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Reduplication in Bilua, a Papuan Language of the Solomon Islands

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Abstract

This paper examines the morpho-phonological features of reduplication in Bilua, a Papuan language spoken in the Solomon Islands. It presents a formal analysis of Bilua reduplication following the Optimality Theory framework. It is argued that reduplicants conform to the Prosodic Word-Restrictor Constraints in copying the minimal prosodic word in Bilua, a bi-moraic foot left-aligned with the base. It is also argued that syllable unmarkedness of the reduplicant follows from the ranking of the markedness constraints NO-CODA and *COMPLEX over MAX-BR.

Keywords: Reduplication, Bilua, Papuan languages, Morpho-phonology

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1. Introduction

Bilua belongs to the Papuan language family and is spoken in the Vella La Vella Island in the Western Province of the Solomon Islands. The language is named after the dialect of one of the Vella La Vella Island's most renowned areas: the Bilua region, and is sometimes referred to as Mbilua or Vella La Vella (Gordon 2005). Although it is estimated that roughly 8000-9000 people speak Bilua, the language is still considered an endangered one due to the rapidly increasing influence of the Solomon Islands Pidgin, which is used as the official language in schools and places of worship (Obata 2003). With the exception of Ray's (1928) small list of words and of the rudimentary work of Capell (1969) and Todd (1975), which provided preliminary comparative studies of the Papuan languages, the seminal work of Obata (2003) remains the only documented and detailed description of the language.

Reduplication in Bilua is a rich morphological process that is formed by copying an entire word or part of it. Examples of constructions involving either whole-word reduplication as in (1) or partial-word reduplication as in (2) are given below.[1]

(1) ˈre.ko-ˈre.ko ‘women’

(2) ˈpi.ta-ˈpi.ta.si ‘division’ (Obata 2003:72)

The reduplicated form is underlined in the examples above; it is usually referred to as the *reduplicant* while the string of segments that undergo copying is called the *base*. In (1), the reduplication of *'re.ko* ‘woman’ is used to express plurality. It involves the verbatim copying of the entire prosodic word [re.ko]. In (2), reduplication derives a noun from the verb *'pi.ta.si* ‘to divide’. The reduplicant *'pi.ta* here involves copying only the first two syllables of the base *'pi.ta.si* ‘to divide’. In both cases, stress is clearly marked on the reduplicant as well as on the base itself.

2. Reduplication in Bilua

The syllable structure of Bilua is mostly a consonant-vowel sequence (CV). Although all monosyllabic words must be consonant-initial, for the first syllable of polysyllabic words the presence of the onset is nonobligatory. With few exceptions, Bilua seems to exercise a general ban on sequences of vowels occurring in the same phonological word.[2]

The minimum number of syllables in each phonological word is a single heavy syllable with a long vowel or diphthong (i.e. a syllable of the form CV:). The maximum number of syllables is seven.

(3) ˈzio ‘to go’

(4) ˈko.lo.ko.lo.ga.ni.si ‘Kolokoloqanisi (M. name)’ (Obata 2003:20-11)

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[1] Abbreviations

PrWd	prosodic word in brackets [XX]	TR	transitive	SG	singular
CV	consonant+vowel sequence	INTR	intransitive	3	third person
F	feminine	M	masculine	*	ungrammaticality
LIG	ligature	RCP	reciprocal	√	root

[2] An exception is the interjection /ee/ ‘yes’.

The examples in (3) and (4) illustrate the minimum and maximum allowable number of syllables in Bilua, respectively. Stress in Bilua is fixed and therefore serves no contrastive function semantically; it is often assigned to the first syllable of a phonological word and to the first element of a diphthong.

Next to suffixation, encliticization and compounding, reduplication is one of the primary morpho-phonological and derivational processes in Bilua. Morpho-phonologically, reduplication is formed in Bilua by either copying the entire prosodic word or part of it to the left of the base; it can, therefore, be considered a form of prefixation. In the reduplication of monosyllabic and bi-syllabic words, the entire prosodic word is copied.

(5) ˈtou-ˈtou ‘tribe’

(6) ˈpo.tu-ˈpo.tu ‘having a wound’ (Obata 2003:20, 70)

In both (5) and (6) the reduplicant forms the entire string of segments that constitute the base. Although the reduplicant and base belong to two separate phonological words, together they form a single grammatical word. This is evidenced by the fact that stress in Bilua is assigned to the base as well as the reduplicant. Consider the following example.

(7) ˈsu.ka-ˈsu.ka.ti ‘full’ (Obata 2003:71)

Given that stress is demarcative of the boundaries of phonological (prosodic) words, the assignment of stress on the base ˈ*su.ka.ti* as well as on the reduplicant ˈ*su.ka* indicates that the reduplicant and the base constitute two separate phonological words, namely [ˈsu.ka] and [ˈsu.ka.ti]. If reduplication in (7) were to involve a single phonological word, we would expect stress to fall on the base form only and never on the reduplicant.

Another evidence for the claim that two phonological words make up reduplication in Bilua is the lack of plosive prenasalization in examples such as (8) below.

(8) ˈbu.le-ˈbu.le ‘clean’ (Obata 2003:18)

In Bilua, voiced stops (and affricates) are often prenasalized when they occur intervocalically.

(9) ˈmaᵐba ‘person’ (Obata 2003:9)

While the voiced plosive /b/ is prenasalized in (9), it fails to undergo prenasalization in (8) although it is flanked by the two vowels /e/ and /u/. Lack of prenasalization in such cases is arguably due to the fact that /b/ initiates a new phonological word independent of the reduplicated form. Thus, it is concluded that reduplication in (8) is built around two discrete phonological words rather than a single one.

In the reduplication of tri- and penta-syllabic words,[3] only the first two syllables of the base are reduplicated.

(10) ˈsu.ka-ˈsu.ka.ti ‘full’

(11) ˈa.ri-a.ri.ku.to.ni ‘forty each’ (Obata 2003:71, 20)

[3] No examples of four-syllable word reduplication were found in the data.

The base consists of three syllables in (10) and five syllables in (11). In both examples, only the first two syllables are copied.

When the second syllable of the base is arrested by either a consonant or a diphthong, only light CV, as opposed to heavy CVC and CV:, syllables are copied.

(12) ˈva.tu-ˈva.tut ‘to move many times (intr.)’

(13) ˈna.na-ˈna.nae ‘to bite many times (tr)’ (Obata 2003:72)

In (12) the last syllable in the base is of the form CVC with the coda /t/, but appears with no coda in the reduplicant. In (13) the last syllable in the base is of the form CV: with a diphthongal nucleus /ae/, but undergoes mono-phthongization when reduplicated. Such restriction on copying heavy CV: syllables seems to apply only to pen-initial syllables and not to initial ones. Consider the examples in (14) and (15).

(14) ˈz**ai**.ti-ˈzai.ti ‘stones put on an oven’

(15) ˈp**ua**.ro-ˈpua.ro ‘generous’ (Obata 2003:72,70)

Unlike in (13), the heavy syllables ˈ*zai* and ˈ*pua* of the base forms are retained in the reduplicants. The retainment of diphthongs in the reduplicated forms in (14) and (15) appears to be licensed by the fact that in both cases the diphthongs form the nucleus of the initial and not the pen-initial syllable of the base.

The Bilua reduplication of verbs applies to bases that are derived from verbal roots.[4] Verbal roots are often determined by segments that identically stand in direct correspondence with each other in the transitive and intransitive forms of the verb. The scheme below illustrates the segmental correspondence relation that derives verbal roots in Bilua.

(16) a. ˈb u i s i *-t* ‘to chase away flies (intr.)’

| | | | |

b. ˈb u i s i *-e* ‘to chase away flies (tr.)’

The *-t* ending in (16a) is the intransitive marker and the *-e* in (16b) is the transitive marker. Segments lacking identical correspondents, namely *-t* and *-e*, are excluded from root derivation. Thus, for (16) the verbal root is √*buisi* which derives the base form for the reduplicant as shown in (17).

(17) ˈbuisi-ˈbuisi ‘sth with which to chase away flies’ (Obata 2003:71)

It is important to note that what gets copied in the reduplicant is the base and not the verbal root. This may not be very clear in (17) because the base and the root are identical. An example that involves reduplication of a base that is non-identical to the root is therefore needed to show that reduplication in verbs targets the base form and never the verbal root. Consider the transitive-intransitive correspondence schema for ˈ*ti.bur* ‘to close (intr.)’ in (18).

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[4] The root here refers to the underlying abstract representation while the base is the actual surface form attested in the language and one that stands in correspondence with the reduplicant.

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(18) a. ˈt i b u r -ø ‘to close (intr.)’

| | | | |

b. ˈt i b u r *-i* ‘to close (tr.)’

As can be determined from the segmental correspondence relation in (18), the verbal root is √*ti.bur*. Nonetheless, the derived base form of the root √*ti.bur* is ˈ*ti.bu.ri*, i.e. with an epenthetic /i/ as shown in the following derivation.

(19) *UR (root)*: ti.bur
Vowel Epenthesis: ti.bu.r*i*
SR (base): ˈti.bu.ri

The surface representation in (19) functions as the base for the reduplicant in (20).

(20) ˈti.bu-ˈti.bu.ri ‘closed’ (Obata 2003:19)

In (20) reduplication targets the base ˈ*ti.bu.ri* and not the root √*ti.bur*. Instances where reduplication applies to the morphological root are never to be found, hence the ungrammaticality of (21).

(21) *ˈti.bu-ˈti.bur ‘closed’

3. Discussion

A cursory look at the data above shows that reduplication in Bilua minimally copies one syllable of the base and maximally copies two. One generalization that can be inferred from the data is that Bilua reduplication systematically copies the minimal (MinWd) prosodic word (PrWd) in the language, which consists of two moras.[5] Light syllables are considered mono-moraic (i.e. CV=μ) whereas heavy syllables are bi-moraic (i.e. CVC/CV:=μμ). This can be seen in (12) and (13) where in each case reduplication reduces the pen-initial (heavy CVC or CV:) syllable of the base form to a light CV syllable; i.e. neither the coda nor the diphthong is copied over to the reduplicant. The data also show that heavy initial syllables with diphthongs are to be tolerated in the reduplicated forms of (14) and (15). Under this bi-moraic analysis copying of heavy initial syllables is to be treated as an exception since reduplication would result in a prosodic word made up of three moras.

It is important to note that the arresting consonant -/t/ of the base form ˈ*va.tut* in (12) and the second element of the diphthong -/e/ in ˈ*na.nae* in (13) are extra-syllabic elements suffixed to the root to denote the syntactic and semantic function of (in)transitivity: -/t/ is the intransitive marker, and -/e/ is the transitive marker. This is not the case with (14) and (15) where the initial syllable diphthong is part of the root word and not a byproduct of a morphological or lexical process. It would appear then that reduplication in Bilua is sensitive to the basic form of the verb and can only target the verb excluding any superfluous extrinsic morphological element(s).

[5] A mora is defined as a unit of weight or time slot for any part of the syllable other than the onset (Spencer 1996).

Another generalization that emerges from the examples of reduplication above is the reduplicant's clear preference for open syllables (CV) over closed syllables (CVC). Such preference is maintained not only in reduplication but even in deriving the base forms from their roots as explained in (19) where the second syllable of the root word √*ti.bur* is of the form CVC, an illicit structure in Bilua. Therefore, to avoid this phonotactic restriction on Bilua final syllables, vowel epenthesis is employed and a third syllable of the form CV is generated. Paragoge (vowel epenthesis at the end of words) appears to be an active process in Bilua that alters roots to conform to the preferred consonant-vowel sequence.

Preference of the structurally less marked CV form of the syllable is universal. The privileged status of the consonant-vowel sequence is well-founded on phonetic and typological grounds. Phonetically, the CV sequence allows for a boost in the consonant occlusion release which 'yields a phonetic burst, a perturbed postconsonantal airstream that clarifies voicing and place of articulation contrasts' (Hudson 1995:655). Frication noise in this position appears to be more intense too, which provides unambiguous acoustic cues for fricatives (Borden et al. 2003). Further, Wright (2004) argues that initial CV formant transitions are more robust and provide optimal consonant cues. Typologically, the CV form of the syllable is considered to be the most common syllable type among the world's languages (Cairns and Feinstein 1982; Clements 1990; Clements and Keyser 1983; Greenberg 1978).

To sum up, while base forms in Bilua tend to resolve cases of syllable structure markedness (i.e. CVC) through paragoge, reduplication favors consonant deletion instead; this is arguably because reduplicated forms, unlike bases, are further subject to prosodic word minimality constraints which in principle require reduplicants not exceed the maximal allowable limit of syllable count in Bilua reduplication: two syllables.

4. Formal Analysis

To my knowledge, no formal analysis of reduplication patterns in Bilua has been attempted. An Optimality Theoretic constraint-based framework of analysis argues that Bilua reduplication demonstrates a clear case of the Emergence of the Unmarked (McCarthy and Prince 1994; Prince and Smolensky 1993). Whereas base forms in Bilua attain unmarkedness at the syllable structure level, reduplication achieves unmarkedness at the prosodic word level. While correspondence relations between inputs and outputs usually hold for the derivation of words in a language, certain morpho-phonological processes, such as reduplication, require output-output correspondence to account for the phonological similarities between two morphologically related words (Benua 1995, Kager 1999).

Following McCarthy and Prince (1994, 1995) and the discussion of the unmarked and the identity of the reduplicative forms therein, it is assumed that reduplication in Bilua is prompted by a RED-morpheme which involves the copying of a PrWd equal, in size, to the MinWd, given that the minimal word in Bilua is bi-moraic. The minimal word requirement is ensured by the application of the Prosodic-Word Restrictor Constraints outlined in McCarthy and Prince (1993a, 1993b):

(22) Prosodic-Word Restrictor Constraints = PWR

a. PARSE-SYLL: All syllables are parsed into feet

b. FT-BIN: Feet are binary under syllabic (σσ) or moraic (μμ) analysis

c. ALIGHN-FT-L: Every foot stands in initial position in the PWd

Since stress in Bilua is trochaic, I assume that a constraint that guarantees left-headedness of the foot is undominated in Bilua:

(23) FT-FORM (Trochaic): Align the left edge of a foot with the left edge of its head (a stressed syllable)

Therefore, reduplicative forms in Bilua follow from the application of FT-FORM (Trochaic) and the PWR constraints stated in (22). Thus, the reduplicant constitutes a perfectly aligned foot with the PrWd consisting of only two moras ('μμ) as illustrated in (24).

(24) Prosodic-Word Restrictor Constraints in Bilua reduplication

PARSE-SYLL, FT-BIN(μ), ALIGHN-FT-L, FT-FORM (Troch)

[RED-ˈa.ri.ku.to.ni]	PARSE-SYLL	FT-BIN(μ)	ALIGHN-FT-L	FT-FORM(Troch)
☞a. [(ˈa.ri)]-[(ˈa.ri).(ku.to).ni]	*		**	
b. [(ˈa.ri).ku]-[(ˈa.ri).(ku.to).ni]	**!		**	
c. [(ˈa.ri).(ku)]-[(ˈa.ri).(ku.to).ni]	*	*!	**	
d. [(ˈa.ri).(ku.to)]-[(ˈa.ri).(ku.to).ni]	*		***!*	
e. [(a.ˈri)]-[(ˈa.ri).(ku.to).ni]	*		**	*!

The tableau in (24) assesses five output candidates first on the constraint PARSE-SYLL. All candidates incur single violations of this constraint except for candidate (b) which violates the constraint twice for failure to parse *ku* and *ni* and is therefore eliminated from the competition. On FT-BIN(μ) only candidate (c) incurs a fatal violation since it parses mono-moraic *ku*. Candidate (d) is left out because it violates the constraint ALIGHN-FT-L multiply. The constraint FT-FORM(Troch) penalizes the output candidate (e) due to the first foot *(a.ˈri)* being aligned to the right rather than to the left head (i.e. the foot is not trochaic, it is iambic). From the exhaustive evaluation of candidates (b-e) in (24), (a) emerges as the optimal candidate.

Crucial to the analysis is the constraint FT-BIN(μ) as it forces all reduplicants to copy either one bi-moraic syllable or two mono-moraic ones. Therefore, when copying two syllables reduplicants must disregard any material that may otherwise render a syllable bi-moraic. This is ensured by having the markedness constraint FT-BIN(μ) ranked above faithfulness MAX-BR which penalizes any deletion of the base segments (McCarthy and Prince 1993b):

(25) MAX-BR: Every segment in the base has a correspondent in the reduplicant.

The relevant ranking of FT-BIN(μ) with regard to MAX-BR is shown in the following tableau:

(26) Syllable structure unmarkedness in Bilua reduplication

FT-BIN(μ)>>MAX -BR

[RED-ˈre.vot]	FT-BIN(μ)	MAX-BR
☞ a. [(ˈre.vo)]-[(ˈre.vot)]	*	*
b. [(ˈre.vot)]-[(ˈre.vot)]	**!	
[RED-ˈle.ɲoe]	FT-BIN(μ)	MAX-BR
☞ a. [(ˈle.ɲo)]-[(ˈle.ɲoe)]	*	*
b. [(ˈle.ɲoe)]-[(ˈle.ɲoe)]	**!	

Note that the ranking between FT-BIN(μ) and MAX-BR in (26) is fixed. In both examples the winning candidate (a) incurs one violation of the higher-ranked FT-BIN(μ). The violation is caused by a non-binary foot in the base (base contains three moras). The reduplicant, on the other hand, complies with FT-BIN(μ) by forming a two-mora foot. For candidate (b) the violation of FT-BIN(μ) is doubled since the reduplicant as well as its base form three-mora feet. At this point it is clear that (a) is the winner. Next, (a) and (b) are evaluated on MAX-BR and only (a) is penalized for deleting the coda in *ˈre.vot* → *ˈre.vo* and the second element of the diphthong in *ˈle.ɲoe* → *ˈle.ɲo* in the reduplicant. However, such violation is irrelevant as the low-ranking of MAX-BR is fixed with regard to FT-BIN(μ). Thus, the evaluation of the output candidates on FT-BIN(μ) favors (a) as the optimal output.

The high-ranking of FT-BIN(μ) in Bilua ensures reduplicants do not copy heavy bi-moraic syllables (i.e. CVC & CV:). However, under the ranking in (26), reduplicants with heavy initial syllables such as the ones mentioned in (14) and (15) are problematic. As the tableau in (27) shows, the desired output (a) fatally violates FT-BIN(μ) and candidate (b) erroneously emerges as the winner:

(27) Problematic ranking for tri-moraic reduplicants

FT-BIN(μ)>>MAX-BR

[RED-ˈzai.ti]	FT-BIN(μ)	MAX-BR
☹a. [(ˈzai.ti)]-[(ˈzai.ti)]	**!	
☞b. [(ˈza.ti)]-[(ˈzai.ti)]	*	*

It is clear from (27) that the proposed ranking works against the attested output in the Bilua grammar, namely candidate (a). Therefore, a constraint that would militate against altering the segments of the base is needed. Obviously MAX-BR cannot come to the rescue as it needs to be low-ranking in the grammar to allow for other cases of reduplication such as (26). One way to incorporate syllable-initial tri-moraic reduplicant feet into the Bilua grammar is to propose a faithfulness constraint which maintains the contiguity of segments in the reduplicant (Kager 1999:214):

(28) CONTIGUITY-BR: The portion of the base standing in correspondence forms a contiguous string, as does the correspondent portion of the reduplicant.

Clearly, CONTIGUITY-BR has to dominate FT-BIN(μ) in order to derive the desired winner:

(29) CONTIGUITY-BR>>FT-BIN(μ)>>MAX-BR

[RED-ˈzai.ti]	CONTIG-BR	FT-BIN(μ)	MAX-BR
☞ a. [(ˈzai.ti)]-[(ˈzai.ti)]		**	
b. [(ˈza.ti)]-[(ˈzai.ti)]	*!	*	*
c. [(ˈzi.ti)]-[(ˈzai.ti)]	*!	*	*

Candidates (b) and (c) which reduce the reduplicant foot to two moras via deleting either of the diphthong's elements are now excluded by CONTIGUITY-BR. Such exclusion renders candidate (a) optimal even though it twice violates FT-BIN(μ).

Alternatively, reduplicative forms in Bilua can be analyzed as an outcome of syllabic unmarkedness. Note that coda deletion as well as diphthong simplification yield a syllable of the form CV, as previously discussed. While coda deletion is motivated by the markedness constraint NO-CODA, mono-phthonganization is enforced by *COMPLEX (McCarthy and Prince 1993a; Prince and Smolensky 1993):

(30) Syllable Well-formedness Constraints

a. NO-CODA: Codas are not allowed in syllables

b.*COMPLEX: Syllable position nodes do not branch

Both constraints have to crucially dominate MAX-BR as illustrated in the ranking tableau below:

(31) NO-CODA, *COMPLEX >>MAX-BR

[RED-ˈre.vot]	NO-CODA	MAX-BR
☞ a. [(ˈre.vo)]-[(ˈre.vot)]	*	*
b. [(ˈre.vot)]-[(ˈre.vot)]	**!	
[RED-ˈle.ɲoe]	*COMPLEX	MAX-BR
☞ a. [(ˈle.ɲo)]-[(ˈle.ɲoe)]	*	*
b. [(ˈle.ɲoe)]-[(ˈle.ɲoe)]	**!	

Although less economical, the use of NO-CODA and *COMPLEX in place of FT-BIN(μ) has its own advantages. For one thing, it captures the fact that the only initial-heavy syllables allowed in Bilua reduplicated forms are those with diphthongs, not codas.

Further, it accounts for syllable unmarkedness in Bilua verbal roots which often follow the CV canonical form of the syllable:

(32) Syllable unmarkedness in Bilua verb roots

NO-CODA>>DEP-IO

Root: [RED-ˈti.bur]	NO-CODA	DEP-IO
☞ a. [(ˈti.bu)-(ˈti.bu).ri]		*
b. [(ˈti.bu)-(ˈti.bur)]	*!	

The ranking of DEP-IO, which penalizes the addition of new segments not found in the input, below NO-CODA allows for verbal roots to epenthesize vocalic segments in order to avoid the restriction on codas. Note that candidate (a) circumvents a violation of NO-CODA by inserting the vowel /i/ after /r/ of the base form.

Finally, an analysis which makes use of FT-BIN(μ) would come short of ruling out a candidate such as [(ˈzai)]-[(ˈzai.ti)]. Consider the tableau in (33):

(33) CONTIG-BR>> FT-BIN(μ)>> MAX-BR

[RED-ˈzai.ti]	CONTIG-BR	FT-BIN(μ)	MAX-BR
☹ a. [(ˈzai.ti)]-[(ˈzai.ti)]		**!	
b. [(ˈza.ti)]-[(ˈzai.ti)]	*!	*	*
c. [(ˈzi.ti)]-[(ˈzai.ti)]	*!	*	*
☞ d. [(ˈzai)]-[(ˈzai.ti)]		*	**

FT-BIN(μ) here works against the desired candidate (a) by eliminating it from the analysis (due to the dual three-mora feet violation incurred by the base and reduplicant). Candidate (d), on the other hand, fares better on FT-BIN(μ) since one violation is incurred by the base only (the reduplicant foot is bi-moraic). Thus, the derivation wrongfully selects candidate (d) as the optimal output. However, such problem disappears under a syllable-markedness approach. Consider the following tableau in (34) which makes use of the same set of candidates and ranking in (33) but replaces FT-BIN(μ) with *COMPLEX:

(34) CONTIG-BR>>*COMPLEX >>MAX-BR

[RED-ˈzai.ti]	CONTIG-BR	*COMPLEX	MAX-BR
☞ a. [(ˈzai.ti)]-[(ˈzai.ti)]		**	
b. [(ˈza.ti)]-[(ˈzai.ti)]	*!	*	*
c. [(ˈzi.ti)]-[(ˈzai.ti)]	*!	*	*
d. [(ˈzai)]-[(ˈzai.ti)]		**	*!*

Candidates (a) and (d) tie on *COMPLEX since both contain syllables with branching nodes in the base as well as the reduplicant. MAX-BR decisively shifts the balance in favor of candidate (a) as (d) incurs two violations of MAX-BR, the first of which is fatal, as opposed to a zero violation by (a).

For mono-syllabic words, total reduplication in Bilua is guaranteed by high-ranking CONTIG-BR over *COMPLEX as in (35):

(35) CONTIG-BR>>*COMPLEX

[RED-ˈzio]	CONTIG-BR	*COMPLEX
☞ a. [(ˈzio)]-[(ˈzio)]		**
b. [(ˈzi)]-[(ˈzio)]	*!	*
c. [(ˈzo)]-[(ˈzio)]	*!	*

In words consisting of more than two syllables such as tri-syllabic and penta-syllable words, partial reduplication is ensured by having the Prosodic-Word Restrictor Constraint PARSE-SYLL in (22a) ranked above MAX-BR, as observed in (36):

(36) PARSE-SYLL>>MAX-BR

[RED-ˈsia.ka.va]	PARSE-SYLL	MAX-BR
☞ a. [(ˈsia.ka)]-[(ˈsia.ka).va]	*	**
b. [(ˈsia.ka).va]-[(ˈsia.ka).va]	**!	
c. [(ˈsia)]-[(ˈsia.ka).va]	*	***!*

Note that in (36) the faithful candidate (b) fails to satisfy PARSE-SYLL since it has the syllable *–va* unparsed both in the base and reduplicant. But what if the syllable *–va* gets parsed in the reduplicant? Given just PARSE-SYLL and MAX-BR, the analysis would incorrectly allow for such candidate to win:

(37) PARSE-SYLL>>MAX-BR

[RED-ˈsia.ka.va]	PARSE-SYLL	MAX-BR
☹ a. [(ˈsia.ka)]-[(ˈsia.ka).va]	*	*!*
b. [(ˈsia.ka).va]-[(ˈsia.ka).va]	**!	
☞ c. [(ˈsia.ka).(va)]-[(ˈsia.ka).va]	*	
d. [(ˈsia)]-[(ˈsia.ka).va]	*	***!*

Here (c) succeeds in being eliminated by PARSE-SYLL by parsing the syllable *–va* of the reduplicant into a foot. The winner-to-be output (a) loses to candidate (c) on account of MAX-BR. To ensure that only the minimally-required number of feet gets copied in the reduplicant, the constraint ALIGHN-FT-LEFT is used. The Prosodic-Word Restrictor Constraint ALIGHN-FT-LEFT requires that feet be left-paralleled to the prosodic word (see 22). Any parsing of a foot that is not aligned to the left of the prosodic word would violate ALIGHN-FT-LEFT. It is crucial that ALIGHN-FT-LEFT dominate MAX-BR as illustrated in the following tableau:

(38) PARSE-SYLL, ALIGHN-FT-LEFT>>MAX-BR

[RED-ˈsia.ka.va]	PARSE-SYLL	ALIGHN-FT-LEFT	MAX-BR
☞ a. [(ˈsia.ka)]-[(ˈsia.ka).va]	*		**
b. [(ˈsia.ka).va]-[(ˈsia.ka).va]	**!		
c. [(ˈsia.ka).(va)]-[(ˈsia.ka).va]	*	*!	
d. [(ˈsia)]-[(ˈsia.ka).va]	*		***!*

Candidate (c) fails on ALIGHN-FT-LEFT as it has a right-aligned foot in the reduplicant, and (a) emerges as the winner. The analysis needs to also account for a possible reduplication output that satisfies ALIGHN-FT-LEFT through parsing the last two syllables of the base. Consider how such output can be problematic:

(39) PARSE-SYLL, ALIGHN-FT-LEFT >> MAX-BR

[RED-ˈsa.ro.ro]	PARSE-SYLL	ALIGHN-FT-LEFT	MAX-BR
a. [(ˈsa.ro)]-[(ˈsa.ro).ro]	*		**
b. [(ˈsa.ro).ro]-[(ˈsa.ro).ro]	**!		
c. [(ˈsa.ro).(ro)]-[(ˈsa.ro).ro]	*	*!	
d. [(ˈro.ro)]-[(ˈsa.ro).ro]	*		**

Candidates (a) and (d) draw on PARSE-SYLL and MAX-BR, and a winner cannot be determined. The output (d) eludes a violation of ALIGHN-FT-LEFT by copying the last two syllables of the base unto the reduplicant; the result is a foot perfectly aligned to the left of the prosodic word. A constraint that forces the reduplicant to be left-aligned with the base is thus needed to exclude outputs like (d). McCarthy and Prince (1995) propose ANCHOR(B-R)L:

(40) ANCHOR(B-R)L: Any segment at the left edge of the base has a correspondent at the left edge of the reduplicant

The tableau in (41) below shows the interaction of ANCHOR(B-R)L with the other so far proposed constraints:

(41) PARSE-SYLL, ANCHOR(B-R)L, ALIGHN-FT-LEFT>>MAX-BR

[RED-ˈsa.ro.ro]	PARSE-SYLL	ANCHOR(B-R)L	ALIGHN-FT-LEFT	MAX-BR
☞ a. [(ˈsa.ro)]-[(ˈsa.ro).ro]	*			**
b. [(ˈsa.ro).ro]-[(ˈsa.ro).ro]	**!			
c. [(ˈsa.ro).(ro)]-[(ˈsa.ro).ro]	*		*!	
d. [(ˈro.ro)]-[(ˈsa.ro).ro]	*	*!		**

The alignment faithfulness constraint ANCHOR(B-R)L rules out candidate (d) since the segments at the left edge of the reduplicant do not correspond to the segments at the left edge of the base. The ranking in (41) succeeds in deriving the optimal output (a) in the grammar of Bilua.

To summarize, different patterns of reduplication in Bilua require the employment of a number of faithfulness and markedness constraints to derive the optimal output in the grammar. The overall ranking established for these constraints is presented in the following hierarchy:

(42) Overall ranking of OT constraints in the Bilua grammar

FT-FORM(Troch), ANCHOR(B-R)L, CONTIG-BR, ALIGHN-FT-LEFT, NO-CODA>>

DEP-IO, PARSE-σ, *COMPLEX >>MAX-BR

The ranking in (42) accounts for the reduplication patterns discussed above and reported in the Bilua data. The tableau in (43) shows the relative ranking of these constraints and how they interact with each other to arrive at the correct reduplication forms attested in the Bilua grammar:

(43) The overall ranking of the OT constraints in Bilua grammar

FT-FORM(Troch), ANCHOR(B-R)L, CONTIG-BR, ALIGHN-FT-LEFT, NO-CODA>>DEP-IO, PARSE-σ, *COMPLEX >>MAX-BR

Input: [RED-ˈti.bu.r]	FT-FORM (Troch)	ANCHOR(B-R)L	CONTIG-BR	ALIGHN-FT-L	NOCODA	DEP-IO	PARSE-σ	*COMPLEX	MAX-BR
☞a. [(ˈti.bu)-(ˈti.bu).ri]						*	*		**
b. [(ˈti.bu)-(ˈti.bur)]					*!			*	*
☞a. [(ˈzio)]-[(ˈzio)]								**	
b. [(ˈzi)]-[(ˈzio)]			*!					*	*
c. [(ˈzo)]-[(ˈzio)]			*!					*	*
☞a. [(ˈle.ɲo)]-[(ˈle.ɲoe)]								*	*
b.[(ˈle.ɲoe)]-[(ˈle.ɲoe)]								**!	
☞a. [(ˈre.vo)]-[(ˈre.vot)]					*				*
b. [(ˈre.vot)]-[(ˈre.vot)]					**!				
☞a. [(ˈsia.ka)]-[(ˈsia.ka).va]							*	**	**
b. [(ˈsia.ka).va]-[(ˈsia.ka).va]							*!*	**	
c. [(ˈsia.ka).(va)]-[(ˈsia.ka).va]				*!*			*	**	
d. [(ˈka.va)]-[(ˈsia.ka).va]		*!					*	*	***
e. [(ˈsi.ka)]-[(ˈsia.ka).va]			*!				*	*	***
f. [(ˈsa.ka)]-[(ˈsia.ka).va]			*!				*	*	***
g. [(sia.ˈka)]-[(ˈsia.ka).va]	*!						*	**	**
h. [(ˈsia)]-[(ˈsia.ka).va]							*	**	***!*

5. Conclusion

This short paper reports on reduplication, a highly-productive morphological process in Bilua. It attempts a formal analysis of Bilua reduplication along the lines of the Optimality Theory framework (Prince and Smolensky 1993). It is argued that the reduplicant stands in a correspondence relation with the base through specific output-output correspondence constraints. The Prosodic Word-Restrictor Constraints play a crucial role in the analysis of reduplication; the reduplicant achieves prosodic unmarkedness by assuming the minimal word form permitted in the Bilua grammar, i.e. a single bi-moraic foot perfectly aligned with the PrWd on both edges.

Syllabic unmarkedness in the reduplicant is argued to be an effect of ranking two syllable well-formedness constraints namely, NO-CODA and *COMPLEX above the faithfulness constraint MAX-BR. The fact that only initial syllables with complex branching nodes (i.e. diphthongs) are allowed in the reduplicant is made possible by the high ranking status of the faithfulness constraint CONTIGUITY-BR over the markedness constraint *COMPLEX. Both ALIGHN-FT-LEFT and ANCHOR(B-R)L are active in the Bilua grammar for the reduplication of words consisting of more than two syllables.

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