Moraic mismatches in Somali phonology: coda consonants reconsidered

Christopher R. Green
Syracuse University
cgreen10@syr.edu

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Christopher R. Green

Syracuse University
cgreen10@syr.edu

Abstract:
This paper reconsiders the moraic status of coda consonants in Somali. It is argued that Somali joins a growing list of languages presenting a challenge to the Moraic Uniqueness Hypothesis. Several phenomena are explored that suggest that Somali exhibits moraic mismatches whereby moras associated with segments of different types contribute to, or "count" differently for particular phonological processes. Evidence in support of this proposal is drawn from the literature on tonology and poetic metrics, but also from word shape and minimality requirements, and from the distribution of syllable shapes of different types in Somali words. It is argued that an approach to Somali phonology that permits reference to moras associated with different segment types offers a unified and more transparent account of the language's segmental and tonal phenomena. Notably, such an approach precludes the assumption of "early" coda consonant moraicity followed by a global dissociation of consonantal moras by rule before high tone assignment, as argued for in earlier work. The findings presented here illustrate that standing points of view on the role of the mora in Somali phonology must be reconfigured.

Keywords: moraic phonology, tonology, gemination, Cushitic, Somali

1 Introduction

That the mora plays a role in Somali phonology is well-established, at least to the extent that the mora governs the location of high tone assignment in lexical items like nouns and verbs. High tone is assigned to the final or penultimate mora of these and other lex-

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ical bases (Banti 1988a; Hyman 1981) though its distribution is less straightforward for multimorphemic words (Green & Morrison 2016, 2018) and in instances of subject marking. So, too, has the mora been invoked in motivating the distribution of syllables with short vs. long vowels in the templatic structure of different poetic genres. Establishment of mora-sized units as the key functional units of Somali poetry is attributed to Maxamed Xaashi Dhamac and Cabdullaahi Diiriye Guuleed, with notable linguistic studies on Somali poetic metrics referencing the mora including Andrzejewski (1982) on *gabay*, Andrzejewski & Lewis (1964) on *masafo*, Orwin (2001) and Orwin & Maxamed Xaashi Dhamac (2010) on *jiifto*, and Banti & Giannattasio (1996), which analyzes several poetic genres. See also discussion in Johnson (1979, 1984).

While Somalists agree that vocalic moras "count" in the phenomena mentioned above, the role of consonantal moras in the language's phonology remains a matter of uncertainty, or better yet, apparent inconsistency. This inconsistency is clearly explicated in a series of insightful works by Orwin and colleagues that seek to explain how and why consonants in syllable codas seem to contribute to syllable weight in the language's reduplicative phenomena (Orwin 1996) and to preclude closed syllable shapes from appearing in certain line positions in poetic metrics (Orwin 2001; Orwin & Maxamed Xaashi Dhamac 2010), all the while playing no apparent role in the calculation of the location of tone assignment.

The current paper contributes to this dialogue by discussing word shape and minimality requirements, as well as the distribution of open vs. closed syllables of different types within Somali words of a variety of shapes, all of which will be argued to implicate coda moraicity. The findings presented, taken together, strongly suggest that Saeed's (1999: 19) blanket claim that "only vowel melodies are relevant for counting" in Somali must be rejected in favor of a more nuanced treatment of the language's moraic phonology. In support of this proposition, it is argued that Somali is a member of a growing list of languages like those discussed in works by Crowhurst (1991), Gordon (2004), Hyman (1992), and Steriade (1990) whose behavior presents a challenge to the Moraic Uniqueness Hypothesis (MUH) (Hyman 1992). The MUH states that "at any given stage in derivation, there is only one moraic projection" (Hyman 1992: 255). Put another way, a segment that contributes a mora (i.e., is weightful) for

one process in a language should do so for all processes. Likewise, if a given segment fails to contribute weight for one process, it should fail to do so for all processes. The expectations of the MUH differ notably from so-called context-dependent weight phenomena (e.g., Hayes 1994; Rosenthall & Van der Hulst 1999) where the ability of a segment to license a mora depends on its position in a word. For example, according to Hayes (1995), closed syllables in Pacific Yupik Chugach pattern as heavy for the purpose of stress assignment only when they are word-initial. When non-word-initial, however, they pattern as if light in that they do not attract stress. Thus, one way to view this is that coda consonants are moraic only in word-initial syllables and non-moraic in others.

Outcomes such as these highlight the complexity of accounting for the behavior of consonants and their moraicity in the world's languages overall. A central question in theories of moraic phonology concerns which segments are underlyingly associated with a mora, with particular concern having been paid to the moraicity of consonants, as their contribution to syllable weight is well known to vary parametrically from language to language. The moraicity of vowels is far less variable, though there are notable instances reported in the literature where vowels of certain types or qualities behave as if non-moraic (see, e.g., Cohn 1989 on the behavior of schwa in Indonesian). Hyman (1985) proposes that all segments, including consonants, are underlyingly associated with a mora but may lose their mora by rule. This depends in part on which position in a syllable they are parsed; the assumption in this particular theory is that onset consonants are never weightful and therefore always lose their mora. Codas, however, may or may not retain their mora, which is determined by whether and how they contribute to outcomes pertaining to stress and tone assignment, among others, in the language. Hayes (1989) instead proposes that it is only vowels that are underlyingly moraic and that consonants, if they contribute to weight in a given language, are assigned a mora by rule. Both theories reasonably accommodate the fact that coda consonants may or may not be moraic, but they differ in whether they are assumed to be moraic in the first place. The position taken in this paper follows Orwin (1994, 1996) and, accordingly, Hyman (1985) in assuming that coda consonants in Somali are underlyingly moraic. Unlike Orwin (1996), however, it is proposed here that the vast majority of coda consonants

retain their moras, rather than losing them by rule prior to high tone assignment.

As will be shown, languages like Somali exhibit what have come to be called "moraic mismatches" (Hyman 1992), and, as such, they contradict the MUH. In these languages, moras of different types – vocalic vs. consonantal – either count, or fail to do so, in the calculation of conditions necessary to trigger altogether different phonological processes. Rather than counting, or not, for the same process depending on their word position, like in Pacific Yupik Chugach stress, a language exhibiting moraic mismatches might, for example, ignore consonantal moras for tonal alternations but count them for other processes. In the case of Somali, it will be shown that it is only vocalic moras that count for calculating the location of tone assignment, while both vocalic and consonant moras count for a variety of segmental or prosodic phenomena. The process-based behavior exhibited by Somali closely correlates with cross-linguistic tendencies reported in Gordon's (2004) survey of syllable weight phenomena. That is, vocalic moras (and, as we shall see, others associated with high sonority segments) more reliably count toward tonal processes, while moras associated with a wider variety of segments tend more often to contribute to segmental or metrical processes.

The remainder of this paper is organized as follows. Section 2 briefly reviews patterns of Somali high tone assignment, as well as patterns of partial prefixing reduplication of adjectives and other attributive elements known by various names, among them "derived adjectives" (Saeed 1999: 147) and "adjectival participles" (Green 2021: 158). It is shown, following work by Orwin, that the latter can scarcely be motivated without reference to moraic consonants in syllable codas. Section 3 turns to a survey of word shape and size requirements before turning to detailed discussion concerning the distribution of particular word-internal vs. word-final syllable shapes in the Somali lexicon. It is shown that Somali exhibits a stringent phonotactic restriction against word-internal singleton syllable codas, despite the fact that geminate consonants are accommodated in the same distribution. Descriptive and theoretical implications of this typologically unusual finding are discussed. The paper closes in section 4 with brief discussion and concluding remarks.

2 Background on moras in Somali

As introduced above, there are several references to the mora in the Somali literature. The longstanding perspective expressed in Saeed's (1999) reference grammar is that only vocalic moras play any substantive role in the language's phonology.[2] Even before this, in the mid-1990s, however, Orwin had already begun to present evidence that consonantal moras have a function in the language, particularly in patterns of partial prefixing reduplication. Later work by Orwin and colleagues suggested that reference to coda consonants may also help to explain the distribution of closed syllables in certain metrical scansion patterns. This section provides a brief overview of work referencing the mora in Somali, beginning with the role that it plays in tone assignment and thereafter in intensive/pluractional/evaluative partial prefixing reduplication. In the interest of space, the reader is directed to works cited above for more detail on the role of the mora in the language's poetic metrics.[3]

2.1   High tone assignment

Saeed's proposition about the role of vocalic moras generally holds in the realm of tone assignment. As has been long established in seminal works on Somali phonology like Hyman (1981) and Banti (1988a), the examples in (1) show that lexical stems exhibit a single high (H) tone on either their penultimate or final vocalic mora. These simple examples illustrate tone distribution in stems of different shapes from both the language's grammatical gender series. Examples are provided in the standard Somali orthography and supplemented with tone marking. H tone is indicated by an acute diacritic over a given vowel. Vowels unmarked by such a diacritic are considered phonologically toneless, though they are realized phonetically low. Note that Somali has two harmonic series of vowels, the distinction between which is typically described as a contrast in ATR (advanced tongue

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2 Saeed's (1993) pedagogical grammar, including the 2nd edition released in 2002, maintains that "tone is a feature of syllables" (Saeed 1993: 29; 2002: 23), though the discussion that follows this claim makes implicit reference to tone's association to vocalic moras.

3 Note that while the behavior of moras in Somali poetic metrics presents another example of process-based weight, precisely where in a given scansion consonants contribute weight is also context-dependent.

root), as indicated in works such as Saeed (1999: 15), Green (2021: 53), and Mohamoud (2013), and implicit in several others. These distinctions are not relevant to the phenomenon under consideration in this paper and are therefore not encoded in the provided examples.

(1) **k-series 'masculine'**   **t-series 'feminine'**

a.	*sán* 'nose'		b.	*bán* 'diarrhea'	
c.	*búug* 'book'		d.	*qoór* 'neck'	
e.	*qáwl* 'pledge'		f.	*haýb* 'genealogy'	
g.	*nácas* 'fool'		h.	*galáb* 'afternoon'	
i.	*gantáal* 'arrow'		j.	*mindí* 'knife'	
k.	*ciídan* 'army'		l.	*Soomaalí* 'Somalis'	

Words like those in (1) illustrate long-noted correlations between H tone location and grammatical gender in noun stems, with H being associated with the penultimate vocalic mora in masculine or 'k-series' grammatical gender stems and instead with the final vocalic mora in feminine or 't-series' gender stems.[4] K-series and T-series here refers to patterns of grammatical gender agreement realized on modifiers and, in some instances, on verbs. For example, the k-series noun *nácas* 'fool' is *nácaska* 'the fool' with a definite determiner, while the t-series noun *qoór* 'neck' would instead be *qoórta* 'the neck' in the same context. The precise surface realization of these agreement affixes varies according to the surrounding consonantal and vocalic context; for details, see Saeed (1999: 28–49) and Green (2021: 65–78).

The penultimate vs. final H tone pattern in nouns is seen most clearly by comparing (1c, g) to (1d, h), though it is neutralized in monosyllabic words like (1a, b) where H is found on the stem's only vocalic mora in both gender series. Words like (1k) are especially telling of the overall pattern in that their H tone is found on the second

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4 There are several competing analyses seeking to explain these correlations between tone assignment and grammatical gender. For Hyman (1981), declension class, and accordingly, grammatical gender dictates the location of tone assignment, but Nilsson (2018) argues that tone assignment is independent of grammatical gender and is instead predictably distributed according to stem shape. Godon (1998), Lampitelli (2011, 2013), and Le Gac (1997) have similarly posited predictability according to stem shape, arguing that "feminine" stems have an empty catalectic slot at their right edge that is counted in tone assignment. Their analyses collectively propose that H tone is always assigned to the penultimate mora of the stem.

mora of a long vowel in the word's penultimate syllable. By comparison, it is reasonable to assume that orthographic glides in words like (1e, f) function as tone bearing units, though whether or not these should be treated as vowels or semi-vowels is an open question. Monosyllabic t-series CVGC words like (1f) realize a rising contour with H tone on the glide, suggesting that the glide is a tone bearing unit.[5] By extension, one can assert that glides in k-series CVGC words have the same prosodic status, though H tone is realized as expected on the penultimate mora, namely on the stem vowel. If coda consonants projected moras that were counted in H tone assignment, one would be hard-pressed to explain even the simplest outcomes like (1a) vs. (1b), as it might be expected that (1b) would instead surface *bań. Likewise, other outcomes would have to stipulate that larger k-series stems have H on their antepenultimate mora while t-series stems instead sometimes have H on their penultimate mora and other times on the final mora. Referring solely to vocalic moras offers a simpler and more transparent analysis.

A complication to this relatively simple pattern is presented by stems with word-final orthographic glides. Whereas glides in words in (1) arguably function as tone bearing units, the word-final glides in (2) do not appear to function in this way in all instances. In disyllabic k-series nouns like (2a, c, e), H appears on the first syllable's vowel, seeming to skip over the glide in calculating the location of tone association. The same can be said of the disyllabic t-series noun in (2d). The monosyllabic noun in (2b) and others like it differ, however, in that the word-final glide counts toward the calculation of H tone assignment, but apparently only when there are fewer than two other vocalic moras in the stem.

(2) **k-series 'masculine'**   **t-series 'feminine'**
a. *árdey* 'student'   b. *eý* 'dogs'
c. *íley* 'one-eyed man'   d. *badów*[6] 'inhabitants'
e. *híley* 'strap'

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5 Here and elsewhere, V stands for vowel, C for consonant, and G for a glide (semi-vowel).

6 A reviewer suggests an alternative gloss for this noun: 'uncivilized or rustic person.' The translation given here stems from Orwin (1996); the noun also appears in Hashi (1995: 38).

Words in (2), and perhaps (1e, f), reveal subtle preferences concerning tone assignment and also suggest that orthographic glides may best analyzed as semi-vowels; their behavior, at least word-finally, differs from that of vowels. As such, one could argue that tone assignment in Somali based on vocalic moras is ideal, but semi-vowels can function as tone bearing units under some conditions. Outcomes like these suggest that even when it comes to tone assignment, there is some, albeit limited, flexibility within the grammar concerning the types of moras that "count." That is, both vocalic and semi-vocalic moras can count, at least under some circumstances, in calculating the location of H tone assignment. As a natural class of segments, Somali tone bearing units could perhaps be defined in terms of their high sonority relative to other segments, or with reference to a feature like [-consonantal].

2.2   Partial prefixing reduplication

A second process in which the mora is said to play a role is in intensive/pluractional/evaluative partial prefixing reduplication of adjective and adjectival participle bases. This phenomenon has been discussed in detail by Andrzejewski (1969), Banti (1988b), Lampitelli (2014), and Saeed (1999), but the importance of the mora in the process is explored only in Orwin (1996).

The summary of patterns in (3) is adapted from Orwin (1996) and illustrates attested reduplicated forms, the bases from which they are derived, and also, in some instances, one or more related but unattested outcomes for comparison. A hyphen is included in examples to facilitate identification of the boundary between reduplicant and base, though it does not appear orthographically. Another minor but important deviation from the standard orthography is the inclusion of an apostrophe to indicate a phonetic glottal stop [ʔ] pronounced in vowel-initial words like (3c). The examples are sub-divided into patterns based on the surface structure of the reduplicant. (3a, b) have a CVV reduplicant where the vowel(s) of the reduplicant differ from the base. (3c–e) have a CVC reduplicant, while the reduplicant in (3f–g) is CVVC. The reduplicants in (3h–j) are unique in that they involve consonant alternation (3h, i) or are somehow subminimal compared to others (3j). Several interrelated factors help to explain how these patterns arise.

(3) a. *dhaa-dheer*   *dheer*   'long'   **dheer-dheer,[7]*
                                                        *dhee-dheer,
                                                        *dhaar-dhaar

     b. *waa-weyn*   *weyn*   'big'   **weyn-weyn,*
                                                        *wee-weyn,
                                                        *wayn-wayn

     c. *'ad-'adag*   *'adag*   'hard'

     d. *xir-xiran*   *xiran*   'tied up'   **xirx-xiran*

     e. *dil-dillaacsan* *dillaacsan* 'burst open'   **dill-dillaacsan*

     f. *taag-taagan*   *taagan*   'standing'   **taa-taagan*

     g. *qayb-qaybsan*   *qaybsan*   'divided'   **qay-qaybsan*

     h. *gug-guban*   *guban*   'burnt'   **gub-guban*

     i. *duud-duuban*   *duuban*   'rolled up'   **duu-duban,*
                                                        *duub-duuban

     j. *ja-jaban*   *jaban*   'broken'   **jab-jaban,*
                                                        *jaj-jaban,
                                                        *jaa-jaban

Orwin (1996: 67) proposes that "the prosodic constituent that makes up the prefixal reduplicative affix is a syllable node which is satisfied to the fullest extent." In further defining how the template is formed and satisfied, Orwin follows argumentation in McCarthy & Prince (1986) concerning cross-linguistic patterns of reduplication and proposes that melodic units (i.e., segments) comprising the reduplicant must be countable prosodic units and therefore moras. His conclusion is that consonants must be moraic at the point in word formation in which reduplication occurs, but because consonants do not count in the calculation of H tone assignment, their moras are later vacated. In support of his analysis, Orwin provides a detailed derivation of just one sub-type of reduplication (specifically, the word given here in 3f), with certain other details set aside (namely vocalic alternations) or attributed to phonotactics. Orwin's analysis unfortunately does not explicitly address forms like those in (3c–e), stating only that they are assumed to behave like other forms with a consonant-final redu-

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7 A reviewer kindly points out that *dheer-dheer* is attested in some sources; Saeed (1999: 49) lists it as an alternative pronunciation to *dhaa-dheer*, while Zorc & Osman (1993: 167, 185) list both *dheer-dheer* and *dhaa-dheer* as independent entries. The generalizations below remain the same.

plicant. It is on this point that Orwin's analysis and that proposed in the current paper diverge to some extent.

While the patterns discussed below in section 3 are in partial support of Orwin's analysis, and specifically in the proposition that consonants are underlyingly moraic, the assumption that consonantal moras are vacated globally at some point in word formation before tone assignment is challenging to substantiate. Given compelling cross-linguistic support for an approach to moraic phonology that accommodates moraic mismatches, as argued for in works cited above in section 1, an analysis grounded in process-based weight would arguably preclude a global operation of consonantal demorafication. Though a global operation may not be justified, patterns of syllable shape distribution in the language suggest that there may be some evidence of mora vacation, akin to that proposed by Orwin. This would be limited to very specific instances, however, as in cases of prefixal reduplication like that in (3f) and others like it (e.g., 3g and 3i). That demorafication occurs more broadly, such as in cases of prefixal reduplication like (3c–e, 3h), would be more difficult to support.

3 Behavior of coda consonants in other outcomes

It was shown in section 2 that the mora has a role to play in Somali in calculating both patterns of tone assignment and the template for prefixal reduplication. The current section considers other outcomes in the language on which moras appear to bear, beginning with word shape and minimality requirements. Discussion then turns to a survey of syllable shape distribution in different word positions. Based on what is presented about these phenomena, the section closes by returning to the matter of prefixal reduplication and revisiting the question raised above concerning whether and which coda consonants in the language vacate their moras following the process.

3.1   Minimal word size and shape

In viewing a Somali corpus, one might have the impression that Somali words are quite large. This is misleading, however, due in part to the synthetic nature of the language's lexicon, particularly its verbs, but also because the orthography treats oftentimes complex phrases as single written words (Green & Morrison 2018). Upon

closer inspection, one finds an abundance of smaller words, with a robust minimality requirement on word size, as illustrated below. The examples in (4) show that, with very few notable exceptions, the smallest content words in the language are primarily of the shapes VC, CVC, VG, and CVG. Some have described VG sequences as diphthongs (Green 2021; Orwin 1996; Saeed 1999), of which there are five attested and represented here.[8]

(4) a. *nín*   'man'   b. *áf*   'tongue, language'
      c. *káb*   'shoe'   d. *búd* 'tomb'
      e. *éy*   'dog'   f. *áw*   'purpose'
      g. *yéy*   'wolf'   h. *hóy* 'home, dwelling'
      i. *gów* 'part, section' j. *jáy* 'type of gravel'
      k. *dáw* 'road'

There are a few possible exceptions, including the CV-shaped nouns *sí* 'way, manner' and *hú* 'clothing.' Curiously, the latter varies with *húb* (Zorc & Osman 1993: 313); a reviewer points out that it is related to the verb stem *huw-*, which is phonologically /huww-/. Another exceptional noun is *cí* 'cry, scream, roar', which is derived from the verb stem *cí* 'scream, bray (of an animal)'.

    There are fairly few monosyllabic content words of the shape CVV, such as *wáa* 'time' and *hoó* 'offering', the latter being derived from the verb *hoy-* 'to take', but open syllable shapes like this, and also VV and CVG, are mostly found in function words and interjections. A representative group of examples is provided in (5), with their function or a reasonable translation provided for each.

(5) a. *ee/oo* subordinators   b. *soo* ventive deictic
                                                particle
      c. *sii*   itive deictic particle d. *baa* focus marker
      e. *waa* declarative marker   f. *haa* 'yes'
      g. *saa* 'thus, like that'   h. *naa* 'hey!'
      i. *see*   'how?'

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   8 In addition, the Somali orthography includes words with "long" diphthongs, i.e., VVG sequences, but these are not contrastive (Armstrong 1934; Orwin 1994; Green 2021) and will not be discussed. As these sources point out, they occur only in borrowings, morphologically-complex words, or as variants of short VG sequences.

As seen in both (4) and (5), most monosyllabic content words and indeed most function words minimally contain a branching rhyme, or, if lacking a coda consonant, their nucleus contains a long vowel. The skewed distribution whereby there are remarkably few CVV content words may suggest a phonotactic preference for falling sonority rhymes. With the possible exceptions of *sí*, *hú*, and *cí* mentioned above, other CV shaped items are function words and clitics, with a fairly exhaustive list of such items given in (6).

(6) a. *ma*   question marker   b. *ka/ta* definite determiners

c. *na*   1PL object pronoun   d. *na*   clausal conjunction

e. *ba*   intensifier   f. *má*   clausal negative marker

g. *se*   clausal disjunction   h. *ú*   'to, for, towards, etc.'

i. *kú*   'at, in, on, with (instrumental), etc.'   j. *ká*   'from, about, out of, etc.'

k. *lá*   'about, with (comitive)'   l. *la*   'one' (pronoun)

m. *i*   1SG object pronoun   n. *ku*   1SG object pronoun

This distribution and the characteristics of these monosyllabic items is highly suggestive of a minimal word requirement. One possibility is that a well-formed, independent phonological word (PWd) in Somali must contain a branching rhyme. This might explain the preponderance of monosyllabic CVC words, but it would entail that nuclei in (C)VV syllables, in particular, be considered branching. Another possibility, however, would be to posit that Somali has a bimoraic minimality requirement. Because, for example, CVV and CVC words pattern similarly, and assuming uncontroversially that CVV syllables are bimoraic, it would appear that coda consonants count in satisfying this minimality condition, and therefore that they behave as if moraic.

There are also many other monosyllabic content words in Somali of the shapes VVC, CVVC, and CVGC, as seen in the representative examples in (7). While such words present no challenge to the propo-

sition of a bimoraic minimal word requirement, they do raise a question as to the moraic status of their final consonant.[9]

(7) a. *daáb* 'handle'   b. *kuúl* 'eye makeup'
     c. *nóoc* 'type, sort'   d. *réer* 'household'
     e. *áar*   'revenge'   f. *uúb*   'afterbirth'
     g. *eéd*   'accusation'   h. *íib*   'item for sale'
     i. *cáwd* 'hot, stuffy place'   j. *qáwl* 'pledge'
     k. *cáysh* 'nourishment'   l. *héyl* 'cardamom'

Words like those in (7) would satisfy the language's minimal word requirement solely by virtue of their heavy nuclei, but the moraic status of their final consonant is unclear. One possibility is that these consonants, like others that we have seen thus far, are moraic and, therefore, that these words are composed of a single superheavy syllable. While superheavy syllables are not unattested in the world's languages, their distribution cross-linguistically is extremely limited. Another possibility might be that the consonants are moraic but that their mora is extrametrical or extrasyllabic. Broselow (1992) and Watson (2007) entertain these and other possibilities to explain the variable patterning of consonants in similarly-shaped words in varieties of Arabic, which, as an Afroasiatic language, is related, albeit distantly, to Somali. Yet another possibility is that the consonants lose their mora altogether, along the lines of what is proposed by Orwin (1996). While it is clear that syllables of this shape are readily permitted word-finally, it is necessary to look at similarly-shaped syllables elsewhere in the language in order to arrive at a better understanding of the moraicity of their coda consonants.

3.2 Syllable shape distribution

It is shown in this section that there are tight restrictions on the types of syllable shapes that can appear word-internally within a stem. Both CVC and CVV syllables readily occur in this distribution, as seen in (8), where syllable boundaries are indicated here and else-

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9 Green (2021: 88–89) provides an overview of Somali phonotactics suggesting that any vowel can appear in a CVVC or VVC word. The distribution of semi-vowels in CVGC words, however, is not equivalent – CV[w]C words are far fewer in number than CV[y]C. There are also restrictions on the types of consonants that appear word-finally after a diphthong. Another detailed study of Somali phonotactics can be found in Barillot (2002).

where by a period for ease of presentation. For CVC syllables in par-
ticular there are no unusual restrictions on the types of consonants
that can occupy these codas, as both stops and sonorants are readily
attested. As is well established, Somali does not allow complex syl-
lable margins, thereby precluding syllables with branching onsets or
codas (Saeed 1999: 16; Green 2021: 85).[10]

(8)	a.	*kúm.bis*	'meat in ghee'	b.	*hán.qal*	'chest (body)'
	c.	*fán.to*	smallpox	d.	*wal.qál*	'naming cere-mony'
	e.	*búr.cad*	'butter'	f.	*ráb.shi*	'guano'
	g.	*dub.lád*	'funnel'	h.	*kab.xán*	'type of tree'
	i.	*baá.rax*	'open space'	j.	*feé.tin*	'stake'
	k.	*ruú.mi*	'wool'	l.	*tii.gaál*	'distant place'

Because the concern here is the moraic status of coda consonants,
words such as these present no conclusive evidence. However, CVV
syllables, being uncontroversially bimoraic, are seen to be accommo-
dated word-internally before another onset, and their distribution
parallels that of CVC syllables.

CVGm syllables are also found word-internally within a stem.
Here, Gm indicates a geminate consonant; Somali has both contras-
tive geminate stops and sonorants in its inventory (see Green 2021;
Saeed 1999). The examples in (9) contain word-internal syllables
with a geminate coda, where the geminate is presumed to be moraic.
This in line with standard views of gemination (e.g., Davis 2011;
Hayes 1989), as is the fact that word-internal geminates are parsed
ambisyllabically.

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10 A reviewer points out that (8j) *feétin* varies with *feýtin* and, furthermore, that
some have analyzed intervocalic voiceless stops in words like this as underlying "vir-
tual" geminates (Barillot 2002; Barillot & Ségéral 2005; Orwin & Maxamed Xaashi
Dhamac 2010; Ségéral & Scheer 2001); some arguments against this view are sug-
gested by Green (2021: 52). Because the current paper is concerned with analyzing
patterns of surface syllable shape distribution, little can be gained here from taking
a stance, one way or another, on the status of these abstract phones. Because other
geminates readily appear word-internally in Somali (see below), the inability for the
voiceless "virtual" geminates to surface is already exceptional.

(9) a. *gáb.bal* 'daylight'   b. *múd.dac* 'argument'

    c. *óg.gol* 'approval'   d. *dum.mád* 'cat'

    e. *gal.lád* 'gratitude'   f. *hol.lób* 'scaly skin'

The ambisyllabic nature of these intervocalic geminates is also implicit in other work on Somali (Bendjaballah & Le Gac 2019; Le Gac & Bendjaballah 2020; Saeed 1999). Assuming this is correct, it reinforces the statement above that bimoraic syllables appear to be readily permitted in such a word-internal distribution. Here, CVC syllables can be seen as patterning with another type of bimoraic syllable.

While CVC and CVGm syllables pattern together in (8) and (9), similarly shaped syllables with long vowels – CVVC and CVVGm – behave strikingly different from one another in this position. Most remarkable is that word-internal CVVC syllables are absent altogether from the Somali lexicon. To be clear, this refers to stems, rather than to morphologically complex words, borrowings, or compounds, where phonotactic requirements are quite different from that of stems. What is more puzzling, however, is that CVVGm syllables are readily accommodated in the same distribution, as seen in the examples in (10). Alternations such as vowel lengthening before intervocalic geminates are not reported in such words (Bendjaballah & Le Gac 2019).

(10) a. *aám.mus* 'silence'   b. *beéd.dal* 'type of female horse'

    c. *cood.dí* 'meat, flesh'   d. *dhood.dí* 'land with hard soil'

    e. *geéd.di* 'traveler'   f. *quúl.le* 'wild berry'

    g. *saáb.bir* 'poor person' h. *daál.lin* 'felon'

    i. *doób.bi* 'laundry'

Given the parallel distribution above for CVC and CVGm syllables, but the divergent behavior here of CVVC vs. CVVGm syllables, one must ask what conditions this difference and also what underlies it. One possible explanation may lie in constraints on segmental structure such that Somali might disprefer stem-internal syllables with a complex nucleus and a branching rhyme. This, however, would not answer why CVVC are absent while CVVGm remain, as both are structurally similar to one another. A related appeal to a "coda con-

dition" on geminates would also fail, as no such condition is observed elsewhere, such as in words in (8) and others like them, where both word-internal CVC and CVGm are attested.

Another possible explanation might pertain to constraints on syllable weight. To explore such a possibility, however, would require one to entertain different assumptions regarding coda consonant moraicity. If one starts with the standard assumption that geminates are moraic (see Davis 2011) and were to begin by assuming that coda consonants are not so in the language, the Somali outcome could be seen as unintuitive. This is because one would need to explain why syllables with inherently moraic geminates are accommodated stem-internally while those with non-moraic coda consonants are not. Even if one were to assume instead that coda consonants and geminates are both moraic, a puzzle would still remain. It would still be unclear why CVVC is selected against while CVVGm is not. Because neither structure nor moraicity alone appear to offer a simple solution to this distribution, one must consider another possibility, namely that both moraicity and structure bear on the outcome.

Though at first puzzling, Somali's behavior is reminiscent of what is reported by Baker (2008) for Ngalakgan, a now extinct language of Australia. In Ngalakgan, syllables ending in a geminate maintain their length but pattern as if light (i.e., they fail to attract stress) even though other closed syllables pattern as heavy. Proposals are offered by Baker (2008) and Davis (2011) for how to analyze these outcomes. One possibility raised is that moraic elements in Ngalakgan must have their own place features, rather than place features shared with an adjacent onset. Thus, singleton coda consonants would have their own place features and accordingly be moraic and attract stress. Geminates, however, would share place features with a following onset and therefore be unable to license a mora and to attract stress. Another possibility calls into question foundational assumptions of different theories of gemination. For example, Hayes (1989) assumes that geminates are underlyingly moraic and that the distinction between singleton and geminate consonants rests in that the latter is underlyingly associated with a mora while the former is not. Other approaches (Leben 1980, among others) propose that the distinction rests instead in length, or association to timing slots. Under such a view, geminates are associated with two timing slots, while singletons are associated with just one.

Davis (2011) suggests that the behavior of geminates in Ngalakgan, among other languages, points toward a reconfigured view of geminate structure that incorporates elements of both earlier theories. He illustrates that, in various ways, languages may require reference to different elements of geminate structure – or different tiers – such as a timing tier (length), a gesture tier (segment or melody), but also a quantity tier (weight). For example, Davis & Torretta (1998) show that in Trukese, an Austronesian language of Micronesia, geminates pattern as heavy but may or may not surface occupying two timing slots. Ringen & Vago (2011) argue that geminates in Hungarian must occupy two skeletal (timing) slots given their susceptibility to interruption by an epenthetic vowel; the geminates are still associated to a single melody (gestural) slot, and whether or not they contribute to syllable weight is dependent on other factors. For Ngalakgan, Baker (2008) argues that geminate behavior crucially makes reference to the gestural tier, despite them not contributing to weight.

With these various outcomes in mind, and in arguing for universal geminate moraicity, Davis (2011) raises the possibility of a "composite" model of geminate structure. In this model, underlying geminate moraicity is assumed, though whether or not the mora is maintained or contributes weight is based on language-specific factors or a ranking of optimality-theoretic constraints. Davis (2011: 858) states the following concerning the composite model: "a geminate is represented on both a timing (length) tier and a gestural tier. It is viewed as having a moraic representation if it functions as heavy." Under this model, and as entertained in Baker (2009), Ngalakgan geminates could be seen as underlyingly moraic, though they would lose the ability to license their mora by virtue of being associated to a single gesture (as opposed to $CVC_\alpha.C_\beta V$ sequences where the coda and following onset are associated with different gestures), while still maintaining their length.

While it is beyond the scope of this paper to fully entertain the applicability of the "composite" model to all geminate phenomena, the structure proposed in the model offers some insight into a possible explanation for the divergent distribution of word-internal CVVC vs. CVVGm syllables in Somali. As introduced above, an explanation for the absence of CVVC but the maintenance of CVVGm is challenging to motivate based on structure or weight alone. An alternative explored here takes both into consideration, as the outcomes might be seen as

illustrating two structurally-mediated responses to a conspiracy to avoid word-internal superheavy (i.e., trimoraic) syllables.

Beginning with attested CVVGm syllables, one could argue that their behavior and their ability to surface aligns in some ways with what is seen in Ngalakgan. That is, although geminates may be underlyingly moraic, and although they may surface maintaining their length, they would appear not to contribute to syllable weight. As such, they might be seen as vacating their mora word-internally, perhaps to avoid the creation of a trimoraic syllable. That they are able to surface, however, may be possible because the geminate is syllabified in two adjacent syllables. Moreover, the ability to maintain their length could be due to their association to two slots on the timing tier.

Such a possibility is schematized in the "composite" structure in (11), composed of separate tiers for weight, gesture, and timing. This structure illustrates a surface representation in which word-internal geminates have vacated their mora, yet are able to be maintained due to their ambisyllabicity; independent association to the timing tier accordingly allows them to maintain their length.

(11) Surface representation of Somali geminates
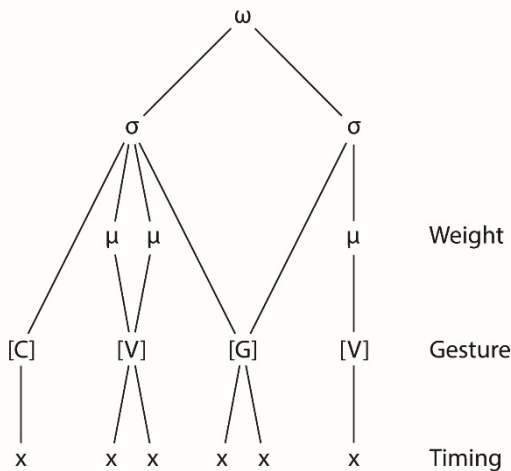
The corresponding structure in (12) illustrates a hypothetical representation with a word-internal CVVC syllable; the first syllable contains a moraic singleton consonant parsed into its coda rather than being shared between syllables. Such a structure cannot be accom-

modated in Somali, of course, due to a ban on trimoraic syllables, and must somehow be repaired. As I have suggested, due to a 'one-to-one' relationship between mora, gesture, and segment in Somali, a requirement for weightful coda consonants, and the coda consonant being parsed in one syllable, repair via mora loss would entail loss of the segment itself.

(12) Hypothetical representation with word-internal CVVC
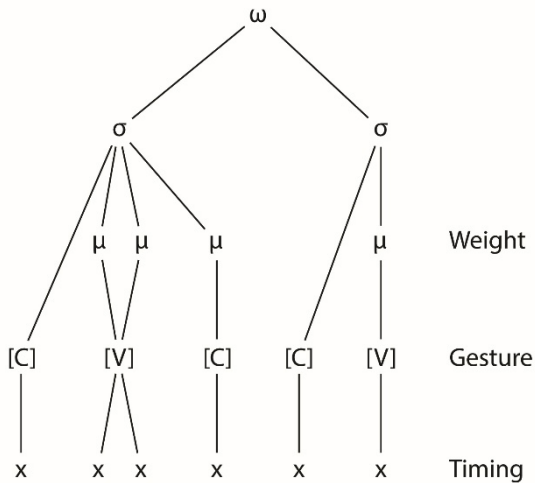
In partial support of such an approach, Bendjaballah & Le Gac (2019) argue for an analysis of Somali geminates based on timing slots, though they do not explore moraicity. They contend that an appeal to timing slots is necessary to explain the sensitivity of consonants of different types to lenition. For the speakers with whom they have worked, phonological geminates are realized as stops while singleton consonants are realized as spirants. The distinction, they propose, is encoded in gestural association to two timing slots for the former and to just a single timing slot for the latter. Thus, Bendjaballah & Le Gac treat the phonological contrast in terms of the number of timing slots, though the phonetic implementation of this distinction neutralizes the length distinction in favor of a manner distinction. As Green (2021) reports, however, not all Somali speakers realize such a neutralization; some speakers maintain a length distinction between

singleton and geminate consonants.[11] Though somewhat peripheral to the main point of this paper, if the perspective on Somali geminates proposed here and in Bendjaballah & Le Gac (2019) is correct, it would offer support for the "composite" model of geminate structure. That is, Somali could be seen as requiring reference to both the moraic and timing tiers of the model.

Setting this aside for now, a comparison to CVVC syllables presents a greater challenge owing to the fact that their properties must be motivated primarily by their absence, at least word-internally. CVVC syllables do appear word-finally, as seen above in (7), but this may be because they can be accommodated due to extrametricality, or a related mechanism, along the lines of those discussed by Broselow (1992) and Watson (2007). Extrametricality would not be an option word-internally. Rather, based on direct comparison to the patterning of word-internal CVVGm syllables, as well as to comparable CVC and CVGm syllables, the absence of CVVC syllables in the same distribution might once again imply the avoidance of violating a constraint against word-internal superheavy syllables. In this instance, however, unlike CVVGm syllables, whose codas may ultimately surface due to a combination of mora vacation and ambisyllabic licensing, CVVC syllables are avoided altogether. In order to surface, singleton codas in such syllables would somehow need to vacate their moras, but unlike geminates, they could not be "saved" by being structurally resident in two syllables. Operations that might accommodate such a sequence, such as mora sharing between the nucleus and coda (Broselow 1992; Watson 2007), appear not to be an available option in the language.

These various possibilities make it clear that the behavior of word-internal codas, at least in syllables with complex nuclei, is a matter that deserves further attention. Despite this, the observed distribution of these syllables finds a fairly transparent explanation under an approach that permits reference to moraic codas. It has been shown that a structural explanation without reference to moras encounters certain problems in motivating the distribution of word-internal CVVC vs. CVVGm syllables. The ability to "count" consonantal moras in explaining this distribution would also be in line with what appears necessary for other segmental phenomena in

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[11] It is worthwhile to note that geminates never occur word-finally in Somali; when they might appear, they are degeminated.

Somali, including those discussed here and elsewhere in the literature. Consonantal moras, as shown above and elsewhere, appear not to have a substantive role to play in the language's tonology.

3.3   Prefixal reduplication revisited

It has been argued in the preceding sections that consonantal moras appear to "count" in the calculation of minimality and word shape requirements in Somali. They have also been argued previously to do so for prefixal reduplication patterns. Taken together, these outcomes strongly suggest a revision is necessary to longstanding viewpoints about the role played by moras in the language's phonology. Vocalic moras are not the only moras that count.

A question left outstanding above in section 2.2 concerns the early vs. late moraicity of coda consonants in prefixal reduplication. This can now be revisited in light of what has been discussed in section 3. Recall that Orwin (1994, 1996) assumed underlying moraicity of coda consonants, but also suggested that these consonants globally vacate their moras prior to H tone assignment. At issue is, in part, whether there is any evidence that some, none, or all consonants exhibit such behavior. Another matter is accounting for why reduplicated forms like *taag-taagan* 'standing', with what would appear to be a word-internal CVVC syllable, are permitted, given that such syllables do not surface elsewhere in the language in this distribution. The first of these questions might be moot under a process-based theory of moraic phonology that recognizes and permits moraic mismatches. Under such a theory, one need not assume that the coda of the reduplicant in outcomes like *xir-xiran* 'tied up', nor other moras in CVC syllables, lose their mora. They might simply not enter into the calculation of H tone assignment which, as discussed above, is a key factor motivating the analysis in Orwin (1996). Forms where alternation leads to an apparent word-internal geminate, such as *duud-duuban* 'rolled up', however, might perhaps provide better evidence for vacation of a consonantal mora, in line with what is proposed in section 3.2 for word-internal CVVGm syllables elsewhere in the language. Still, there is some reason to question this given that in prefixal reduplication results in both CVVGm syllables (*duud-duuban* 'rolled up') and CVVC syllables (as in *taag-taagtan* 'standing') are permitted in the same distribution. One could argue that their now parallel distribution suggests that there may be something struc-

turally unique about these words formed by reduplication, compared to lexical bases.

One possibility to account for this outcome would be to appeal to the shape and characteristics of the reduplicant itself. Earlier works cited above have posited that the reduplicant is a single syllable that is satisfied to the fullest extent allowed by the language's phonotactics. This could be adjusted slightly to stipulate that the reduplicant fills a bimoraic template – $CV_\mu X_\mu(X)$ – where some final consonant X may be included in the reduplicant, but only if permitted by the language's phonotactics, though it does not otherwise have a role to play in the reduplication process. That is, this final consonant would behave as if extrametrical. Such an adjustment is attractive in that it parallels what is observed for word shape/size requirements, as discussed in section 3.1. The shape/size requirements of the reduplicant would appear to be the exact same as those for minimal word shape. Another way to think of this would be that the reduplicant in prefixal reduplication is, at most, the very size of a prosodic word. This would arguably also help to explain why CVVC is accommodated as a reduplicant, as the right edge of the reduplicant's syllable would also coincide with the right edge of a word. If this is correct, then one could argue that there is no evidence that mora vacation applies in prefixal reduplication, but rather, it is a case of extrametricality. As such, it would appear that the strongest case to be made for mora vacation in the language word be in word-internal CVVGm syllables within a stem. In this way, the vacation of consonantal moras might be seen as a last resort in a conflict between syllable markedness and stem faithfulness, rather than an operation triggered across the board.

4 Summary and concluding remarks

The modest goal of this paper has been to explore the behavior of coda consonants in Somali in order to determine whether and how they participate in tonal and segmental phenomena. The paper has taken as its premise, based on earlier studies, that both vocalic moras and consonantal moras have a role to play in the language's phonology. What has yet to be explored until now, however, is the extent to which consonantal moras, in particular, function more broadly in the language outside of prefixal reduplication and poetic metrics, and whether there is any clear indication that a given consonant's

status alternates from moraic to non-moraic at some point in the derivation of a word.

In exploring these matters, this paper has considered the shape and size of monosyllabic words, as well as the distribution patterns of syllable shapes of various types within stems. It is argued that the patterns observed strongly suggest that coda consonants function as moraic. The implication thereby is that the moraicity of consonants, as proposed by Orwin, et al. in prefixal reduplication, as well as what is known about the behavior of consonants in poetic metrics, are not "one off" outcomes. Rather, it would appear that, more often than not, consonants do count in Somali, contrary to what is assumed elsewhere in the literature. That is, although consonantal moras play no role in the language's tonal phenomena, they regularly, and in remarkably similar ways, play a role in segmental processes and alternations. Typology also supports the proposal argued for here. More specifically, the correlation between moras associated with more highly sonorous elements being implicated in tonal phenomena and those associated with less sonorous elements "counting" more often for segmental phenomena is in line with cross-linguistic patterns of process-based weight phenomena reported by Gordon (2004). This analysis of Somali also informs moraic theory in presenting further evidence that the Moraic Uniqueness Hypothesis cannot be upheld, while simultaneously opening the door for further inquiry into evidence that Somali's behavior might provide for the "composite" model of geminates. From a descriptive standpoint, this is also the first invocation, to my knowledge, of moraic mismatches in a Cushitic language. Future research, therefore, would benefit from inquiry into whether and how similar processes, among others, reference moras of different types across the family. For Somali specifically, these outcomes ultimately suggest that a reconfiguration or at least a more nuanced restatement concerning the role of the mora in the language is needed. Lastly, while the analysis in this paper is largely aligned with earlier work on Somali moraic phonology, it improves upon this earlier work by introducing an analytical alternative that need not globally assume the loss of consonantal moras, while also illustrating that some limited instances of such an alternation may still be justified.

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