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Squibs and replies

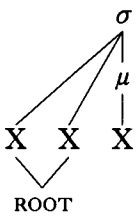
*On the representation of initial geminates**

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1 Introduction

Hume *et al.* (1997) argue that in Leti, an Austronesian language spoken on Leti Island off the coast of East Timor, geminate consonants are not moraic. In particular, they focus much of their attention on the word-initial geminates of Leti, which are syllable-initial when they begin a phrase. They argue that Leti initial geminates cannot be moraic and are instead best represented as in (1), with a single root node linked to two X-slots. (The example in (1) displays a syllable with an initial geminate; the vowel is moraic. The term ROOT indicates the consonantal root node; the features under it are not indicated.)

(1)



While Hume *et al.* do not explicitly extend their discussion of the representation of initial geminates by examining relevant data in other languages, they do note (pp. 397–398) that 'given the paucity of discussion in the phonological literature concerning syllable-initial geminates, the evidence from Leti is particularly important not only for further enriching our understanding of these segments but, in addition, for serving as a testing-ground for theories of prosodic structure and the representation of geminate consonants'. From this, one could postulate a strong position in

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which all initial geminates have the same, non-moraic, representation. The purpose of this squib is to argue against this strong position. While the evidence provided by Hume *et al.* against the moraic representation of Leti initial geminates is convincing, I present evidence in this paper showing that initial geminates are moraic in other languages. In §2 I present data from Trukese previously discussed by Churchyard (1991), Hart (1991) and Davis & Torretta (1998) that provide a compelling case for the moraic representation of word-initial geminate consonants in that language. In §3 I suggest that the different representations of word-initial geminates in Leti and Trukese are supported by the very different phonotactics of word-initial clusters found in the two languages. Finally, in §4 I relate the discussion on initial geminates to the peculiar patterning of palatal segments in Italian, where palatals always surface as long except in phrase-initial position. I argue that the palatal segments in Italian are moraic even when surfacing in phrase-initial position. I conclude that initial geminates may be moraic in some languages but not in others.

2 Initial geminates as moraic in Trukese

One argument that Hume *et al.* provide against the moraic representation of initial geminates in Leti comes from the observation that Leti has no words that consist of an initial geminate followed by a short vowel, e.g. [ppe]. This observation is significant, given that Leti has a minimal word condition that requires lexical words to be minimally bimoraic. If initial geminates were moraic then one would expect to find words like [ppe]. Thus, as Hume *et al.* contend, the lack of such words in Leti provides a compelling argument against the moraicity of Leti initial geminates.

If we turn our attention from Leti to a different Austronesian language, Trukese, spoken in the Truk state in Micronesia, we find another language that permits word-initial geminates. However, in Trukese, the evidence is strong that initial geminates are moraic. This has been specifically argued for previously by Churchyard (1991) and Hart (1991), working within non-linear derivational phonology, and by David & Torretta (1998), who provide an optimality-theoretic analysis of the Trukese data. Since the Trukese data do not seem to be generally known among phonologists it is worth presenting the relevant data here and showing how they support the moraic status of initial geminates.[1] The argument for the moraicity of Trukese initial geminates relates to a minimal word condition on Trukese nouns that requires them to be bimoraic. As has been observed by previous researchers, Trukese does not have nouns of the shape CV or

[1] The Trukese sources include Goodenough & Sugita (1980) and Dyen (1949, 1965). They reflect the Lagoon dialect. The data presented in Quackenbush (1970), some of which is introduced by Kenstowicz (1994: 132), reflect other dialects. Quackenbush's discussion of the morphophonemics does not include the full range of data bearing on the phonology of geminates. The forms with geminates that she does present appear to be similar to what is found in the Lagoon dialect.

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CVC.[2] It does, however, have nouns of the shape CVV, as reflected by the data in (2).[3]

(2) a. [təə] 'islet'
b. [maa] 'behaviour'
c. [oo] 'omen'
d. [soo] 'precipitate'
e. [nɨɨ] 'unripe coconut'

The various primary sources on Trukese, such as Dyen (1965), Quackenbush (1970) and Goodenough & Sugita (1980), provide an abundance of words with initial geminate consonants. (Trukese does not otherwise allow words to begin with a consonant cluster, ignoring some recent loanwords from English.) What is noteworthy about Trukese is that it permits nouns that consist of an initial geminate followed by a short vowel. Some examples are given in (3).

(3) a. [tto] 'clam (SP)'
b. [kkæ] 'taro (SP)'
c. [čča] 'blood'
d. [ssɔ] 'thwart of a canoe'

The data in (3) can be taken as evidence for the moraicity of Trukese initial geminates, especially in comparison to Leti, where, as mentioned above, Hume *et al.* propose that the lack of Leti words like that in (3) argues for the non-moraicity of initial geminates in that language.

Further evidence for the moraicity of Trukese initial geminates comes from the interaction of the minimal word condition with compensatory lengthening and final mora deletion. Trukese has a process that deletes a word-final mora. Relevant data are presented in (4). (The data in the last column, with the 1st person possessive suffix, are presented to provide evidence for the underlying nature of the final vowel.)

(4)

	underlying	*output*		
a.	/omosu/	[omos]	'turban shell'	[omosu-y]
	/məkɨre/	[məkɨr]	'head'	[məkɨre-y]
	/piseki/	[pisek]	'goods'	[piseki-y]
	/sæfeye/	[sæfey]	'medicine'	[sæfeye-y]
	/səkɨri/	[səkɨr]	'back'	[səkɨri-y]

[2] The lack of nouns of the shape CVC is taken as evidence that a word-final consonant in Trukese is not moraic. Otherwise, Trukese does permit nouns to end in a single consonant (e.g. CVVC words such as [faas] 'nest'). The only word-internal coda allowed is one that is the first part of a geminate. Even the first part of a partial geminate (i.e. the nasal in a nasal + homorganic obstruent sequence) is not permitted in coda position. Given this patterning, I follow Churchyard (1991) and Hart (1991) in viewing Trukese word-final consonants as extraprosodic.

[3] The phonetic [æ], [ə], [ɔ] and [ɨ] correspond respectively to the symbols *á*, *é*, *ó* and *ú* of Trukese orthography. Most of the Trukese sources cite data using the orthographic symbols. Also, Trukese does not have a voicing contrast: obstruents are voiceless and sonorants are voiced.

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b.	/pečee/	[pěce]	'foot'	[pečee-y]
	/tikkaa/	[tikka]	'coconut oil'	[tikkaa-y]
	/etiruu/	[etiru]	'coconut matting'	[etiruu-y]
	/čuučuu/	[čuuču]	'urine'	[čuučuu-y]

In (4a), a word-final short vowel deletes and in (4b) a word-final long vowel shortens. In (4a), we observe that there is no compensatory lengthening that results from the deleted vowel. However, if the result of vowel deletion would violate the minimal word condition then compensatory lengthening does occur. This is shown by the data in (5). (Again, the data in the last column, containing the relational suffix *-n*, are presented so as to provide evidence for the underlying nature of the final vowel.)

(5)	*underlying*	*output*		
	/tipe/	[tiip]	'emotions'	[tipe-n]
	/čiki/	[čiik]	'basket'	[čiki-n]
	/pəkə/	[pəək]	'chip'	[pəkə-n]
	/ača/	[aač]	'handle, stem'	[ača-n]
	/wutu/	[wuut]	'interior'	[wutu-n]

In comparing the output forms in (5) with those in (4a), it is apparent that compensatory lengthening occurs in (5) so as to avoid an output form that would be monomoraic. For example, the output of the first form of (5) would be *[tip] if compensatory lengthening did not occur. Now, consider the forms in (6), which begin with an initial geminate.

(6)	*underlying*	*output*		
	/ffəne/	[ffən]	'advice'	[ffəne-n]
	/nnəti/	[nnət]	'shrub (SP)'	[nnəti-n]
	/ttoŋa/	[ttoŋ]	'love'	[ttoŋa-n]

Here the final vowel deletes and the output form is a single syllable. But unlike the data in (5), there is no compensatory lengthening. The lack of compensatory lengthening in (6) argues for the moraicity of the initial geminate. Compensatory lengthening in (6) is unnecessary since the output is bimoraic without lengthening the vowel. The word-initial geminate contributes a mora.

Finally, reconsider the phonetic data in (3), as displayed in (7). These nouns end in a long vowel in underlying representation, as evidenced by the last column in (7).

(7)	*underlying*	*output*		
a.	/ttoo/	[tto]	'clam (SP)'	[ttoo-n]
b.	/kkææ/	[kkæ]	'taro (SP)'	[kkææ-n]
c.	/ččaa/	[čča]	'blood'	[ččaa-n]
d.	/sscɔ/	[ssɔ]	'thwart of a canoe'	[sscɔ-n]

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The data in (7) exhibit the shortening of a word-final long vowel, just like the data in (4b). If we compare (7) with the phonetic data in (2) we can surmise that the shortening of the vowel would not occur if the output would be monomoraic. The fact that shortening does occur in (7) can be taken as evidence for the moraicity of the geminate. Thus, Trukese provides a compelling case for the moraicity of initial geminates.

3 Representation

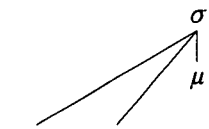
Hume *et al.* provide strong evidence for the non-moraicity of initial geminates in Leti, while the Trukese evidence above provides an equally compelling case for their moraicity. It is proposed here that the initial geminates are underlyingly represented differently in the two languages. I suggest that the initial geminates in Leti are represented as in (8), while Trukese has the representation in (9). (8a) and (9a) show the underlying representation of a word-initial geminate in the two languages. (The consonantal features under the root nodes are not shown.) (8b) and (9b) show the syllabification of the (word-initial) geminate followed by a short vowel.[4] It should be noted that both the representations in (8b) and (9b) were briefly discussed in the appendix of Hayes (1989) as possible representations for word-initial geminate consonants when incorporated within syllable structure.[5]

(8) *The representation of Leti word-initial geminate consonants*

a. *Underlying representation*

ROOT ROOT

b. *Incorporated in syllable structure*



[4] The representation that I offer in (8b) for initial geminates in Leti is different from that of Hume *et al.* shown in (1), in that (8b) does not incorporate a skeletal tier. Hume *et al.* assume both a skeletal tier and a moraic tier. Their position is controversial in light of the arguments against the skeletal tier found in such works as McCarthy & Prince (1986) and Hayes (1989). The difference between the representation I posit in (8b) and that in (1) is not critical for my discussion, but (8b) is supported by the phonotactics of Leti initial consonant clusters, as I discuss following (9). (The difference between (8b) and (1) is not critical for my discussion because both representations view the initial geminates of Leti as non-moraic; this is to be contrasted with the representation of the initial geminate of Trukese in (9), where the geminate is moraic.)

[5] The structure in (9b) for Trukese initial geminates is similar to what Hart proposes. However, I posit that the initial mora of (9b) links to the prosodic word node when in phrase-initial position whereas Hart proposes that it links to the syllable node. See note 10 for relevant discussion on this point and on the realisation of the initial mora when in the middle of a phrase.

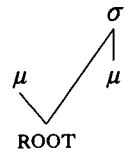
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(9) *The representation of Trukese word-initial geminate consonants*

a. *Underlying representation*



b. *Incorporated in syllable structure*



The difference between the Leti and Trukese representations in (8) and (9) is supported by the difference in the phonotactics of word-initial sequences found between the two languages. Leti allows for almost any possible sequence of two consonants at the beginning of the lexical word, as observed by Hume *et al.* (note 3). There are no sonority restrictions on what these two consonants can be. The two consonants in a word-initial sequence can be obstruent + sonorant, such as [pn pl pr tm tl tr vn vl vr], sonorant + obstruent, such as [mb ms mv ns rs rv], sonorant + sonorant, such as [mr nr rm rn rl], and obstruent + obstruent, such as [pt tp pk kp tk kt].[6] Given this patterning, where almost any consonant can occur before another consonant at the beginning of the word, it is not surprising that one possibility is for the two consonants at the beginning of the word to be identical. Consequently, the underlying representation of the initial geminate can be captured by (8), where a geminate consonant would be viewed as a sequence.[7]

On the other hand, Trukese does not have initial consonant sequences (with the exception of a handful of loanwords from English). However, Trukese geminates can occur word-initially as well as word-medially.[8] As

[6] There are some relatively minor constraints on the initial cluster. For example, clusters of a voiced obstruent followed by a voiceless one, such as [dp dt dk ds], do not seem to occur, nor do sequences of two fricatives such as [sv]. Despite these examples, the initial cluster in Leti does not display any general sonority constraints.

[7] The representation in (8) predicts that Leti geminates should be treated like other consonant clusters. While Hume *et al.* show that this is sometimes the case, they also point to Leti reduplication and downgrading (a process that destresses the first word in a two-word phrase of a certain type, such as possessor–possession, location–locational, verb–object), where the geminate behaves differently than other consonant clusters. Although I will not offer a reanalysis of reduplication and downgrading here, it may be relevant to note that these two processes can be viewed as involving output–output correspondence. In any case, the fact that Leti lacks words consisting of a geminate followed by a short vowel, as discussed at the beginning of §2, supports the inherently non-moraic nature of the Leti initial geminate.

[8] Geminates do not occur in word-final position in Trukese. This could be understood in terms of the extraprosodicity of word-final consonants or by a high-ranking constraint against word-final geminates. Relevant are words of the pattern $CVCVC_iC_iV$, which display both final mora deletion and degemination, as exemplified by /tikitti/ 'fresh water eel', which is realised as [tikit]. Shorter words of the pattern CVC_iC_iV additionally display compensatory lengthening or 'gemination throwback', so as to maintain a bimoraic minimum. Examples include /tappa/ 'green coconut' and /kunnu/ 'rotation', which are realised as [taap] and [kkun], respectively. See Davis & Torretta (1998) for a detailed optimality-theoretic analysis of this and Muller (1998) for an alternative analysis of such forms.

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mentioned in note 2, the first part of a geminate is the only allowable coda consonant in the language. This patterning can be analysed if geminates are underlyingly moraic in Trukese along with the inviolability of a constraint against inserting moras and of a constraint requiring codas to be moraic (see Broselow *et al.* 1997 for discussion on these two constraints). The result is that the only moraic consonants that surface are those that are underlyingly moraic or geminate. Trukese has no (inviolable) constraint against word-initial geminates; thus if a geminate is underlyingly in initial position it surfaces as moraic. The consistent patterning of initial geminates as moraic as discussed in §2 is well captured by the representation in (9).

Hume *et al.* consider and reject (9) as a possible representation for the word-initial geminates of Leti. While most of their arguments are specific to Leti, they do suggest that a mora unattached to syllable structure as in (9b) should give rise to a short consonant that would be phonetically indistinguishable from the non-moraic consonant. This brings up the interesting issue of the phonetic realisation of word-initial geminate consonants, especially with respect to voiceless stops. Hume *et al.* observe that the duration of voiceless closure in initial position seems to be an insufficient perceptual cue. They cite the study by Abramson (1992), which shows that other cues are present for the initial geminates in Pattani Malay, such as the increased amplitude of the syllable with the initial geminate. With respect to the phonetics of word-initial geminates in Trukese, Dyen (1949: 423) comments that such consonants are actually not pronounced as long in absolute initial position. Muller's (1999) more recent phonetic study of Trukese geminates (based on her own fieldwork) shows that it is only the stops that are not pronounced as long in initial position; fricatives are. However, according to Muller, the initial stops can still be distinguished from their non-geminate counterparts by a larger pitch perturbation and a large jump in amplitude at the release. Thus, we see that the initial geminates of Trukese, unlike the medial geminates, do not all have a uniform phonetic realisation in terms of longer duration. Nonetheless, they do display uniform phonological behaviour, as seen by the comparison of (7a) with (7d), where both the stop consonant in (7a) and the fricative in (7d) are treated as geminate in allowing for the shortening of the vowel. (Compare these with (2a) and (2d), respectively.) This strongly supports a uniform phonological representation as in (9), where the initial consonant is moraic. Such a representation is less tied down to absolute duration as compared to the two-X-slot analysis of geminates. A mora can be viewed as a unit of syllable weight (cf. Newman 1972, McCawley 1978). While the realisation of this is frequently in terms of increased duration, there may be certain positions, such as initial position, where increased duration may not be distinguishable.[9] In such situations, weight may be realised by other means, such as pitch perturbation or increased amplitude, as in Trukese and Pattani Malay. Thus,

[9] See Goedemans (1998) for experiments showing that increased duration is harder to perceive in onset position.

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the observation by Hume *et al.* that the representation in (9b) might imply a phonetically short consonant does not necessarily argue against the moraic representation of Trukese initial geminates.[10]

4 Italian palatals

One interesting consequence of the analysis of Trukese geminates is that even though the geminates in Trukese have a uniform phonological representation (as underlyingly moraic, as in (9a)), their phonetic realisation may vary depending on type and position. Interestingly, there are other cases of the same phenomenon where a 'geminate' consonant is not realised as long in word-initial position.

A particularly well-known case of this that provides support for the representation in (9b) relates to word-initial palatal consonants in Italian. As observed by a variety of researchers, such as Chierchia (1986), Burzio (1989) and Wiltshire & Maranzana (1998), as well as in traditional descriptions like Chapallaz (1974), consonantal length in Italian is distinctive word-internally (e.g. *fato* 'fate' *vs.* *fatto* 'fact'), but not word-initially. However, as illustrated by the data in (10) and (11), palatal segments in Italian are always long, except phrase-initially.[11]

[10] Churchyard (1992) posits a representation of Trukese word-initial geminate in which the mora of the geminate is linked directly as the onset of the syllable. This is shown in (i) for a sequence of an initial geminate followed by a vowel.

(i)



This is different from the representation that I posit in (9b), where the mora of the geminate is not syllabified as an onset. Trukese evidence for the representation in (9b) comes from the realisation of word-initial geminate stops as long in a phrasal context when the preceding word ends in a vowel. The geminate serves both as the onset to the word-initial syllable and as the coda of the final syllable of the preceding word. Specifically, the initial mora of (9b) syllabifies as a coda of the final syllable of the preceding word when that word ends in a vowel. The representation in (9b) more readily predicts this outcome than Churchyard's representation in (i). If the consonantal mora of the geminate is linked directly as the onset of the syllable as in (i), there is no clear reason why it should surface as part of the coda of the preceding word when that word ends in a vowel. Moreover, a representation like that in (i) predicts that weight-sensitivity of onsets should be common. However, cases where onsets add weight to the syllable, such as for rules of stress placement, are extremely rare. Such cases are better analysed as involving stress shift independent of weight (Davis 1988), prominence as independent of weight (Hayes 1995) and/or the relative ill-formedness of onsetless syllables (Downing 1998). A full discussion of these works is beyond the scope of this paper.

[11] This is also true of the dental affricates [t^s] and [d^z]. Our discussion, though, focuses on palatal consonants, so as to avoid the issue of the possible representation of the dental affricates as bisegmental.

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(10) *Italian palatal consonants not in phrase-initial position*

a.	fascia	[fašša]	'bandage'	(cf. *[faša])
b.	legno	[leñño]	'wood'	(cf. *[leño])
c.	casa sciupata	[kásaš.šupata]	'ruined house'	(cf. *[kása.šupa-ta])
d.	folle gnomo	[fólleñ.ñomo]	'crazy gnome'	(cf. *[fólle.ño-mo])

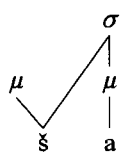
(11) *Italian palatal consonants in phrase-initial position*

a.	sciupata	[šupata]	'ruined'
b.	gnomo	[ñomo]	'gnome'
c.	scialle	[šalle]	'shawl'

The data in (10a) and (10b) exemplify the observation that Italian palatals never surface as single when in the middle of the word. (10c) and (10d) show that they also do not surface as single when word-initial in phrase-medial position. However, as seen in (11), palatals do surface as single when in phrase-initial position. Burzio (1989: 53) comments that the Italian palatals are '"intrinsically geminated" in the sense that they do not exist in the inventory as non geminates'. The intrinsic geminate nature of the Italian palatals can best be observed in (10c) and (10d), where the palatal surfaces as a geminate in a phrasal context even though the regular Italian gemination process (*raddoppiamento sintattico*) does not occur after a stressless vowel. In other words, the geminate palatal in (10c) and (10d) cannot be the result of *raddoppiamento sintattico*. That the palatals are geminate in (10c) and (10d) provides evidence for their intrinsically geminated nature. To capture this, Chierchia (1986), Nagy & Napoli (1996) and Wiltshire & Maranzana (1998) represent the palatals as a single phoneme underlyingly linked to two C-slots (or X-slots). These researchers make reference to constraints that disallow a palatal from surfacing as a geminate in phrase-initial position.

Instead of representing the Italian palatals as comprising a single phoneme linked to two C-slots, I argue that they are simply represented as being underlyingly moraic. This directly captures the patterning of the palatals as geminates that we see in (10), as well as Burzio's (1989) comment noted above that the palatals are 'intrinsically geminated'. Moreover, there is strong evidence that even in word-initial position, the Italian palatals are moraic although they do not surface as long phrase-initially. That is, the initial palatal + vowel sequence of a word like *scialle* 'shawl' in (11c) would have the representation shown in (12), where the initial [š] is moraic.

(12)



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The evidence for this representation comes from the distribution of the allomorphs of the Italian masculine definite article. As is well known (e.g. Davis 1990, Kenstowicz 1994: 302–303), the Italian masculine definite article has two allomorphs, *il* and *lo* (or its contracted form *l'*).[12] The allomorph *il* occurs before words that begin with a single consonant, as exemplified in (13a), while *lo* occurs before words that begin with a vowel, as exemplified in (13b).

(13) a.	il sale	'the salt'	b.	l'est	'the east'
	il padre	'the father'		l'affare	'the affair'
	il ferro	'the iron'		l'osso	'the bone'
	il talento	'the talent'		l'umore	'the mood'
	il cibo [č]	'the food'		lo iodio	'the iodine'
	il gorgo	'the whirlpool'			

What is revealing is that masculine words beginning with a palatal take the definite article *lo*, as exemplified in (14).

(14) lo gnomo 'the gnome'
lo scialle 'the shawl'

One might expect *gnomo* and *scialle* in (14) to take the definite article *il*, because, as seen by the transcription in (11b) and (11c), when these words are pronounced in isolation they begin with a single non-geminate consonant, just like the words in (13a). However, the fact that these words take *lo* strongly supports the moraic representation in (12). Under such a view, *lo* occurs before a word that begins with a moraic segment, be it a vowel-initial word as in (13b) or a palatal as in (14).[13] The representation in (12) captures the observation that while Italian word-initial palatals may have the duration of a single consonant when in phrase-initial position, they behave phonologically like moraic segments, thus accounting for Burzio's (1989) observation that they are 'intrinsically geminated'.[14]

[12] In traditional Italian grammars the contracted form *l'* is seen as being related to the allomorph *lo*. Some analyses of Italian, such as Bolognesi (1996), argue that *l'* is unrelated to *lo*. Since this issue can be viewed as tangential to the present discussion, I assume the standard analysis of *l'* as being the contracted form of *lo*.

[13] The allomorph *lo* also occurs before words that begin with consonant clusters where, according to the analysis of Davis (1990), the sonority distance between the two consonants is small (e.g. *lo smalto* 'the pavement' *vs. il premio* 'the prize'). Davis makes the generalisation that *il* occurs before a word where the initial consonant is syllabified as part of the onset; otherwise, *lo* occurs. Such a generalisation is compatible with the behaviour of palatal-initial words, (14), given the representation in (12) where the initial mora of the palatal consonant is not part of the onset.

[14] One might assume that, given the discussion regarding the phonetic realisation of Trukese initial geminates, the phrase-initial palatals of Italian should show pitch or amplitude differences in comparison with other phrase-initial single consonants. However, I am not aware of any phonetic studies that specifically address the acoustic characteristics of phrase-initial palatals in Italian. Nonetheless, the phonology of the initial palatals in Italian clearly supports the moraic representation.

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5 Conclusion

This squib has shown that while initial geminates are analysed as non-moraic in Leti, as argued for by Hume *et al.*, there are languages such as Trukese that support the moraic representation of initial geminates. It has also been argued that the initial palatals of Italian are best represented as moraic. This captures both their phonetic and phonological behaviour. In conclusion, the patterning of initial geminates as moraic or non-moraic varies among languages. The precise analysis of initial geminates in a given language may depend on other factors in the phonology of that language. The cross-linguistic behaviour of initial geminates is a potentially rich topic for future research.

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