates a long vowel, whereas underscored vowels refer to [-ATR] vowels; the corresponding vowels without the underscore refer to [+ATR] vowels. We also follow the convention of Creider (1982) in maintaining morpheme boundaries (-) in the structural representation even if these are arguably absent as a result of fusion between morphemes.

(22)   Singulative marking:
         Singular   Plural

         po̱:l-tà   pó̱:l   'cloud'

         ta̱lám-wa̱   ta̱là̱m   'grasshopper'

     Plural marking:
         Singular   Plural

         melék   mélek-wa   'axe'

         tùm   túm-wâ   'forest'

     Replacement:
         Singular   Plural

         sikir-ya   sikir-ày   'donkey'

         mò̱:r-na̱   mó̱:r-în   'finger'

Nominal stems in Nandi and other members of the Kalenjin clusters may be followed by specifiers (also referred to as secondary suffixes; see Creider and Creider 1989: 32-39 for a discussion).When such a specifier is added, vowel coalescence (fusion) occurs if the preceding root or stem ends in a vowel. Compare again some of the same examples when expanded with a specifier:

(23)   Singular:
         ta̱lám-wé̱:t   <ta̱la̱m-wa-it   'grasshopper'

         sikir-ye:t   <sikir-ya-it   'donkey'

     Plural:
         melek-we:k   <melek-wa-ik   'axes'

         sikir-áî:k   <sikir-ay-ik   'donkeys'

Since Kalenjin does not allow for extra long vowels in syllable nuclei or double consonants in coda positions, additional truncation rules occur, as in the following example, where the vowel of the specifier is deleted after a long vowel:

(24)   Stem   With specifier

         so:s-yà: so:s-yâ:t (<so:s-ya:it)   'palm tree'

A further complication occurs as a result of additional truncation rules affecting final vowels (plus the preceding consonant depending on the syllable structure).These final vowels may be part of the root, in which case they are usually referred to as "thematic vowels" in studies of Kalenjin lects, as in the example for 'day' below, or they constitute a number suffix, as with 'warrior' and 'bird' below. The

signs < > are used here in order to distinguish such word-final elements from elements which do not get deleted in this position.

	Singular	Plural	
(25)	pe:t<u>	pe:t-u:sya	'day'
	múren<-a>	muren	'warrior'

As the example for 'day' above shows, the "thematic vowel" is realized if another suffix (e.g. for number, or a specifier) follows. In the following example, the final vowel as well as the preceding glide (together constituting a singulative suffix) are omitted before pause if the result would be an impermissible syllable structure:

(26)   ta̱rí:t<-ya̱>   tarí:t   'bird'

Deletion of the vowel only would result in a final syllable with a complex coda (**ta̱rí:ty), a structure which is impermissible in Nandi. Consequently, the preceding consonant or glide is also omitted in such cases.

  The omitted (truncated or deleted) thematic vowel may also show up in the Nominative under specified tonal conditions, as already pointed out by Tucker and Bryan (1964-1965: 237-243) in their pioneering and brilliant study of noun classification in Nandi and Kipsikiis.[4] For example, the thematic vowel in the word for 'warrior' (itself a number suffix) is realized, due to tonal changes, when the latter occurs in the Nominative, as shown by Tucker and Bryan (1964-1965: 238), who translate this word as 'young man', and who transcribe the low [+ATR] vowel as ao:

(27)   kè:ré   muren-aó   'a young man sees him'

The alternation between Nominative and Absolutive case, which involves tonal modification in Southern Nilotic languages, already suggests that tone is relevant as a conditioning factor. Creider and Creider (1989: 35) point out with respect to the deletion of specific final vowels (plus preceding consonants, depending on syllable structure conditions) that "[p]artial predictions are possible based on the tonal shape of the stem." These tonal conditions cannot be elaborated upon in detail here for reasons of space, but examples discussed for Nandi in the present study strongly suggest that tonal polarity plays a key role.

---

[4] Nouns in isolation in Nandi and other Nilotic languages with case marking always occur in the Absolutive case (also sometimes referred to as the Accusative), which constitutes the morphologically unmarked case.

	Stem	With specifier	

(28)　mó̱:t<ya̱>　　　　　mó̱:t-yét　　　　'quiver'

　　　kú̱:t<ya̱>　　　　　kú̱:t-yét　　　　'grub'

In other words, a root-final vowel (plus preceding consonant or glide, depending on the syl-lable structure) is absent before pause, if its tone is opposite to the tone on the preceding syllable; thus, <ya̱> in 'quiver' and 'grub' above carries a low tone, whereas the preceding syllable carries a high tone.

　This synchronic conditioning for the truncation of "thematic vowels" also has a plausible historical explanation. In neighbouring Teso-Turkana languages, i.e. in members of the Eastern Nilotic branch of Nilotic, final vowels are devoiced whenever they carry a tone which is opposite to the tone on the preceding vowel (Dimmendaal and Breedveld 1986):

(29)　ítákɔ̀　　->　　[ítáqʰɔ̥]　　　　'heifer'

　　　àpá ˋ　　　　　[àpá]　　　　'father'

Vowels which are devoiced before pause are always realized as voiced vowels whenever a suffix or another word follows. Internal evidence from Turkana also shows that there is a permanent tendency to drop such devoiced vowels altogether historically. Thus, when looking at trisyllabic (or trimoraic) roots in this Eastern Nilotic language, one notices that de-voiced vowels are all [+high] (Dimmendaal 1983a: 246); devoiced [-high] vowels have been lost in trisyllabic stems, but are still found in the corresponding form inflected for number, i.e. the singulative:

	Singular	Plural	

(30)　ɛ́-títípʉ́ ˋ　　　ŋí-títìpʉ́　　　　　　　'hill'

　　　á-kírɔ̀rú ˋ　　　ŋá-kírɔ́rʉ̀　　　　　　'sheath'

　　　á-tɔ́tɔ́lɛ́ ˋ　　　ŋá-tɔ́tɔ́l ˋ (not ** ŋá-tɔ́tɔ́lɛ̀)　　'charcoal'

　　　é-múkúɲó ˋ　　ŋí-múkúɲ ˋ (not ** ŋí-múkúɲò̥)　'black ant'

It is thus easy to understand how vowel devoicing (itself caused by tonal configurations) leads to loss of such vowels in word-final position, whereas such vowels are retained before another bound morpheme. It is most likely, therefore, that the Kalenjin system of 'thematic vowel" truncation presents the end result of the kind of alternation still found synchronically in neighbouring Teso-Turkana languages. This scenario receives further plausibility in light of the fact that devoiced (non-voiced) vowels still occur in the Datooga cluster, which belongs to the other primary branch of Southern Nilotic, Omotic-Datooga (Kießling 1998).

　This leaves us with one more analytical challenge when trying to understand morphophonemic alternations in Nandi and other members of the Kalenjin cluster, namely one already anticipated in the

examples for 'quiver' and 'grub' above. As these examples show, the vowel resulting from the coalescence of the "thematic" root vowel and the specifier is short, rather than long.

  As was already pointed out by Tucker and Bryan (1964-1965) in their studies on Kalenjin morphophonemics, there is sometimes length dissimilation in the final syllable containing the specifier. The authors give a number of examples, but they do not provide a conditioning for the shortening rule. Examples from Kipsikiis:

	Stem	With specifier:		
(31)	kìmàgè:t	kɪmagɛ:t-yɛt	(< kɪmagɛ:t-ya-ɪt)	'hyaena'
	Not:	** kɪmagɛ:t-yɛ:t		
	ké:cí:r	ké:cí:r-ék	(< ke:ci:rä-ik)	'sheep'
	Not:	**ke:ci:r-eek		

Similar examples are provided by Creider (1982) in his empirically rich and detailed account of tonal alternations in Nandi nouns.

|	Stem	With specifier		
(32)	tápa:kwa	tápâ:kwét	(not **tápâ:kwé:t)	'girl's leglet'
	pí:re:c	pí:re:c-ét	(not ** pi:re:c-e:t)	'soldier ant'
	kérê:ŋ	kéré:ŋkêt	(not ** kéré:ŋkê:t)	'leg'
	kékê:ŋ	kéké:ŋkêt	(not ** kéké:ŋkê:t)	'firebrand'

Note, however, that Creider (1982) does not represent the so-called thematic vowels in his underlying representations. The actual shape of the noun with the specifier -it in three of the examples above nevertheless suggests the presence of the following "hidden" segments:

	Stem	With specifier		
(33)	pí:re:c<-a>	pí:re:c-ét	(< pi:re:c-a-it)	'soldier ant'
	kérê:ŋ<ka>	kéré:ŋkêt	(< kéré:ŋka-it)	'leg'
	kékê:ŋ<ka>	kéré:ŋkêt	(< kéké:ŋka-it)	'fire-rand'

This still leaves us with the question of why the vowel is short in the final syllable resulting from the coalescence of the stem-final vowel and the initial vowel of the specifier. As a first hypothesis, one might claim that Nandi does not allow syllable structures involving a sequence short-long-long. The following examples, however, show, that "(short) long long" as such is possible as a metrical structure:

	Stem	With specifier		
(34)	kító:nka	kító:nké:t	(not ** kító:nkét)	'basket'
	kiplé:nk-wa	kiplé:nk-wé:t	(not ** kiplé:nkwét)	'hare'
	súpen<a>	súpen-é:t	(not **súpenét)	'log'

The same "counter examples", however, show that the choice for the vowel shortening rule is *co-determined* by or interacts with, tonal configurations on the noun: Vowel shortening only occurs in trisyllablic nouns with the tonal configuration H H F(alling) or H F(alling) High (as against H HH and other patterns):
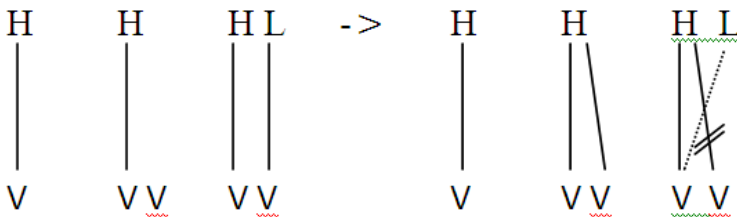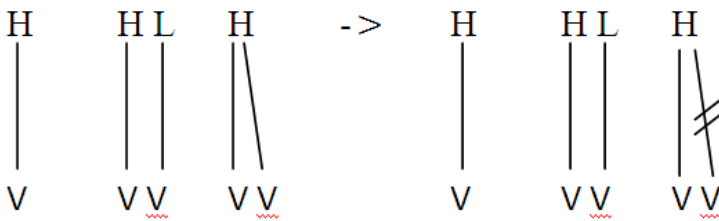
The question may arise as to why these rules are not simplified into a rule stating that complex (falling) tones are avoided on disyllabic stems? In other words, is the tone on the initial syllable in trisyllabic stems actually relevant? The answer is: yes! No shortening occurs with disyllabic nouns with a H HL tone pattern in Nandi:

	Stem	With specifier	
(35)	kò:k<wa>	kó:k-wê:t	'neighbourhood'
	là:l<a>	lá:l-ê:t	'bag'
	rò:t<a>	ró:t-ê:t	'backbone'
	pe:l-yá:	pe:l-yâ:t	'elephant'
	te:k-á:	te:k-â:t	'bamboo'

As the examples for 'neighbourhood', 'bag', and 'backbone' (with the specifier) show, sequences of H HL on a sequence of two long vowels are not excluded in and by themselves; they are not allowed in *trisyllabic* nouns when preceded by a high-toned syllable.

Disyllabic stems in fact manifest partly different conditions on vowel shortening in Nandi, as the following examples help to show. Whereas sequences of H HL (as in 'bag' above) or L HL (as in 'elephant' above) are allowed, Nandi appears to disallow sequences of HLH on disyllabic nouns. Compare the following examples involving final "thematic vowels":

	Noun	With specifier		
(36)	mó:t<y<u>a</u>>	mó:t-yét	(< mó:t-yà-ít)	'quiver'
	kú:t<ya>	kú:t-yét	(< kú:t-yà-<u>í</u>t)	'grub'

The deletion of the low tone on <ya> is accounted for by a rule called High Fall Raising in Creider (1982: 46-47). It involves the simplification of a high falling tone to high level before a following high (on the specifier in the examples above). As with the other examples above, it shows that tonal melodies involving contour tones are avoided when linked to specific sequences of syllables, which parallels the first vowel shortening rule for vowels as in 'girl's leglet' above.

Other types of tonal configurations on disyllabic nouns not involving contour tones do not result in a shortening of the final vowel. These include tonal sequences of, for example, L H:

	Stem	With specifier	
(37)	m<u>o</u>:y<<u>o</u>>	m<u>o</u>:-é:t	'wound'
	ser<u>	ser-ú:t	'nose'
	l<u>a</u>:k-w<u>a</u>	l<u>a</u>:k-w<u>é</u>:t	'child'

Similar rules apply to forms expanded with a plural specifier. Thus, the final vowel is shortened in the example for 'noses' below.

(38)	sér-u:nék	(<sér-ú:nà-ík)	'noses'

It is important to point out that all tonal and vowel shortening rules associated with nominal morphology in Nandi (or other Kalenjin lects) also apply to other categories, e.g. verbs or adjectives. This constellation of course has tremendous advantages in terms of language acquisition, since the rules are monosystemic. For reasons of space, no exhaustive analysis can be presented here of length dissimilation for vowels and its link to tonal configurations.

The preliminary survey in the present study should make clear that in Southern Nilotic Kalenjin spondaic feet are avoided under specific tonal configurations. The segmental reductions in Western

Nilotic suggest that pyrrhic feet structures are marked and tend to be replaced, in order to create trochaic feet. Further details of these intricate phenomena are presented in Dimmendaal (To appear).

The synchronic reflexes of the singular and plural specifier in Kalenjin in fact suggest that their allomorphs were also conditioned by metrical rules. The most common specifier in Nandi is -ɪt for the singular and -ɪk for the plural. Rottlandt (1982: 225) reconstructs a singular specifier (Sekundärsuffix) *-ɪta and a plural specifier *-ɪka for Proto-Kalenjin (and Proto-Southern Nilotic). The synchronic reflexes are either -ɪt or -ta (singular) and -ɪk or –ka (plural) in Kalenjin, e.g. in Nandi.

	Singular	With specifier		
(39)	pánî̂t	pánt-ít	not ** panit-(t)a	'witchcraft medicine'
	akúy	akuy-tà	not **akuyit	'grandfather'

	Plural	With specifier		
	tùc	tu:-kà	not **tuc-ik	'cows'
	pú:n	pu:n-ìk	not**pu:n-ka	'enemy'

Historically, the singular specifier *-ɪta became -ɪ(t) after a vowel, /t/, and another consonant, if a vowel preceding the consonant was deleted; *-ɪta became -ta after a consonant, except in the abovementioned cases, according to Rottland (1982: 103). A similar rule applied to *-ɪka in Päkoot; in other Kalenjin lects, the rules are slightly more complex. See Rottlandt (1982: 103 and ad passim) for further details. Of course, the syncope rule *-ɪta > –ta and *-ɪka > -ka themselves are instances of a metrical rule.

Similar changes occurred in Omotik-Datooga, with voicing of the intervocalic stops. Instead of elaborating upon this variation in Omotik-Datooga, we will address another grammatical domain where metrical rules appear to have played a role, or still play a role today, that of case marking by way of tonal inflection.

4.2 Nominative case and foot structures in Omotik-Datooga

The inflection of postverbal subjects for case in transitive as well as intransitive predications by way of tonal modification is one of the properties shared between Eastern and Southern Nilotic. Across Western Nilotic, the situation is more diffuse. Whereas Marked Nominative systems occur in Dinka-Nuer, a number of languages from the Lwoo cluster manifest split ergativity.(See Dimmendaal 2012 for a survey and historical interpretation of this variation.

Southern Nilotic languages are similar to Western Nilotic Dinka-Nuer and Eastern Nilotic languages in that they have a Marked Nominative system involving tonal inflection of postverbal subjects. Creider (1982: 85-87) describes this phenomenon from a tonal point of view for the Kalenjin lect

Nandi. Kießling (2007: 153-154) provides a detailed analysis of this tonal coding in Datooga, a member of the other primary branch of Southern Nilotic usually referred to as Omotik-Datooga:

> "Nominative case in disyllabic and trisyllabic nouns …is marked by high tones throughout. However, if a noun has four or more syllables …high tones are placed on the initial and the two final syllables with intermediary low tones… the domain of tone assignment to tone bearing units (τ), i.e., syllables, is the primary nominal stem which exempts the specifying suffixes, -da (sg) or -ga (pl)."

Kießling (2007: 156-157) formulates the following rules in order to account for modifications in disyllabic and trisyllabic noun stems:
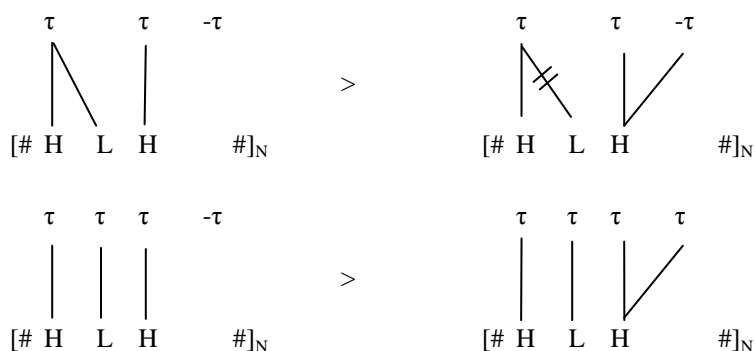
Creider (1982: 85-87, 95), in his description of Nominative case inflection in Nandi, also distinguishes between case inflection in nouns with and without a specifier (also referred to as primary as against secondary forms). The tonal modification involves "… the removal of all lexical tones, and the superimposition of new patterns which are basically invariant across all noun groups and number" (Creider 1982: 85). With secondary nouns consisting of "… three-, four-, etc. syllable words, this rule results in shapes LHL, LHHL, etc. …"

These examples involving Nominative case inflection in Southern Nilotic again suggest that beyond a certain number of syllables, tonal melodies play a role, rather than each syllable potentially carrying its own distinctive tone.

5. Some conclusions and some further challenges

The preliminary survey of a range of related phenomena in Nilotic suggests that metrical structures play an important role in the structure of different members of this family. Although the immediate link with tonal configurations is not obvious (yet) with respect to the examples from Eastern and Western Nilotic above, evidence from Southern Nilotic (already) suggests that the avoidance of specific tonal structures is linked to metrical patterns (syllables or foot structures). Of course, this parallels the situation described for languages like Bambara, Kera, Shanghai Chinese in the literature referred to above.

As the (non-exhaustive) survey above should have made clear, there are solid reasons to think that metrical rules play a role in a wide range of Nilotic languages. Of course, these metrical rules are

subject to change historically in the same way that other grammatical domains are. Differences in metrical rules may occur even between closely related languages or dialects. Rottland (1982:78) makes the following interesting observation for Southern Nilotic Kalenjin in this respect:

> "The average realization of vowel length decreases when going from north to south across the Kalenjin speaking area; for example, the long vowels of Marakwet are hardly longer than the short vowels of Kipsikiis."

A popular view held among speakers of, for example, Marakwet is that Kipsikiis speakers speak too slowly, an impression also caused presumably by the fact that in Kipsikiis more sequences of long vowels are permitted within a word than in Marakwet dialects.[5]

      Rather than claiming that all languages have accent at the word level (as, for example, Ewen and van der Hulst 2001: 203 do), one may claim that in tonal languages the prosodic feature tone is associated with the syllable or mora in shorter words. In longer words, usually involving morphologically complex forms resulting from derivational and inflectional rules, tone tends to be linked to foot structures. To give an example: With nominal stems consisting of three or more moras in Eastern Nilotic Turkana fixed "melodies" can be observed (Dimmendaal 1983a: 255-258). Thus, in the following examples the second moraic unit (vowel) in the stem has a low tone, whereas remaining vowels have a high tone:

(40)   ŋí-rísìk-íyó   'anti-witchcraft charm'

        ŋí-dɔ́ŋà-sínéy   'dances'

        ŋá-láàr-ín   'fences'

        ŋí-kúròdó-í   'foam'

Similar fixed tone patterns or tonal melodies can be observed with verb morphology, as the extremely detailed account of tonal patterns in the Teso-Turkana lect Karimojong by Novelli (1985: 197-497) shows.

    In a neighbouring branch of Nilo-Saharan, Central Sudanic, monosyllabic words are common and tonal contrasts on words not only correspond to lexical differences but also to grammatical distinctions. In languages of this type, metrical rules presumably do not play a role at the word level, but instead within larger grammatical domains, such as noun phrases.

    Additional domains of specific linguistic interest on this topic may be found in music, since meter is the basic rhythmic structure of a verse (or lines in a verse). If the feet are iambs, and if there are five feet to a line, we have an iambic pentameter. Alternatively, a dimeter, trimeter, tetrameter, pentameter,

---

[5] This is also taken to be an indicator of slow-wittedness by some speakers, an attitude not uncommon in other parts of the world where such dialect differences exist, e.g. northern versus southern varieties of American English, or German as spoken in Germany as against Switzerland.

hexameter, heptameter, or octameter may occur. Compare Japanese poetry, where metrical patterns work in terms of moras, e.g. alternating lines of five and seven moras, such as the 5-7-5 of haiku. An African variant of particular interest in this respect would be the "rapping avant la lettre" as found in ox songs, a prominent feature of various pastoral speech communities speaking Nilotic languages. Also, the choralic singing of Western Nilotic speech communities such as the Nuer provide an interesting source for the investigation of metrical structures in language.[6] This, then, could be one of the new challenges we may want to take on in our investigation of this fascinating language family.

REFERENCES

Akinlabi, Akinbiyi, and Eno Urua. 2003. Foot structure in the Ibibio verb. *Journal of African Languages and Linguistics* 24: 119-160.

Andersen, Torben. 1988. Consonant alternation in the verbal morphology of Päri. *Afrika und Übersee* 71: 63-113.

_____. 1989. The Päri vowel system with an internal reconstruction of its historical development. *Journal of African Languages and Linguistics* 11: 1-20.

_____. 1990. Vowel length in Western Nilotic languages. *Acta Linguistica Hafniensia* 22: 5-26.

Bickmore, Lee. 2003. The use of feet to account for binary tone spreading: Evidence from Cilungu. In Rose-Juliet Anyanwu (Ed.), *Stress and Tone - The African Experience,* pp. 23-47. Cologne: Rüdiger Köppe.

Creider, Chet A. 1982. *Studies in Kalenjin Nominal Tonology*. Berlin: Dietrich Reimer.

Creider, Chet A., and Jane Tapsubei Creider. 1989. *A Grammar of Nandi.* Hamburg: Helmut Buske.

---

[6] Meter and melody in Dinka speech and songs are currently being investigated by a team from the Department of Linguistics and English Language, University of Edinburgh, in particular by Bob Ladd and Bert Remijsen.

de Chene, Brent. 1979. *The Historical Phonology of Vowel Length.* Bloomington: Indiana University Linguistic Club.

Dimmendaal, Gerrit J. 1983a. *The Turkana Language.* Dordrecht: Foris.

_____. 1983b. The two morphological verb classes in Nilotic.In Rainer Vossen and Marianne Bechhaus-Gerst (eds.), *Nilotic Studies 2*, pp. 269-309. Berlin: Dietrich Reimer.

_____. 1987. Drift and selective mechanisms in morphological changes: the Eastern Nilotic case. In Anna Giacalone Ramat et al. (eds.), *Papers from the VIIth International Conference on Historical Linguistics*, pp. 194-210. Amsterdam: John Benjamins.

____. 1988. The lexical reconstruction of Proto-Nilotic: A first reconnaissance. *Afrikanistische Arbeitspapiere* 16: 5-67.

____. 1996. The role of bilingualism in Nilotic sound change. In Marc Dominicy and Didier Demolin (eds.), *Sound Change*, pp. 85-109. Amsterdam: John Benjamins.

_____. 2000. Number marking and noun categorization in Nilo-Saharan languages. *An-thropological Linguistics* 42: 214-261.

____. 2002. Constraining disharmony in Nilotic: What does an optimal system look like? *Journal of African Languages and Linguistics* 23: 41-69.

____. 2011. *Historical Linguistics and the Comparative Study of African Languages.* Amsterdam: John Benjamins.

____. 2012. Marked nominative systems in Eastern Sudanic and their historical origin. *Afrikanistik Online.*

_____. To appear. *Nilotic Languages: A Synchronic Survey and Diachronic Interpretation.* Two Volumes.

Dimmendaal, Gerrit J., and Anneke Breedveld. 1986. Tonal influence on vocalic quality. In Koen Bogers et al. (eds.), *The Phonological Representation of Suprasegmentals*, pp. 1-33. Dordrecht: Foris.

Duanmu, San. 1999. Metrical structure and tone: Evidence from Mandarin and Shanghai. *Journal of East Asian Linguistics* 8 (1): 1-38.

Ewen, Colin, J., and Harry van der Hulst. 2001. *The Phonological Structure of Words: An Introduction.* Cambridge: Cambridge University Press.

Green, Christopher R. 2010. Prosodic Phonology in Bamana (Bambara): Syllable Complexity, Metrical Structure, and Tone. Doctoral Dissertation, Indiana University.

Heine, Bernd, and Rainer Vossen. 1981. On the origin of gender in Eastern Nilotic. In Rainer Vossen and Marianne Bechhaus-Gerst (eds.), *Nilotic Studies* Part Two, pp. 247-268. Berlin: Dietrich Reimer.

Hieda, Osamu. 2011. Tonal system in Acooli – double downstep and syntactic functions of tone. *Studies in Nilotic Linguistics* 3: 1-35.

Hyman, Larry M., and Francis X. Katamba. 1993. A new approach to tone in Luganda. *Language* 69: 34-67.

Kießling, Roland. 1998. Der Pluraktionalis im Datooga. In Ines Fiedler, Catherine Griefenow-Mewis, and Brigitte Reineke (eds.), *Afrikanische Sprachen im Brennpunkt der Forschung: Linguistische Beiträge zum 12. Afrikanistentag, Berlin, 3-6. Oktober 1996*, pp. 179-196. Cologne: Rüdiger Köppe.

____. 2007. The „marked nominative" in Datooga. *Journal of African Languages and Linguistics* 26: 149-191.

Leben, William R. 2002. Tonal feet. In Ulrike Gut and Dafydd Gibbon (Eds.), *Proceedings, Typology of African Prosodic Systems* Vol. 1, pp. 27-40. [Bielefeld Occasional Papers in Typology].

McCawley, James D. 1978. What is a tone language? In Victoria A. Fromkin (ed.), *Tone: A Linguistic Survey*, pp. 113-113. New York: Academic Press.

Noonan, Michael. 1992. *A Grammar of Lango.* Berlin: Mouton de Gruyter.

Noske, Manuela. 1991. Metrical structure and reduplication in Turkana. In M. Lionel Bender (ed.), *Proceedings of the Fourth Nilo-Saharan Linguistics Colloquium*, pp. 245- 262. Hamburg: Helmut Buske.

Novelli, Bruno. 1985. *A Grammar of the Karimojong Language.* Berlin: Dietrich Reimer.

Pearce, Mary. 2006. The interaction between metrical structure and tone in Kera. *Phonology* 23: 259-286.

Reh, Mechthild. 1985. Reconstructing Proto-Western Nilotic and Proto-Nilotic lexicon (preliminary draft). Manuscript, University of Cologne.

____. 1991. Frequentative derivation in Anywa: Present-day refexes of a Proto-Nilotic suffix. *Afrika und Übersee* 74: 223-246.

Rottland, Franz. 1982. *Die südnilotischen Sprachen.* Berlin: Dietrich Reimer.

Storch, Anne. 2005. *The Noun Morphology of Western Nilotic.* Cologne: Rüdiger Köppe.

Tucker, A. N., and M. A. Bryan. 1962. Noun classification in Kalenjin: Päkot. *African Language Studies* 3: 137-181.

Tucker, A. N., and M. A. Bryan. 1964-1965. Noun classification in Kalenjin: Nandi-Kipsigis. *African Language Studies* 5: 192-247, 6: 117-187.

Vossen, Rainer. 1982. *The Eastern Nilotes: Linguistic and Historical Reconstructions*. Berlin: Dietrich Reimer.

Weidman, Scott, and Sharon Rose. 2006. A foot-based reanalysis of edge-in tonal phenomena in Bambara. In Donald Baumer, David Montero & Michael Scanlon (Eds.), *Proceedings of the 25th West Coast Conference on Formal Linguistics,* pp. 426-434. Somerville, MA: Cascadilla Proceedings Project.