CONTOUR SEGMENTS IN NEVERVER: SYNCHRONIC JUSTIFICATIONS

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Abstract

The Neverver language of Vanuatu has been analysed as containing six prenasalised phonemes. Prenasalised phonemes can be described as contour segments, beginning their articulation with nasal airflow [+nasal], and ending their articulation with oral airflow [–nasal]. Syllabification in Neverver provides important evidence of the status of prenasalised phonemes as complex but unitary segments. In this paper, I examine the behaviour of prenasalised phonemes, showing how prenasalised segments behave in the same way as simple segments, and how they contrast clearly with heterogeneous and geminate consonant sequences through syllabification processes that shape the surface forms of inflected verbs. My analysis aligns with native-speaker intuitions about the psychological reality of complex segments in Neverver, and provides evidence against a recent claim that a universal No Contour Principle operates in language.

1. Introduction

Depending on the evidence available in a given language, a homorganic sequence of a nasal consonant followed by a non-nasal consonant might be analysed as a sequence of two separate segments. Alternatively, the sequence might be analysed as tauto-segmental, where the nasal element and the non-nasal element together form a single complex segment. Favouring a universal interpretation of language data, San Duanmu (1994, 2009) has made the claim that tauto-segmental sequences, comprising for example a nasal and a non-nasal phase of articulation, are prohibited by a universal constraint on segmental composition. Further, Duanmu (1994, 2009) opines that there is no convincing evidence for prenasalised segments. This paper aims to address the claimed gap of evidence by investigating sequences of homorganic nasal plus non-nasal consonant in the Neverver language of Malakula Island, Vanuatu.

1.1 Data collection and transcription

The data presented in this paper were collected from native speakers of the Neverver language, and have been extracted from the Neverver documentation corpus. The corpus was developed by the author during nine months of field work in Vanuatu, and another five-week workshop with two native speakers in New Zealand. The corpus comprises over twenty hours of recorded speech, including assorted monologues (traditional and contemporary narratives, historical recounts, process descriptions), interview-type dialogues between native speakers on cultural matters, and conversations. The most spontaneous recordings are public conversations with participants entering and exiting the recording area freely. At all times the recording equipment was visible to all participants. The most controlled recordings derive from studio recording sessions made in New Zealand with two speakers of Neverver. In one of these sessions, the two young women were provided with a list of verbs, and asked to make up sentences using the words. The resulting data were used to extract measurements of geminate consonants.

All recordings in the corpus were transcribed in the presence of native speakers, with their assistance. Once the phonemic units of the language were established, only broad transcriptions were made with native speakers. Following transcription sessions, sound files were checked for phonetic detail as phonological processes at work in the language came to light, including the insertion of epenthetic consonants and vowels, the loss of word and phrase final phonemes and phonetic detail, and various assimilation effects. These details tended to be suppressed when native speakers were ‘speaking back’ the recorded material to assist with transcription. Transcriber software, and to a lesser extent Praat, were used for the digital processing of sound files outside of the field context.

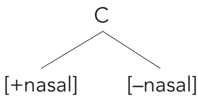
The documentation corpus also contains lexical data collected opportunistically from community members, along with transcribed material collected during unrecorded elicitation sessions. In these sessions morpho-syntactic hypotheses were tested. The elicited data were collected quite late in the field work, and although the broad phonemic transcriptions were made with some confidence, elicited material has been excluded from the data used for analysis as far as practicable.

1.2 Data analysis

In this paper, two closely related phonological theories are drawn on to analyse Neverver data. These theories build on generative understandings presented in *The Sound Pattern of English* (Chomsky and Halle 1968), which in turn builds on work by Roman Jakobson (cf. Jakobson and Halle 1956). Firstly, I employ feature theory. In feature theory each segment within the sound system of an individual language is understood as comprising a unique combination of distinctive features. These distinctive features primarily represent characteristics of articulation, such as voicing, where a sound might be specified as [+voice] or [–voice]. Feature theory is used to express contrasts between individual segments in Neverver, as well as between classes of segments. Secondly, auto-segmental (or CV) phonology (cf. Clements and Keyser 1983; Goldsmith 1990) is employed, where the linear sequence of sounds that is produced in the articulation of speech is analysed on multiple tiers. Different types of information are specified on each tier. For example, on the CV or skeletal tier, segments are specified as C units, which can function as the onset or coda of a syllable, or V units, which can function as the peak of a syllable. Auto-segmental phonology is useful in the analysis of Neverver for several reasons. For example, auto-segmental phonology allows the distinction to be made between the length of segments, with long vowels occupying two V units, and geminate consonants occupying two C units. Thus, with geminate consonants, a single articulation is associated with two timing units on the CV tier. Neverver does not have long vowels, but there are many consonants which can be either plain or geminated.

Auto-segmental phonology is a particularly useful framework for representing sequences of homorganic nasal plus non-nasal consonant as complex segments. In this framework, prenasalisation is treated as involving the 'multiple association of phonemic material to skeletal positions' (Goldsmith 1990: 66). Prenasalised segments can be represented as displaying a manner contour, with 'differently valued occurrences of the same manner feature' (Gussenhoven and Jakobs 2005: 177), illustrated in (1) below.

(1)



Such an analysis is argued for in Stephen Anderson's paper 'Nasal consonants and the internal structure of segments', where Anderson (1976: 331) identifies a number of languages that are described as having prenasalised stops with 'the distribution typical of single segments (i.e., they can occur in positions where clusters are impossible), and they may contrast with clusters'. This criterion is crucial. In order for a language to be analysed as having complex segments, these complex segments need to behave like simple segments, and where relevant, contrast with sequences of separate segments.

In early work on features, a simple relationship between features and segments is assumed as 'the distinctive features are aligned into simultaneous bundles called phonemes' (Jakobson & Halle 1956: 20); however, Lyle Campbell (1974: 60) argues that affricates, labialised segments, and palatalised segments need to be treated as 'complex symbols', or segments that 'are articulatorily complex, in that they involve separate but related articulatory gestures—occurring not quite simultaneously in time, but in close juxtaposition'. This means that a single segment may involve more than one bundle of features, representing the different phases of articulation. According to Anderson (1976: 331), prenasalised stops 'involve nasality, but they cannot simply be treated as [+nasal] stops, ... since they would then be indistinguishable from primary nasal consonants'. This is because nasals and stops both involve the complete obstruction of the oral air way, and are thus both classified as [–continuant], as well as sharing place of articulation features, and in most cases of prenasalisation, the laryngeal gesture of voicing. Contrasting plain nasals, prenasalised stops, and another set of sounds which are variously described as 'postnasalized stops' or 'pre-stopped nasals', Anderson (1976: 332), like Campbell (1974), observes that these complex segments 'involve the same articulations, and seem to differ from one another only in relative timing: the velum is lowered THROUGHOUT an ordinary nasal, but only at the BEGINNING of a prenasalized stop, and only at the END of a postnasalized stop'. This leads Anderson (1976: 333) to propose a subsegmental structure, where 'a single segment would be characterized, at least in some cases, by a sequence of specifications for the same feature, rather than by a single homogeneous feature'.

In more recent work by San Duanmu (1994, 2009), an attempt is made to constrain sub-segmental possibilities. Initially focused on providing evidence against contour tones in Chinese languages (such as short falling or rising tones over single segments), Duanmu (1994) argues that sub-segmental structure must not involve a contour in features. This leads him to formulating a universal constraint whereby 'no feature is made twice by the same articulator' in the production of sounds (Duanmu 2009: 26). Duanmu (2009: 21) claims that sequential gestures producing a contour in features 'usually take up twice as much time as a single sound does' and thus need to be associated with two timing units on the CV tier[1]. Further, in Duanmu's opinion, 'there is no compelling evidence that pre-nasalized stops ... exist as single sounds' (2009: 26).

According to Duanmu then, the sub-segmental structure presented in (1) above is forbidden. Interestingly enough, the analysis of sub-segmental structure is not abandoned entirely. Duanmu (2009) permits complex segments, provided the segment in question involves different articulators, and that the articulators are conceivably acting simultaneously. The complex segment [k^{w}] is used as an example for Duanmu's claim that 'two articulators that make separate gestures can do so simultaneously' (2009: 25). The segment [t^{s}] is offered as an example where the same articulator is involved, but through careful feature listing, different features are employed. So [t^{s}] is described as being a coronal sound that is simultaneously [+stop] and [+fricative]. Utilizing underspecification, Duanmu neatly avoids a contour that would appear with the [t] element being identified as [–fricative] or the [s] element being identified as [–stop].

Motivated by Duanmu's claim that there is no good evidence for prenasalised consonants, in this paper, I seek to present a justification of the analysis of Neverver as containing six prenasalised segments. Crucial evidence for my analysis comes from morphology, and concerns the formation (and syllabification) of the subject/mood prefix that attaches to verbs, and the formation of the reduplicative prefix that likewise attaches to verbs. After presenting the phoneme inventory for Neverver, and a distinctive feature matrix for the inventory in section two, I describe the syllable structure of the language in section three. In section four, I contrast the behaviour of plain segments with the behaviour of heterogeneous and geminate consonant sequences in relation to the inflection of verbs. I aim to show that prenasalised segments follow the pattern for plain segments, and contrast with the pattern for consonant sequences. In section five, I follow the same analysis in relation to the process of reduplication. In section six, I argue that the presence of prenasalised phonemes in Neverver provides counter-evidence for the claim made by Duanmu (1994, 2009) that contour segments are not permitted in languages, and I address a second claim made by Duanmu, that syllables in all languages are constrained to a maximal CVX structure. In section seven, I address the matter of the psychological reality of prenasalised segments for native speakers of Neverver, and in section eight, I propose further research projects that could be carried out in this complex area.

2. The consonant inventory

Neverver has nineteen consonant segments. In the central Malakula region where Neverver is spoken, the language is known for its trills. The trills include a prenasalised bilabial trill [^{m}ʙ], a prenasalised alveolar trill [^{n}r], and a plain alveolar trill [r]. Of relevance to this paper are six prenasalised segments. In addition to the two prenasalised trills, there are three prenasalised voiced plosives and a prenasalised affricate.

Table 1. The Neverver consonant inventory

		BILABIAL	ALVEOLAR	PALATAL	VELAR	LABIO-VELAR
Nasals		m	n		ŋ	
Plosives	Plain	p	t		k	
	Prenasalised	b	d		g	
Fricatives	Plain	β	s		ɣ	
Affricates	Prenasalised			dʒ		
Trills	Plain		r			
	Prenasalised	ʙ	ᴅ			
Approximants			l	j		w

The bilabial trill segment has been reported as a linguistic rarity in the languages of the world, used often for communicative expression, but seldom for linguistic contrast (Maddieson 1989). Recent work by Christy Keating (2007: 3) identifies forty-seven languages with bilabial trills, accounting for less than one percent of an estimated 6000 languages spoken around the world. Such languages are found predominantly in Central Africa, Papua

New Guinea, Vanuatu, and Brazil (Keating 2007: 44). In these forty-seven languages, at least twenty-five have a phonemic trill; in the remaining languages the trill is an allophone of another consonant (Keating 2007: v). Along with Neverver, several other languages of Malakula in Vanuatu have a bilabial trill. These include Avava (Crowley 2006: 25), Unua (Pearce 2010), Nahavaq (Dimock 2009), Aulua (Paviour-Smith, personal communication), and Northeast Malakula/Uripiv (McKerras N.d.).

Maddieson (1989) proposes that the bilabial trill emerges from a sequence of a bilabial nasal and a voiced bilabial plosive [mb] followed by a high back vowel [u]. The release of the plosive into the rounded vowel means that there is a sustained period when the lips are rounded and relaxed, allowing for 'involuntary full or partial reclosure of the lips one or more times during the stop-vowel transition' (Maddieson 1989: 104). Maddieson (1989: 94) observes that a narrower transcription of the trill would be [mbʙ] or [^{mb}ʙ] as 'the first phase of the trill is a bilabial stop burst'. Maddieson's (1989) proposal of the emergence of the trill is supported by synchronic evidence from Neverver, as the bilabial trill most commonly occurs before [u]. It is not restricted to this environment however, and can occur syllable-finally before other consonants,[2] as well as word-finally. Keating's (2007) survey of languages with bilabial trills identifies a small number of languages where bilabial trills occur preceding vowels other than [u], and observes also that not all trills are prenasalised in the world's languages. This synchronic evidence does not necessarily invalidate Maddieson's hypothesis however, as it is well-established that the segments of a language undergo change over time (cf. Campbell 1998).

The prenasalised alveolar trill, also lightly pre-stopped, has been identified in a small number of Oceanic languages other than Neverver, including the closely related Avava language (Crowley 2006), Aulua (Paviour-Smith, personal communication), the South Efate language of Vanuatu (Thieberger 2004: 52) and the rather more distant Fijian language (Schütz 1985). Blust (2007) also identifies the trill in several languages of Manus Island, located in the Admiralty Islands. Blust (2007: 299-300) describes the articulation of the Fijian trill as comprising three phases: '1) a brief onset in which the nasal port is open during apico-alveolar closure; 2) a very brief transition during which the apico-alveolar closure remains fixed but the nasal port is closed; and 3) a longer period during which aerodynamic forces transform the apico-alveolar closure into a voiced trill'. This description captures the Neverver articulation. To contrast with the plain trill [r], the symbol /ᴅ/ is used to represent this phonemic unit. A narrow transcription would represent this sound as [ndr] or [ⁿᵈr].

When describing the segmental contrasts of Neverver using feature theory, a crucial distinction is made between plain segments and prenasalised segments. Plain segments are characterised by single values associated with each distinctive feature, and thus a simple matrix can be produced for each segment. Among this set of simple segments, the most important allophony to mention involves the segment /p/. Before the high back vowel /u/, this segment has a trilled allophone [ʙ̥].

Although just six features are sufficient to describe the plain segments in Neverver, I also include [±voice] and [±sonorant] as features in the matrix. These additional features are salient in the description of phonological processes and phonotactic rules. Voice is relevant to the description of a very general type of allophony: there is a regular process of devoicing which applies to word-final voiced segments, and to voiced segments that precede voiceless segments. Further, both of the features [±voice] and [±sonorant] are needed to describe consonants which may form geminate sequences. Those segments which are attested in geminate sequences in the corpus include the [+sonorant][+anterior] segments /m, n, r, l/, and the [–voice] segments /p, t, k, s/. Table two presents a full feature matrix for plain segments in Neverver. The features employed in this analysis follow Katamba (1989, based on Chomsky and Halle 1968).

Table 2: Distinctive features for plain segments

	m	n	ŋ	p	t	k	β	s	ɣ	r	l	j	w
±sonorant	+	+	+	–	–	–	–	–	–	+	+	+	+
±continuant	–	–	–	–	–	–	+	+	+	+	+	+	+
±nasal	+	+	+	–	–	–	–	–	–	–	–	–	–
±voice	+	+	+	–	–	–	+	–	+	+	+	+	+
±labial	+	–	–	+	–	–	+	–	–	–	–	–	+
±anterior	+	+	–	+	+	–	+	+	–	+	+	–	–
±strident								+		–	–		
±lateral										–	+		

The description of prenasalised segments using distinctive features requires a more complex matrix. The feature values for the different elements in each segment are displayed in table three. The feature [±lateral], used to distinguish between /l/ and /r/ in table two, is not employed for the complex segments. Multi-tiered autosegmental analysis, introduced in section 1.2 above, handles the separation of these complex segments into their component parts on the segmental tier. The component parts are then united on the CV tier, where I argue that each complex segment counts as one consonant or C slot in the application of phonotactic processes.

Table 3: Distinctive features for complex segments

	^{m}b		^{mb}ʙ			^{n}d		^{n}ʤ			ndr			^{ŋ}g	
	m	b	m	b	ʙ	n	d	n	d	ʒ	n	d	r	ŋ	g
±sonorant	+	–	+	–	–[3]	+	–	+	–	–	+	–	+	+	–
±continuant	–	–	–	–	+	–	–	–	–	+	–	–	+	–	–
±nasal	+	–	+	–	–	+	–	+	–	–	+	–	–	+	–
±voice	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
±labial	+	+	+	+	+	–	–	–	–	–	–	–	–	–	–
±anterior	+	+	+	+	+	+	+	+	+	+	+	+	+	–	–
±strident						–	–	–	–	+	–	–	–		
±lateral															

Regarding the distinction between prenasalised and plain plosives, the regular process of devoicing described above means that the prenasalised voiced plosives are more consistently distinguished from the plain voiceless plosives on the basis of their prenasalisation rather than their voicing. For example, the segment /p/ always has the feature [–nasal] and is also voiceless; the segment /b/ always has the feature [+nasal], although it may be realised as the voiced allophone [^{m}b] or the voiceless allophone [^{m}p].

Referring to the allophony described for the plain bilabial plosive, we might anticipate that the prenasalised bilabial plosive also has a trilled allophone, explaining the presence of the prenasalised trill. It emerges however, that the prenasalised trill and the plosive contrast in a small number of lexemes both morpheme-initially and morpheme-finally (see Appendix A for segmental contrasts).

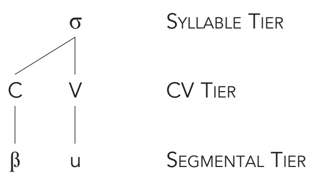
The prenasalised alveolar trill contrasts with the plain trill at the same place of articulation (see Appendix B for segmental contrasts), although there is some evidence that the contrast between these segments is being neutralised by younger speakers of Neverver (Barbour 2009: 60).

The prenasalised affricate displays a number of different allophones which vary from a clear prenasalised alveo-palatal affricate, to a voiceless alveolar fricative. The segment is articulated variously as [^{n}dʒ, ^{n}ʒ, ^{n}ʃ, ^{n}s, s]. Individual speakers vary in their articulation of this phoneme, even when producing instances of the same morpheme. Morpheme initially and inter-vocalically, the voiced allophones are more common than the voiceless alternatives although a few younger speakers devoice quite consistently in all environments. The most commonly occurring allophones preserve prenasalisation and are [^{n}dʒ] and [^{n}s], with older speakers preferring the voiced variant.

3. The syllable constraint

In the description of phonotactic constraints on Neverver, the framework of autosegmental phonology, introduced in section 1.2, is employed. As noted above, autosegmental phonology involves the separation of different types of phonemic information onto tiers. While more complex models for analyzing syllable structure exist (cf. Selkirk 1982, Blevins 1995), the three-tiered model of Clements and Keyser (1983) is sufficient to describe the structure of words in Neverver.[4] Linear sequences of phonemes, which can also be described as sets or matrices of distinctive features, are ordered on the segmental tier. The segments that form these linear strings are assigned to vowel positions (V slots) and consonant positions (C slots) on the CV tier. V slots form the peak or nucleus of syllable nodes on the syllable tier. An example of the Neverver word /βu/ 'go' is presented in (2) below. I use IPA symbols as shorthand for the bundles of distinctive features that describe the characteristics of each segmental position on the segmental tier.

(2)



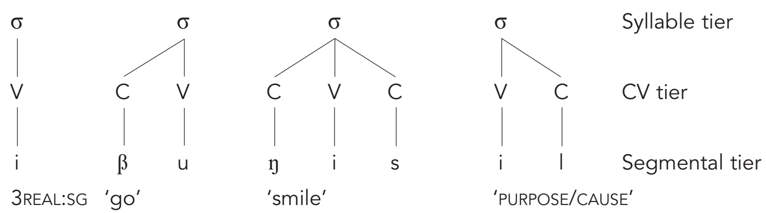
Syllables with the structures V, CV, CVC and VC are attested in the corpus.

Based on these syllable structures, a simple phonotactic constraint can be formulated for Neverver:

(3) **Syllable Constraint**
The basic syllable structure in Neverver is (C)V(C).

The syllable constraint captures the strict limitation on the number of C slots that may be associated with each V slot in the formation of syllables. Employing standard terminology, the C preceding the V is described as the onset, while the C following the V is described as the coda. The MAXIMUM ONSET PRINCIPLE (Khan 1976, cited in Gussenhoven and Jacobs 2005) applies in Neverver, ensuring that onsets are formed before coda consonants are assigned to syllables.

In canonical syllables, segments are associated with C slots and V slots in a one-to-one relationship. This type of association is exemplified in (4), where the four realisations of the canonical syllable in Neverver are displayed.

(4)


4. The inflection of verb stems

In Neverver, verb stems (bound bases) may not be used as words on their own when they are functioning as predicates. Rather, they are obligatorily inflected with a subject/mood prefix. The prefix varies in morphological content according to the person and number of the participant encoded as the subject of the clause, and according to whether the situation being described is considered within the domain of the real or the unreal. The formation of the subject/mood prefix is complicated when irrealis morphology is present because this introduces consonant sequences in the prefix itself, when the subject is either dual or plural. The full morphological breakdown of the subject/mood prefix is presented in table four.

Table 4: Morphology of the obligatory verb prefix (after Barbour 2009: 256)

1 PERSON		2 NUMBER (1) INCLUSIVE/EXCLUSIVE		3 MOOD		4 NUMBER (2)	
		i-	$1^{st}/3^{rd}$ singular				
n-	1		1^{st} inclusive non-singular			Ø-	singular
k-	2	u-	2^{nd} singular	Ø-	realis	r-	dual
Ø-	3	a-	$2^{nd}/3^{rd}$ non-singular	m-	irrealis	t -	plural
			1^{st} exclusive non-singular				

4.1 Inflection of CV stems

Verb stems may begin with a sequence of consonant plus vowel. Such stems are called CV stems. In the inflection of these stems, a simple three-step process accounts for syllabification. Vowels are assigned to syllable nodes first, then onset consonants are associated. Coda consonants are associated last. When there is only one C candidate for the single coda consonant position, this C is associated with the preceding V. Depending on the situation being described, a prefix may contain both the irrealis mood morpheme, and a dual or plural number morpheme. This will produce a sequence of two consonant segments but only one available C slot. To avoid the formation of a complex coda or onset, a regular process of epenthesis occurs, breaking up potential clusters. This process is captured by step iv in (5) below. The syllabification rules thus deal with sequences of up to three consonants that may form across the morpheme boundaries of inflected CV stems.

(5) Syllabification rules for inflected verbs Neverver

i. Peak formation:
Assign each V to a syllable node.

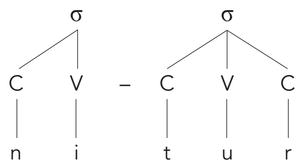
ii. Onset formation:
Associate one C with each right-hand V
(in accordance with syllable constraint).

iii. Coda formation:
Associate any single remaining C with a left-hand V
(in accordance with syllable constraint).

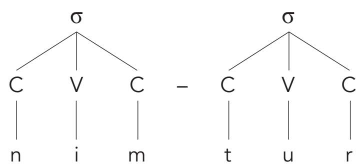
iv. Stray CC sequences:
Insert medial epenthetic i to serve as syllable peak;
syllabify according to steps i. to iii.

Examples are given to illustrate the basic inflection and syllabification processes. The verb, /tur/ ([tur]) 'stand, get up' has a single initial consonant. Verbs like this can be classified as CV stems and contrast with CCV stems, discussed in section 4.2 below.

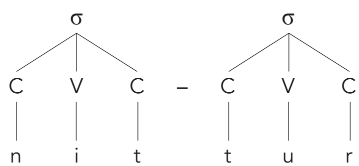
(6) CV stem with singular realis prefix: [ni-tur] '1REAL:SG- get up'



(7) CV stem with singular irrealis prefix: [nim-tur] '1IRR:SG- get up'

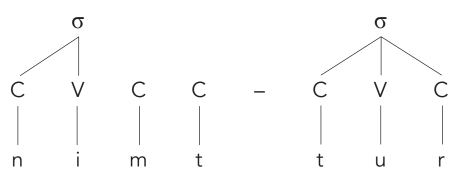


(8) CV stem with non-singular realis prefix: [nit-tur] '1IN:REAL:PL- get up'

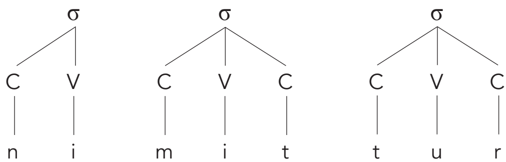


(9) CV stem with non-singular irrealis prefix: [ni^{m}bit-tur] '1IN:IRR:PL- get up' after dissimilation

a.



b.



Example (9) displays regular allomorphy in the irrealis morpheme. The bilabial nasal [m-] dissimilates to [^{m}b-] when it is followed by a segment of greater sonority. This process occurs when there is a following vowel or liquid, and is captured by the following dissimilation rule:

Irrealis m- : ^{m}b- / ___ >sonority

The rule applies consistently to the irrealis morpheme. Arguably, we could posit a rule working in the opposite direction, with the prenasalised plosive being the underlying form, and the plain nasal being produced in environments of lower sonority. Diachronic evidence however, favours the plain nasal as the underlying form of the irrealis morpheme (cf. Lynch 1975)[5].

4.2. Inflection of CCV stems

In addition to CV stems in Neverver, there are also verb stems that begin with a sequence of two consonants followed by a vowel. Such CCV verb stems may comprise either a heterogeneous sequence or a homogeneous (geminate) sequence of consonants. This means that when verb stems are inflected, sequences of up to four consonants may be formed, depending on the mood and number of the inflection, and the phonotactic structure of the stem, as shown in (10).

(10)	C-	C-	CCV stem
	m	r/t	
	irrealis mood	dual or plural number	

CCCC sequences require an additional step in syllabification, to ensure that the maximal CVC syllable shape is maintained. Below, (11) repeats the syllabification rules from (4), and adds a step v to deal with an underlying CCCC sequence that forms across the morpheme boundary of an inflected CCV stem.

(11) Syllabification rules for inflected verbs Neverver

i. Peak formation:
Assign each V to a syllable node.

ii. Onset formation:
Associate one C with each right-hand V
(in accordance with syllable constraint).

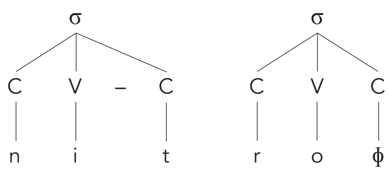
iii. Coda formation:
Associate any single remaining C with a left-hand V
(in accordance with syllable constraint).

iv. Stray CC sequences:
Insert medial epenthetic *i* to serve as syllable peak;
syllabify according to steps i. to iii.

v. Stray CCC sequences:
Treat as a single C, followed by a CC sequence and
syllabify according to steps i. to iv.

The inflection and syllabification of CCV stems is illustrated firstly with a heterogeneous stem /troβ/ [troɸ] 'jump'.

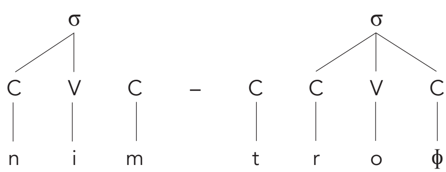
(12) CCV stem with singular realis prefix: [ni-troɸ] '1REAL:SG- jump'



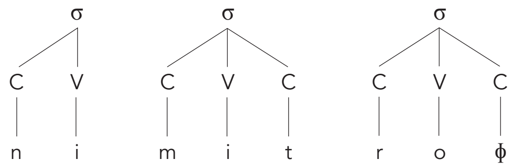
In the remaining three inflections of 'jump', the epenthetic [i] is needed to break up prohibited consonant sequences.

(13) CCV with singular irrealis prefix: [ni^{m}bi-troɸ] '1IRR:SG-jump' after dissimilation

a.

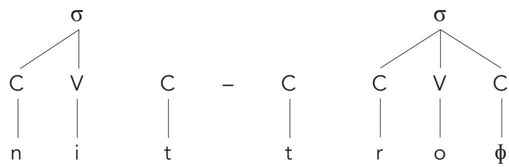


b.

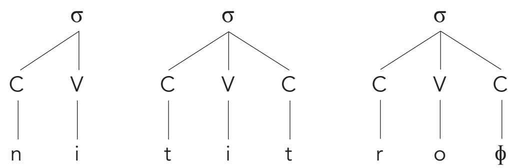


(14) CCV stem with non-singular realis prefix: [niti-troɸ] ‘1IN:REAL:PL- jump’

a.

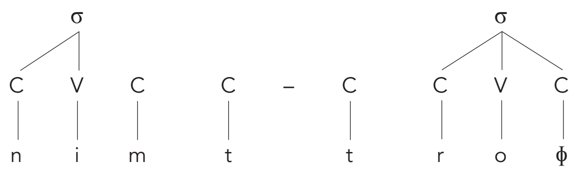


b.

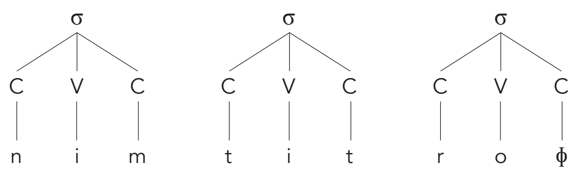


(15) CCV stem with non-singular irrealis prefix: [nimti-troɸ] ‘1IN:IRR:PL- jump’

a.

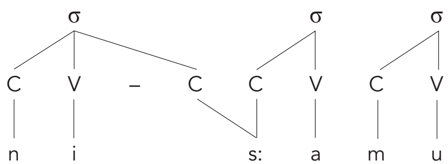


b.



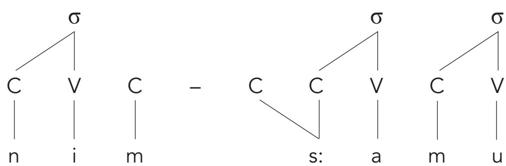
The next CCV stem /ssamu/ ([s:amu]) 'sweep', has an initial geminate consonant. We can observe that heterogeneous and geminate consonant sequences are treated in the same way in syllabification, with an epenthetic [i] needed whenever an irrealis and/or non-singular subject/mood prefix is attached and creates a consonant sequence which cannot be handled by simple syllabification.

(16) CCV stem with singular realis prefix [ni-s:amu] '1REAL:SG-sweep'

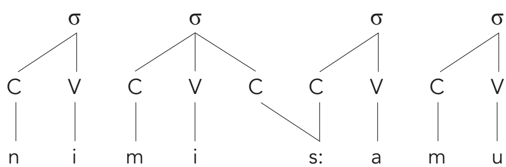


(17) CCV stem with singular irrealis prefix: [ni^{m}bi-s:amu] '1IRR:SG-sweep' after dissimilation

a.

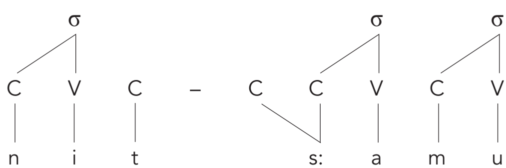


b.

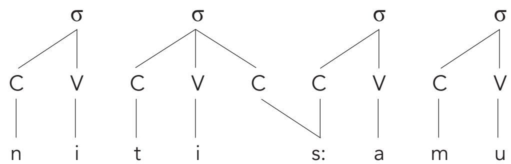


(18) CCV stem with non-singular realis prefix: [niti-s:amu] '1IN:REAL:PL-sweep'

a.

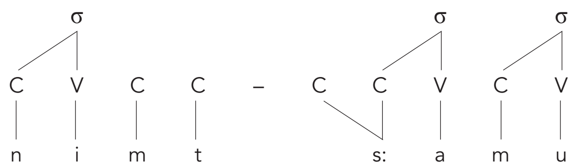


b.

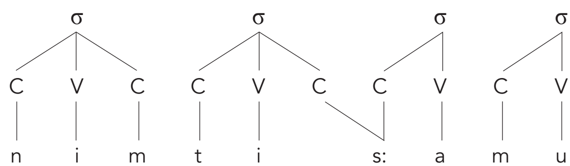


(19) CCV stem with non-singular irrealis prefix: [nimti-s:amu] '1IN:IRR:DL-sweep'

a.

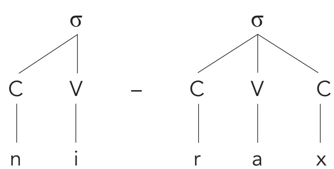


b.



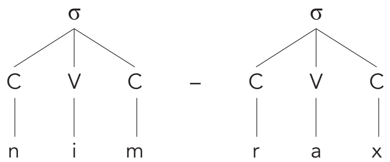
The next two sets of examples contrast the pair of words /raɣ/ ([rax]) 'clear ground' which is a CV stem, and /rraɣ/ [r:ax] 'hunt (in fresh water)' which is a CCV stem.

(20) CV stem with singular realis prefix: [ni-rax] 1REAL:SG-clear ground

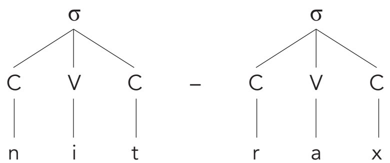


The initial liquid segment [r] requires the irrealis nasal to dissimilate when the two are contiguous in (21). The irrealis nasal also dissimilates in (23) when followed by the epenthetic vowel [i].

(21) CV stem with singular irrealis prefix: [ni^{m}b-rax] '1IRR:SG-clear ground' after dissimilation

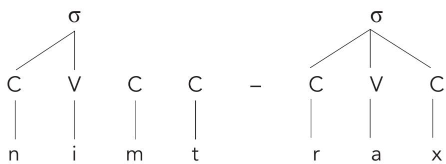


(22) CV stem with non-singular realis prefix: [nit-rax] '1IN:REAL:PL-clear ground'

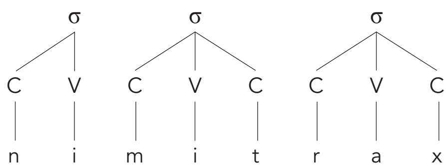


(23) CV stem with non-singular irrealis prefix: [ni^{m}bit-rax] '1IN:IRR:PL-clear ground' after dissimilation

a.

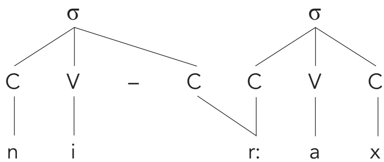


b.



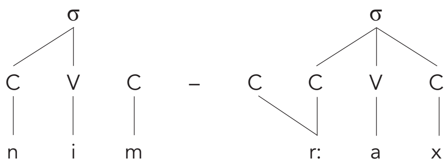
The verb /rraɣ/ ([r:ax]) 'hunt (in fresh water)', with an initial geminate consonant, inflects and syllabifies differently from /raɣ/ 'clear ground' with its initial singleton consonant.

(24) CCV stem with singular realis prefix: [ni-r:ax] '1REAL:SG-hunt'

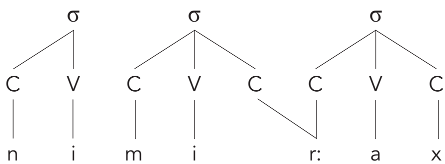


(25) CCV stem with singular irrealis prefix: [nibi-r:ax] '1IRR:SG-hunt' after dissimilation

a.

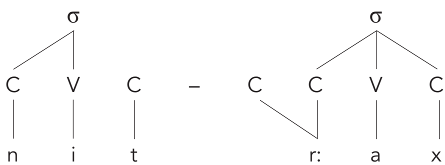


b.

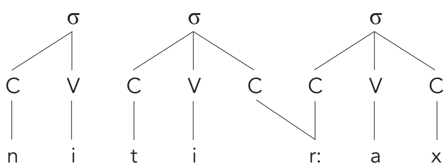


(26) CCV stem with non-singular realis prefix: [niti-r:ax] '1IN:REAL:PL-hunt'

a.

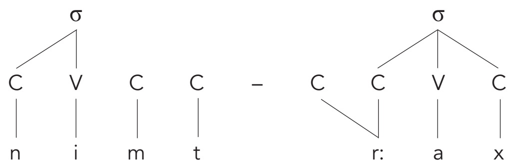


b.

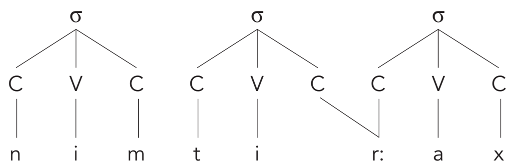


(27) CCV stem with non-singular irrealis prefix: [nimti-r:ax] ‘1IN:IRR:DL-hunt’

a.



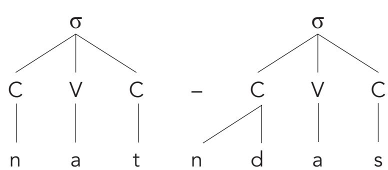
b.



4.3 Inflection of stems with initial homorganic nasal/non-nasal consonant

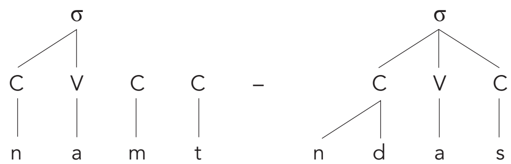
Having established that the formation of verbal inflections is sensitive to the phonotactic structure of verb stems, and specifically that the inflections of CV stems differ from those of CCV stems, I now turn to the behaviour of stems beginning with a homorganic nasal/non-nasal consonant sequence. If the analysis of complex (and contour) prenasalised segments in Neverver is valid, then we would expect to find that a verb stem beginning with a homorganic nasal/non-nasal consonant sequence followed by a vowel would behave as a CV stem rather than a CCV stem. In the examples (28) to (31), the verb stem [^{n}das] ‘go down’ does indeed behave in this way.

(28) CV stem with non-singular realis prefix: [nat- ^{n}das] ‘1EX:REAL:PL-go.down’

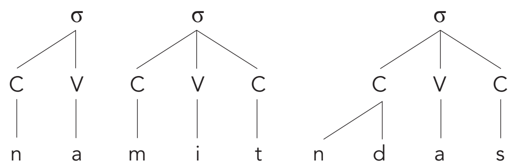


(29) CV stem with non-singular irrealis prefix: [na^{m}bit- ^{n}das] '1EX:IRR:DL-go.down', following dissimilation

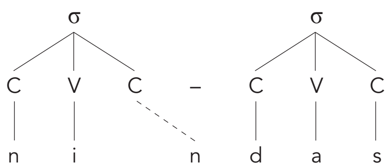
a.



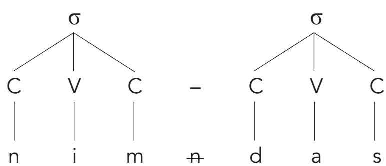
b.



(30) CV stem with singular realis prefix: [ni- ^{n}das] '1REAL:SG-go.down'



(31) CCV stem with singular realis prefix: [nim-das] '1IRR:SG-go.down'



Examples (30) and (31) display two further properties of prenasalised segments. When preceded by an open syllable, the nasal element of the complex segment is articulated as the coda of the preceding syllable. This is illustrated in (30). When preceded by a closed syllable, where the coda itself comprises a nasal, prenasalisation is not articulated, as shown in (31). These processes apply consistently in word formation, not simply in the formation of inflected verbs. With respect to the dropping of prenasalisation, it should be pointed out that sequences of nasals where the nasals are separate phonemes are permitted in the language. Words with nasal sequences such as [nomŋon] 'mouth' and [niβi^{n}dumni] ‘kind of grass’ occur in the corpus, along with verbs such as [ŋot] ‘to break’, when inflected for irrealis mood as in [imŋot] ‘3IRR.SG-break’ and [manmanus] ‘to warm up by a fire’, which displays reduplication.

Data is displayed in table five below for the inflection of verb stems beginning with three of the other prenasalised segments. I note that when the prenasalised alveolar trill is preceded by a nasal, prenasalisation is dropped but prestopping remains audible.

Table 5: Inflection of verbs with initial homorganic nasal/non-nasal C

Uninflected verb stem	[^{m}b] [^{m}bel] ‘chase’	[^{n}dʒ] [^{n}dʒaldʒal] ‘scrape’	[^{n}ri] [^{n}ri] ‘turn’
A: Plural inflection			
Attested CV inflection	nat.^{m}bel	nat.^{n}dʒal-	at.^{n}ri
Unattested CCV inflection	(na.tim.bel)	(na.tin.dʒal-)	(a.tin.ri)
B: Irrealis with dual/plural inflection			
Attested CV formation	na^{m}.bit.^{m}bel	(no data)	ni^{m}.bit.^{n}ri
Unattested CCV formation	(nam.tim.bel)	(no data)	(nim.tin.ri)
C: Irrealis inflection			
Attested CV formation	nim.bel.ix	im.dʒal-	kum.ri
Unattested CCV formation	(nim.bim.be.lix)	(im.bin.dʒal-)	(kum.bin.ri)

In row A, each verb is inflected for a plural subject, marked with the morpheme /t-/. If the nasal element were perceived to be a separate segment, this would produce a sequence of two stray consonants and trigger epenthesis. The resulting inflections can be formulated by a linguist to maintain the basic syllable structure, but these are not attested in the corpus. In row B, the prefixes contain both irrealis morphology, and dual or plural morphology. This produces a sequence of two stray consonants, triggering epenthesis. Again, if the nasal element were perceived to be a separate segment, this would produce a sequence of three stray consonants. Epenthesis would still be triggered, but the resulting hypothetical inflections would differ considerably from the attested sequences. In row C, the prefixes contain irrealis morphology. This produces a sequence of irrealis /m/ followed by a homorganic nasal/non-nasal sequence. In such cases, prenasalisation is deleted. If the nasal in the nasal/non-nasal sequence were preserved as a separate segment, a rather different inflection would be produced.[6]

Illustrating the inflection patterns for the prenasalised bilabial trill is problematic as there are very few verb stems in the lexicon (twenty in total) beginning with this sound, and several of these only occur as the second uninflected element of a serial (compound) verb construction. In the speech corpus, a small number of constructions are attested, for which the interpretation of the [m] articulation as either prenasalisation or irrealis mood is unambiguous, because of contextual material. These are presented in (32).

(32)	[^{m}ʙun] 'fill'	im. ʙun	irrealis inflection
	[^{m}ʙur] 'be swollen'	i^{m}. ʙur	realis inflection
	[^{m}ʙun ^{m}ʙun] 'be full'	i^{m}. ʙun. ʙun	realis inflection
	[^{m}ʙul ^{m}ʙulix] 'be confused about s.t.'	i^{m}. ʙul.^{m}ʙu.lix	realis inflection

In each case, the prefix is singular; there are no data containing dual or plural morphemes that would trigger epenthesis and provide evidence about the status of the homorganic nasal. This is clearly an area for further work, where elicited data could flesh out conclusions that can be drawn from the corpus of recorded speech.

The presentation of data for irrealis constructions, where the irrealis morpheme directly precedes the verb stem, also suggests an area of further research. Speakers of Neverver will need to distinguish between prefixes containing the irrealis /m/, and those where prenasalisation with the same articulatory gesture is present as a part of the verb stem. In terms of basic articulatory gestures, these forms are much the same:

(33)	[i-^{m}bo]	i^{m}.bo	'3REAL.SG-be rotten'
	[im-bo]	im.bo	'3IRR.SG-be rotten'

It is plausible that either stress placement, or nasal length, or a combination of these factors is used to disambiguate the meanings of these forms. It may emerge however, that as with many homophones in other languages, the larger discourse context plays the most important role in disambiguation.

Although there are gaps in the data, particularly for the homorganic nasal/bilabial trill articulation, the evidence provided in table 5 for attested verb inflections and accompanying epenthesis and syllabification patterns supports an analysis of the homorganic nasal/non-nasal sequences as complex, though unitary, segments.

5. Reduplication

In this section I consider the process of reduplication, and implications for the analysis of nasal/non-nasal consonant sequences. Following linguists such as Moravcsik (1978), Broselow and McCarthy (1984) and Marantz and Wiltshire (2000), reduplication is understood to be a morphological process of affixation. The phonological content of the reduplicative affix is underspecified and gains content from the stem or base to which it is attached. In Neverver, productive reduplication is associated with the verb phrase, and it is argued to serve a detransitivising function (Barbour 2009). The reduplicative template is specified by the following constraint:

(34) **Reduplication Constraint 1: The reduplicative template**
In a reduplicated construction, the reduplicative prefix is realised by the structure CV(C)-.

The reduplicative template conforms to the basic syllable constraint in Neverver, which only permits simple onsets and codas (see (3) above). Because there are both CV and CCV stems in Neverver, reduplication provides a second word formation process where we can investigate the behaviour of homorganic nasal/non-nasal consonant sequences.

5.1 Reduplication of CV stems

Table six presents a series of CV stems with their reduplicated prefixes. Assorted detransitive functions are associated with the reduplicated forms. Verbs with the phontactic structure CV fully reduplicate, as do most verbs with a CVC structure. Longer verbs reduplicate only the first CVC in the sequence.

Table 6. Reduplication of CV stems

SIMPLE STEM		REDUPLICATED STEM	
CV	[te] 'hit'	**CV**-CV	[te~te] 'fight REFLEXIVE'
	[βe] 'do'		[βe~βe] 'do +PROHIBIITION'[7]
	[tas] 'scratch'		[tas~tas] 'file, sharpen ITERATION'
CVC	[nok] 'knock' (from Bislama **nok**)	**CVC**-CVC	[nok~nok] 'knock ITERATION'
CVCV	[malu] 'leave'	**CVC**-CVCV	[mal~malu] 'disperse PLURAL ACTION'
CVCCVC	[taxtax] 'damage, destroy'	**CVC**-CVCCVC	[tax~taxtax] 'damage, destroy + PROHIBITION'
CVC	[sus] 'ask'	**CV**-CVC	[su-sus] 'ask REFLEXIVE'
CVCV	[βaβu] 'walk'	**CV**-CVCV	βa~βaβu] 'walk DURATION'

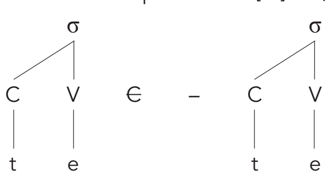
In the final two examples, we would expect the reduplicative prefix to take the form CVC-. Instead it is limited to CV-. It appears that a constraint is in place to prevent geminate sequences from forming as a result of reduplication. CVC reduplication of [sus] 'ask' would be [sus:us], while CVC reduplication of [βaβu] 'walk' would produce [βaβ:aβu]. These forms are rejected by native speakers. Based on these examples and others like them, we can posit a constraint on filling the reduplicative template:

(35) **Reduplication Constraint 2: Degemination**[8]

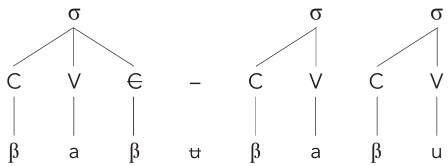
The copied coda consonant of the reduplicative prefix must differ from the onset consonant of the stem. Any consonant which will form a geminate sequence cannot be assigned to the reduplicative prefix.

Examples of the reduplication process applying to CV stems are presented below.

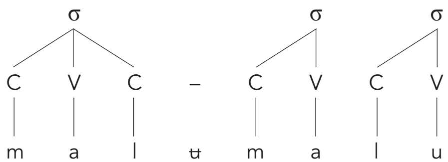
(36) CV stem: reduplication of [te] 'hit, cut' [te~te]



(37) CV stem: reduplication of [βaβu] 'walk' as [βa~βaβu] after degemination



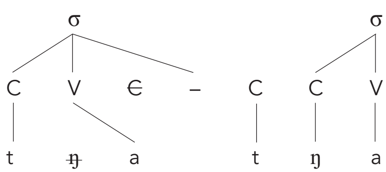
(38) CV stem: reduplication of [malu] 'go out' as [mal~malu]



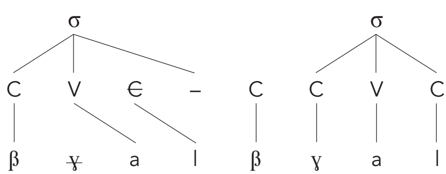
5.2 Reduplication of CCV stems

The reduplicative template also applies to the reduplication of CCV stems, whether they are heterogeneous or geminate. Reduplication of the heterogeneous CCV stems /tŋa/ 'search (visually)/look around for' and /βɣal/ 'fight' are illustrated below.

(39) CCV stem: reduplication of [tŋa] 'search (visually)' as [ta~tŋa]



(40) CCV stem: reduplication of [βɣal] 'fight' as [βa~βɣal]

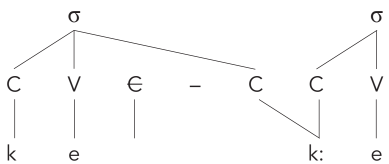


These examples show a further underlying constraint, captured in Reduplication Constraint 3 below, which states that stem consonants must be assigned. Because of this constraint, the coda C of the reduplicative template is always filled by material from the stem itself in CCV stems. Copied coda consonants have to be deleted because there is no longer a coda position available. Reduplication Constraint 3 is essential to preserve the morphological integrity of the verb stem.

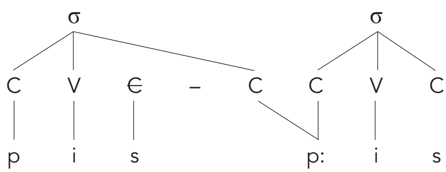
(41) **Reduplication Constraint 3:**
Stem consonants must be assigned.

CCV stems with initial geminate consonants reduplicate in the same way as CCV stems with heterogeneous consonants.

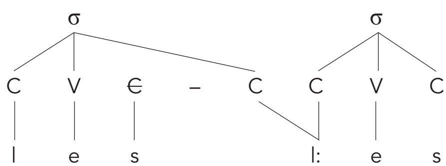
(42) CCV stem: reduplication of [k:e] 'call' as [ke~k:e]



(43) CCV stem: reduplication of [p:is] 'hurt' as [pi~p:is]



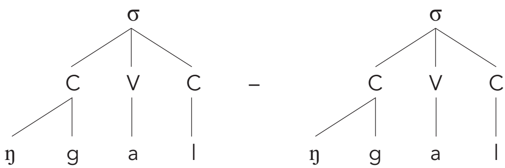
(44) CCV stem: reduplication of [l:es] 'bathe' as [le~l:es]



5.3 Reduplication of stems with initial homorganic nasal/non-nasal consonant

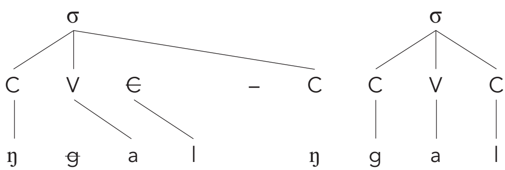
In the corpus, verb stems with an initial homorganic nasal/non-nasal consonant sequence reduplicate as CV stems. The nasal element is not counted as a separate segment. This reduplication process is illustrated in (45) with the verb [ᵑgal] ‘be stuck’.

(45) CV stem: reduplication of [ᵑgal] ‘be stuck’ as [ᵑgalᵑgal] ‘be tight’



If the nasal element were counted as a separate segment, we would find a rather different reduplication pattern, and one that is not attested in the data. The basic syllable constraint prohibits complex onsets in syllables; however, by reduplication constraint 2, stem consonants must be assigned. This means that the initial nasal element would have to be assigned to the coda position of the reduplicative template. These constraints have been demonstrated above in examples (39) to (44), and are shown again in (46), treating [ᵑgal] ‘be stuck’ as a CCV stem [ŋgal]. The [g] segment would be deleted from the reduplicative prefix, on account of the single available onset C being filled with the nasal [ŋ].

(46) *CCV stem: reduplication of [ŋgal] ‘be stuck’ as [ŋaŋ-gal] ‘be tight’

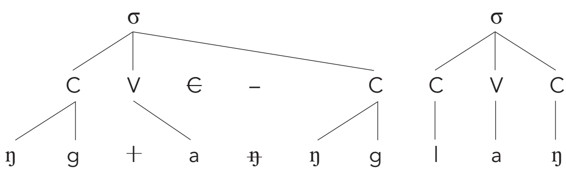


Further examples of reduplication are displayed for the remaining five combinations of initial homorganic nasal/non-nasal consonant.

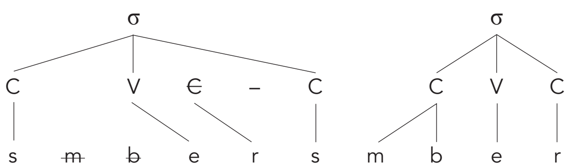
(47)	^{m}bir 'break'	^{m}bir^{m}bir 'argue'
	^{n}deɸ 'carry (of embers)'	^{n}deβ^{n}deɸ 'damp a fire'
	^{m}ʙut 'be silent'	^{m}ʙut^{m}ʙut 'be dumb'
	^{n}dʒiŋ 'lie down'	^{n}dʒiŋdʒiŋ 'be lying down'
	^{n}ri 'turn'	^{n}ri^{n}ri 'roll'

Additional evidence for the treatment of homorganic nasal/non-nasal consonant as complex segments comes from the occurrence of verb stems that contain an initial sequence of prenasalised consonant followed by plain consonant (48) or plain consonant followed by prenasalised consonant (49). Such sequences reduplicate as CCV stems.

(48) CCV stem: fossilised reduplication of [^{ŋ}ga-^{ŋ}glaŋ] 'be coloured (of pandanus strips)'



(49) CCV stem: reduplication of [s^{m}ber] 'reach' as [se-s^{m}ber] 'touch'



There are no verbs with more than two initial consonants; nor are there any mechanisms for handling reduplication of verbs with more than two initial consonants. It is not possible to preserve the reduplicative template (or indeed the basic syllable template) when the stem exceeds a sequence of two initial consonant segments. As with the subject/mood inflection of verb stems, we find that the morphological process of reduplication supports the analysis of homorganic nasal/non-nasal consonant sequences as contour segments.

6. Contour segments in Neverver

As described in section two above, and confirmed by the analysis presented in sections four and five, Neverver has six prenasalised segments. San Duanmu (1994: 601) makes the claim that such segments are prohibited by a No Contour Principle, formulated as follows:

(50)

```
      *X            X   = X slot (or a mora unit)
      ...           ... = possible intermediate structures
     /   \          α   = any feature value
  [αF]   [–αF]      F   = any feature
```

Duanmu (2009: 26) has strengthened this claim, proposing in new work that 'an articulator cannot make the same feature (F) twice within one sound'. The following types of complex segment are now prohibited in Duanmu's analysis (Duanmu 2009: 26):

(51)

```
 *Articulator     *Articulator     *Articulator     *Articulator
    /    \           /    \           /    \           /    \
 [+F]    [–F]     [–F]    [+F]     [+F]    [+F]     [–F]    [–F]
```

With regard to prenasalisation, Duanmu makes the statement that he has found 'no compelling evidence that pre-nasalized stops ... exist as single sounds' (2009: 26). As such, his No Contour Principle does not need to permit them, and indeed is formulated to exclude such complex sounds. Duanmu's No Contour Principle is clearly violated in Neverver because the morphological processes of subject/mood inflection and reduplication count homorganic nasal/non-nasal consonant sequences as single consonant units in spite of their [+nasal][–nasal] contour.

Another claim made in Duanmu's (2009) new work is that the maximal syllable structure in any language is CVX, where X may be a consonant or a vowel:

> There is little doubt that in many languages the maximal syllable size is at least CVX. What I have proposed is that CVX is also the upper limit on syllable size, where C, V, and X can each be a complex sound. Extra consonants can be found at word edges, but they can be explained by morphology. (Duanmu 2009: 51)

Provided there is no violation of the No Contour Principle, sequences of consonants may be assigned to the simple onset or simple coda positions available in the CVX template, and are treated as complex sounds. Blevins (2010: 89) points out that at least some violations of the No Contour Principle can be avoided because underspecification of feature values ‘allows some manipulation of what features are specified for what segments’. Such feature manipulation was presented in section 1.2 above, for the specification of the affricate [t^s]. In a language like English, which is known for its branching onsets and codas, Duanmu (2009: 29) treats consonant sequences such as [kl], [kr], and [tr] (the latter two transcribed as [kr^w] and [tr^w]) as complex sounds rather than as consonant clusters. This allows many English syllables to fit into the CVX generalisation, and Blevins (2010: 289) observes that the purpose of this treatment is indeed to justify ‘the theoretical claim that the maximal universal syllable-template is CVX’.

Applying the CVX syllable limit to Neverver should be fairly straight forward, given that the language has a maximal CVC syllable structure; however, prohibiting the analysis of prenasalised consonants as complex contour segments has the effect of creating a sudden abundance of unassigned nasals. Accounting for these nasals is extremely problematic. According to Duanmu, the nasals are prohibited by the No Contour Principle from being associated with their neighbouring homorganic consonants, and they must instead be dealt with at the level of morphology.

We have already seen that in Neverver the bilabial nasal /m/ has a distinct role in morphology, signalling irrealis mood, so it is certainly the case that some nasals have a role in morphology. There is however no evidence that the homorganic nasals have an independent morphological function in Neverver. We simply cannot account for all homorganic nasals as bi-products of word formation processes, as there are plenty of items in the Neverver lexicon that begin with a homorganic nasal/voice consonant sequence and are free standing morphemes. The personal noun [^{m}ʙu^{m}ʙu] ‘grandfather’ and the adverb [^{m}bor] ‘maybe’ are examples of commonly used free roots that display prenasalisation.

At this point, the conclusion must be drawn that Duanmu’s proposed universals cannot simultaneously account for the Neverver data. Complex segments, which fit tidily into Duanmu’s proposed universal CVX syllable structure, violate his proposed universal No Contour Principle. Observing the No Contour Principle by **not** analysing homorganic nasal/non-nasal sequences as tauto-segmental would create nasal segments which are unassignable to the

CVX syllable structure, and which cannot be accounted for in the morphology of Neverver. The elegant parallel between the basic syllable constraint in Neverver and the shape of the reduplicative affix would need to be replaced by a much more complex set of structures and rules to account for the behaviour of stems containing prenasalised segments.

Where Duanmu's No Contour Principle fails to account for the behaviour of articulatory strings in Neverver, sub-segmental contours neatly deal with the presence of homorganic nasal/non-nasal sequences that behave in the same way as simple segments. Alongside the linguistic evidence presented in sections four and five for the unitary status of contour segments in Neverver, native speaker intuitions about the psychological reality of prenasalised consonants in Neverver support this analysis.

7. The psychological reality of contour segments

The intuitions of native speakers are often made invisible in descriptive work by linguists; however, I find reassurance in arriving at a linguistic analysis that aligns with native speaker understandings. Thus I consider relevant four incidents when Neverver speakers have treated homorganic nasal/non-nasal consonant sequences as unitary. All four incidents relate to the written representation of Neverver. Prior to my work with the Neverver speech community, the language was only written by one community member, and the proposed spelling system had caused conflict among Neverver speakers. The desire for an acceptable written representation of the language prompted family members of the writer to seek linguistic support (see Barbour 2010 for an account).

In the course of developing an orthography for Neverver, the representation of prenasalisation and prenasalised segments was of interest to me, primarily because English does not have these contour segments and I was unable to rely on my own representational intuitions.

The first incident, which was repeated on many occasions during my field work, concerned the pronunciation of alphabetic symbols used to write either English or Neverver. For Neverver speakers, 'b' is never [bi:] but always [^{m}bi:]; 'd' is never [di:] but always [^{n}di:]. Recitations of the alphabet consistently produce prenasalisation on voiced stops.

The second incident occurred during a very early transcription session in the field. Teenage observers from the village, and their friends from the neighbouring Avava community, which also has prenasalised consonants according to Crowley (2006), were quite concerned that I was transcribing prenasalisation. In a whispered Bislama[9] conversation behind me, I heard one young man say ‘She doesn’t need to write that down!’. On other occasions however, I would be directed to write a nasal [m] before a bilabial stop, and eventually I established that this second kind of [m] had a morphological value as the marker of irrealis mood, and was not simply prenasalisation.

The third incident occurred when I returned to the field with a draft orthography. On my first field trip, the diverse articulations of the prenasalised affricate had troubled me and I wasn’t sure that I was dealing with a single phoneme, or assorted sequences of nasal/fricative or nasal/affricate. In my field notes, I often wrote a sequence of ‘ns’ when transcribing with younger speakers. A comment by a supervisor about the inconsistency of this (in relation to the representation of other prenasalised consonants as ‘b’ for [^{m}b], ‘d’ for [^{n}d]) led me to propose the symbol ‘j’ for the prenasalised affricate. I was quite nervous about suggesting the symbol, and I asked my most linguistically astute language consultant if my spelling of ‘banana’ as *navuj* [naβu^{n}s] was okay. He looked at me as though I was asking a completely irrelevant question, said ‘yes’, and moved on to other things. I have since observed numerous community members reading ‘j’ as the prenasalised affricate, in the phonetic realisation that is appropriate for the word in which it occurs.

The final incident occurred during the preparation of literacy materials for the community. The kindergarten teacher and I were discussing the inventory of sounds in the language, and listing sounds not found in English or Bislama. The first sounds that were mentioned were the prenasalised stops like /b/ [^{m}b], and the prenasalised bilabial trill /ʙ/ [^{m}ʙ] (written as ‘bb’). Then without prompting, the kindergarten teacher added /ᴅ/ [^{n}r] (written as ‘dr’) to our oral list. It transpired that we had actually forgotten to include that segment in our drafting process. She quickly produced the relevant pages for her alphabet booklet. She illustrated the segment with *drokhdrokh* [^{n}roɣ^{n}rox] ‘to bow’, and *dromdrom* [^{n}romrom] ‘to be thirsty’.

8. Summary and future work

In the Neverver data, homorganic nasal/non-nasal consonant sequences appear to behave as complex contour segments. In the formation and syllabification of the subject/mood prefix that attaches to verbs, and in the formation of the reduplicative prefix, these homorganic sequences behave in the same way as simple segments, and contrast with heterogeneous and geminate consonant sequences. Not only that, native speaker intuitions about the content and representation of prenasalised segments consistently reflect a unitary analysis for the six segments described in this paper. The evidence from Neverver does not support the proposed universal No Contour Principle (Duanmu 1994, 2009), but rather it supports the analysis that Neverver does indeed have contour segments.

In the process of composing this paper, a number of future projects which might offer further evidence regarding the status of contour segments have come to light. Firstly, inflection patterns for verb stems beginning with the prenasalised bilabial trill are incomplete in the recorded speech corpus for Neverver, and will need to be elicited from native speakers.

A phonetic study involving length measurements of segments would be of considerable interest. Segmental duration is clearly salient in a language with geminate consonants. A comparison could be made of the duration of bilabial prenasalisation, the morphological bilabial nasal (the irrealis /m/), other singleton nasal segments, and geminate nasals. It has been established elsewhere that /mm/ take more than one and a half times longer to articulate than /m/ in more spontaneous speech (114 milliseconds compared to 73 milliseconds), and around 2.2 times longer (195 milliseconds compared to 88 milliseconds) to articulate in more careful speech (Barbour 2009: 65). The duration of prenasalisation could be measured in a variety of environments and compared with the duration of plain singleton nasals and geminate nasals in similar environments. Further, the duration of prenasalised segments, including the non-nasal phase, could be compared more generally with the duration of plain and geminate consonants. Such a study would establish, in a particular language, the validity of Duanmu's (2009: 21) claim that two gestures produced by the same articulator (such as [+nasal][–nasal]) generally take twice as long to produce as one.

Finally, Berg and Niemi (2000), in their work on syllabification in Finnish and German, suggest two experiments that might produce relevant empirical data for the analysis of syllabification more generally. In one experiment they investigate the reduplication of syllables, but as Neverver has a productive reduplication process which has been described in detail in section five of this paper, it is their other task that is of more interest. This is a permutation task (Berg and Niemi 2000: 189), which involves switching syllables in nonsense-words in order to see where native speakers place syllable boundaries. If the proposed analysis of contour segments is incorrect, we might find that prenasalisation is separable from accompanying homorganic non-nasal consonants. This would offer some evidence for the observation of a No Contour Principle in Neverver. If, on the other hand, the contour segment analysis is correct, we would predict that prenasalisation would move with accompanying non-nasal consonants. Such a finding would further support the analysis of contour segments that is advanced in this paper.

Notes

1 The reader should note that Duanmu (2009) does not offer comparative measurements to support the claim that sequential gestures made by the same articulator take twice as long to articulate as a single ‘sound’.

2 Common nouns in Neverver that involve a bilabial trill followed by another consonant include for example: [ni^{m}ʙsen] ‘saliva’, [ni^{m}ʙten] ‘umbilical cord’, and [le^{m}ʙlat] ‘hen’.

3 There does not seem to be a standard feature value for sonority associated with the bilabial trill. In Neverver, I classify the trilled phase of the bilabial trill as [-sonorant] on the basis of its probable historical origin as an allophone of the prenasalised bilabial plosive, which is [-sonorant] in the plosive phase.

4 Arguments put forward by Blevins (1995) for a more complex syllable-internal structure include the presence of processes that distinguish between heavy and light syllables, and the need to account for differences in permitted consonant sequences in the onset and coda of a syllable. These are not relevant to the description of Neverver.

5 One interesting observation made by Lynch (1975) is that it is possible to reconstruct the irrealis morpheme in Proto Oceanic as either *ma or *na, depending on which grouping of languages is investigated. Malakula languages appear to exhibit reflexes of an earlier *ma irrealis form.

6 If the homorganic nasals were separate segments, we might expect to find contrastive sets of verb stems with and without homorganic nasals. These do not occur in the data. Voiced plosives are either accompanied by their homorganic nasal, or they are preceded by a different nasal, normally as a result of word-formation processes.

7 Prohibitives are formed with the combination of reduplication of the verb stem, and the post-verbal negative particle *si*.

8 Reduplication Constraint Two appears to be an effect of the OBLIGATORY CONTOUR PRINCIPLE (OCP), which is formulated by McCarthy (1986) as:

> Obligatory contour principle
> At the melodic level, adjacent identical elements are prohibited.
> (McCarthy 1986: 208)

The OCP is formulated as a universal constraint, but it does not apply in all cases in Neverver. Geminate consonants appear in verb stems, and geminate sequences are permitted to form over the morpheme boundary between the subject/mood prefix and verb stem. They may also form between compounded morphemes. It is only in the case of reduplication that the language-specific tolerance for sequences of identical consonant segments gives way to the universal OCP.

9 Bislama is a dialect of Melanesian Pidgin and serves as the regional *lingua franca* in most parts of Vanuatu, and as the national language of Vanuatu (Crowley 2004).

Appendix: Segmental Contrasts

A. Bilabial contrasts /m, ᵐb, p, ᵐʙ/

Morpheme-initially, contrastive sets can be established for the bilabial nasal and the two bilabial plosives, preceding the vowels /a, i, o, e/.

	+_i		+_e		+_a	
/m/	[mis:um]	'hail s.o.'	[men]	'sweat'	[mam]	'be ripe'
/b/	[ᵐbirᵐbir]	'argue'	[ᵐberᵐber]	'long'	[ᵐbar]	'blind'
/p/	[pis]	'wear'	[pep:elix]	'swing, rock'	[papak]	'piggy'
/ʙ/	—		—		—	

	+_o		+_u	
/m/	[mol]	'rest'	[mur]	'shed leaves'
/b/	[ᵐbor]	'tasteless'	[ᵐburum]	'broom' (Bis. brum)
/p/	[poŋ]	'be guilty'	[ʙ̥un]	'grow bushy'
/ʙ/	—		[ᵐʙun]	'full, high (of tide)'

Before the vowel high back vowel /u/, the segment /p/ has a trilled allophone [ʙ̥]. The distribution rule can be stated as /p/ : [ʙ̥] / ___u.

The prenasalised bilabial trill also appears before the high back vowel /u/. This distribution pattern suggests that the prenasalised trill may hold an allophonic relationship with the prenasalised plosive /b/, as we have seen with the plain trill. However, the prenasalised trill appears to contrast with the other bilabial segments of interest.

In the set above, the prenasalised plosive appears in a borrowed item preceding /u/. There are also a small number of confirmed indigenous items that contain a prenasalised plosive preceding /u/. These items designate geographic features. The final item on the list is a place name, similar to the word for ‘hill’ but compounded with the stem /ɣa/ ‘tree’. These items provide one kind of evidence that /b/ and /ʙ/ are distinct phonemes, rather than being in an allophonic relationship.

/bu/	[ni^{m}butuan]	‘hill’
	[ni^{m}butriri]	‘hilltop’
	[^{m}butuanɣa]	place name

Word-final /p/ is restricted to loan words. In this environment, the final /p/ alternates with the voiceless allophone [ɸ] of the bilabial fricative /β/. Importantly, /b/ and /ʙ/ contrast clearly in indigenous items in this context.

	e_#		a_#	
/m/	[^{n}dʒem]	‘chew’	[^{n}dram]	‘bleed’
/b/	[le^{m}p]	‘give birth’	[la^{m}bla^{m}p]	‘be big, fat’
/p/	—		[kap ~ kaɸ]	‘metal, iron’ (Bis. *kapa*)
/ʙ/	[re^{m}ʙre^{m}ʙ]	‘spread (coconut cream on pudding)’	[t:a^{m}ʙ]	‘defecate’

	o_#	
/m/	[^{n}dlom]	‘swallow’
/b/	[ɣo^{m}p]	‘bend, of roofing bamboo’
/p/	[sop ~ soɸ]	‘soap’ (Bis. *sop*)
/ʙ/	[ni^{m}bɣo^{m}ʙ]	‘brown gecko’

Finally, the segments /m/ and /p/ can occur in geminate sequences, as illustrated below. Neither of the prenasalised segments may form geminates.

	+_:i		+_:e		+_:a	
/m/	[min]	‘drink’	[met]	‘be dark’	[mam]	‘be ripe’
/m:/	[m:ial]	‘be red’	[m:el]	‘be sour’	[m:a]	‘be domesticated’
/p/	[pinox]	‘be free’	[pep:elix]	‘swing, rock’	[papak]	‘piggy’
/p:/	[p:is]	‘be sore’	[p:ek]	‘wind, of yam vines’	[p:ar]	‘fall.out, of teeth’

B. Alveolar contrasts /n, ^{n}d, ^{n}r, r, t, ^{n}dʒ, s/

Of note in these data sets, common nouns almost all carry a prefix of the form /n(V)-/, and many nouns are subject to a process of vowel harmony, where the prefix vowel assimilates to the stem vowel. There are very few n-initial verbs in the corpus.

	#_i		#_e		#_a	
/n/	[niβri]	'crab'	[nemat]	'snake'	[nan]	'seep pus'
/^{n}d/	[^{n}di^{n}di]	'dip (laplap)'	[^{n}der]	'pull apart'	[^{n}dan]	'set (of the sun)'
/^{n}r/	[^{n}ri^{n}ri]	'roll'	[(ne)^{n}re]	'blood'	[^{n}ram]	'lick'
/r/	[riɸ]	'escape'	[reɸ]	'pull'	[ran]	'be daylight'
/t/	[tixtax]	'store half of something'	[te]	'cut, hit'	[tata]	'promise'
/^{n}dʒ/	[^{n}dʒiɸ]	'kick'	[^{n}dʒeɸ]	'separate'	[^{n}dʒal]	'sick'
/s/	[si]	'blow, of conch shell'	[ses]	'rub'	[sal]	'float'

	#_o		#_u	
/n/	[noto]	'chicken, fowl'	[nunun]	'dive'
/^{n}d/	[^{n}dor]	'burp'	[^{n}dum]	'run'
/^{n}r/	[^{n}rom]	'thirsty'	[^{n}rus]	'shuffle'
/r/	[rot]	'feel'	[rus]	'wear, put on'
/t/	[tom]	'lay eggs'	[tur]	'stand up; wake up'
/^{n}dʒ/	[^{n}dʒol]	'heal (of yams)'	[^{n}dʒur]	'poke'
/s/	[solix]	'hide'	[sul]	'shine'

As described in section two, the prenasalised affricate has a number of different allophones which vary from a clear prenasalised alveo-palatal affricate, to a voiceless alveolar fricative. The allophones are articulated as [^{n}dʒ, ^{n}ʒ, ^{n}ʃ, ^{n}s, s].

	i_#		e_#		a_#	
/n/	[k:in]	'peel, with knife'	[sien]	'think'	[ran]	'be daylight'
/^{n}d/	[βiβi^{n}d]	'throb'	—		[ma^{n}d]	'EMPHATIC'
/^{n}r/	[titi^{n}r]	'their'	[e^{n}r]	'PLURAL'	[^{n}dʒa^{n}r]	'pass'
/r/	[sir]	'accompany'	[s:er]	'remove seeds'	[sar]	'hang'
/t/	[^{m}bit]	'err'	[βet]	'weave, of walls'	[^{m}bat]	'fall, of rain'
/^{n}dʒ/	[ja^{n}s]	'be ripe, of yams'	[smi^{n}s]	'use stopper'	[me^{n}s]	'IMMEDIATE'
/s/	[jas]	'cover with stones'	[^{ŋ}gris]	'splash'	[mles]	'be fragile'

	o_#		u_#	
/n/	[^{n}don]	'soak'	[^{m}ʙun]	'be full'
/^{n}d/	[nimoβo^{n}d]	'tree sp.'	—	
/^{n}r/	[^{n}dʒo^{n}r]	'hiccough'	—	
/r/	[s:or]	'speak'	[sur]	'near, along'
/t/	[^{ŋ}got]	'mess around'	[^{m}ʙut]	'be silent'
/^{n}dʒ/	[lo^{n}s]	'bend down'	[βu^{n}s]	'slap'
/s/	[slos]	'be calm'	[βus]	'carry'

C. *Velar contrasts /ŋ, ^{ŋ}g, k/*

	+_i		+_e		+_a	
/ŋ/	[ŋis]	'smile'	—		[ŋas]	'go for circumcision'
/^{ŋ}g/	[^{ŋ}gis]	'squeeze'	[^{ŋ}gel]	'slice'	[^{ŋ}ga]	'after'
/k/	[kiskis]	'do to excess'	[kek:en]	'be skillful'	[kaka]	'hang (decorations)'

	+_o		+_u	
/ŋ/	[ŋot]	'be broken'	—	
/^{ŋ}g/	[^{ŋ}gor]	'block'	[^{ŋ}gun]	'sit (with knees up)'
/k/	[koko]	'hunt (with spear, club)'	[kut]	'the place, locpn'

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