

# CV reduplication in Isbukun Bunun

## Variable RED placements

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This paper presents a novel generalization of the reduplicant (henceforth RED) placement in CV reduplication in Isbukun Bunun. It is shown that the variable RED placements cannot be explained in terms of the presence of a PF marker or merely by the syllable number of the root, as assumed in previous studies. Rather, the variable RED placements are argued to be simultaneously governed by the size and the syllable well-formedness of the root. The RED is normally prefixed to the root; however, if onsetless RED is generated under normal copying, the placement of the RED shifts one syllable rightward, except for shorter (bimoraic) roots. Thus, the variable placements of the RED are driven by a universal tendency for the RED to be unmarked and the need for the P-Root to sustain a minimal size.

**Keywords:** Isbukun Bunun, CV reduplication, RED placement, Optimality Theory

### 1. Introduction

Bunun is a Formosan language spoken in Kaohsiung City, Nantou County, Pingtung County, and Taitung County in Taiwan. Just like other Formosan languages, Bunun incorporates reduplication as a means of word formation. Bunun has five main dialects, the two northern dialects, Takituduh and Takibakha, the central dialects Takbanuaz and Takivatan, and the southern dialect Isbukun (Li 1988; 1997). This paper focuses on reduplication in the Isbukun dialect of Bunun.

Isbukun Bunun reduplication is mentioned in L. Huang (1997), Li (1997), Yeh (2000), Zeitoun (2000), Lin et al. (2001), Zeitoun & Wu (2006), and Istanda (2009). Based on discussions in the literature, reduplication in Isbukun Bunun basically falls into four types: (i) lexicalized reduplication, whose unreduplicated part does not exist in the synchronic morphology (e.g. [χuðaŋχuðaŋ] ‘move’, \*[χuðaŋ]);

(ii) Ca- reduplication,<sup>1</sup> which is formed straightforwardly by the copying of the root-initial consonant followed by a fixed vowel segment *a*, to denote the meaning of human reference in the formation of numerals (e.g. [pitu tu ʃaðam] ‘seven birds’ > [pa~pitu tu ʃuvað] ‘seven children’ (Li 1997: 315));<sup>2</sup> (iii) total reduplication, which involves the total copying of the root segments to convey progressive aspects on verbs and to denote intensive or diminutive meanings on color terms (e.g. [ma-danʃas] ‘red’ > [ma-danʃas~danʃas] ‘light/dark red’ (Yeh 2000: 361)), and (iv) CV reduplication which copies a CV sequence from the root to denote the meaning of continuation and repetition on active verbs and collectivity on stative verbs (e.g. [ma-patað] ‘kill (AF)’ > [ma-pa~patað] ‘keep on killing (AF)’). While the first three patterns of reduplication are quite straightforward, CV reduplication is reported to have variable reduplicant (RED) placements: the RED is placed before the root in some examples (thus, prefixal) and within the root in others (thus, infixal). This paper thus aims to pin down the factors governing the variable RED placements in CV reduplication. As CV reduplication in nouns is rare, the paper focuses on CV reduplication in verbs.

Previous discussions on Isbukun Bunun reduplication are descriptive in nature and do not explain what governs the different RED placements, except for Yeh (2000). According to Yeh (2000: 371), the Patient Focus (PF) marker plays an important role in determining whether the RED would surface as a prefix (i.e. CV-) or as an infix (i.e. -CV-), suggesting that the RED placement is morphologically governed. Istanda (2009: 36), on the other hand, briefly mentions that trisyllabic roots will have the penultimate syllable copied, suggesting the RED placement is phonologically governed by syllable number. However, neither proposals can properly explain the variable RED placement in Isbukun Bunun, as least for the Isbukun dialect spoken in Kaohsiung City (as further discussed in §3.4).

Based on the author’s fieldwork on the Isbukun dialect spoken in Kaohsiung City, this paper shows that the RED placement is phonologically rather than

1. Ca- reduplication was coined by Blust (1998).

2. In this paper, the RED is underlined and separated from the base by ‘~’, the non-reduplicative prefixes and suffixes are separated from the root by ‘-’; and non-reduplicative infixes are placed in angle brackets ‘<...>’. ‘|’ indicates P-Root edge, ‘{’ indicates M-Root edge. The conventions used in this paper are as followed: The prefixes in the data given include /ma~m-/ (AF marker); /is-/ (IF marker); /mu-/ (Int, AF marker); /tin-/ [tɕin-] ‘suddenly’; /ti-/ [tɕi-] ‘result in’; /ku-/ ‘go to’; /min-/ ‘become’; /mal-/ ‘in the state/condition of’; /an-/ ‘not on purpose’; /matu-/ ‘in the state/condition of’; /ka-/ ‘harvest’; /ku~k-/ ‘eat’; /pin-/ ‘become’; /mapal-/ ‘cause to be in the state/condition of’; /mati-/ ‘to adopt’; /mun-/ ‘go to’; /un-/ ‘go to’. The suffixes in the data given here include /-an/ (LF marker; PF marker); /-un/ (PF marker); /-av/ (Imp, PF marker). The infix in the data given is /-in-/ ‘past tense’. The meanings of the affixes are based on the online *Isbukun Bunun dictionary* (Jeng 2010) and Lin et al. (2001).

morphologically governed. In contrast to Yeh's (2000) proposal, I believe that the PF marker never causes the RED to shift. Phonologically, though the number of syllables does play a role in the determination of the RED placement, as suggested by Istanda (2009), the role it plays is only partial. It will be shown that the placement of the RED is simultaneously governed by the size and the syllable well-formedness of the root. Following Downing (1998), this paper assumes two types of roots, the Morphological Root (M-Root) and the Prosodic Root (P-Root). The P-Root is the part of the root to which the RED attaches. In order to be unmarked (such as being onsetful), the P-Root may skip the onsetless initial syllable of the root (e.g. 1a) or include elements not in the root (such as prefixes, e.g. 1b); consequently, P-Root may not be coextensive with the corresponding M-Root. (Please refer to § 4.2 for detail.)

- (1) Misalignment between P-Root and M-Root to prevent an onsetless P-Root (' indicates P-Root edge, { indicates M-Root edge, and the root is in boldface)
  - a. [**alus**ðan-an] 'accompany (PF)'  
     [{a-lu~|lus}ðan-an] 'keep on accompanying (PF)'
  - b. [m-**adas**] 'bring (AF)'  
     [ma~|m-{adas}] 'keep on bringing (AF)'

It will be shown in § 3 that CV reduplication is normally prefixal. However, for roots beginning with a vowel, the vowel-initial syllable can be skipped to avoid copying onsetless syllable, resulting in infixal -CV- reduplication. Thus, the shift of the RED placements is triggered by the need to reduce markedness in the RED, conforming to the common observation in reduplicative phonology that RED tends to be unmarked. But not every vowel-initial root will have the first syllable skipped; when a vowel-initial root is short (i.e. bimoraic), the initial syllable is copied despite the fact it is onsetless in order to satisfy P-Root minimality (i.e. P-Root must be minimally bimoraic). Obviously, several forces are competing in CV reduplication; the force to ensure a prefixal RED, the force to ensure an onsetful RED, and the force to ensure a minimally bimoraic P-Root. As conflicting forces are best accounted for in terms of constraint interaction, a formal account based on Optimality Theory (OT; McCarthy & Prince 1993; Prince & Smolensky 1993/2004) is proposed for the variable RED placements in CV reduplication.

The remainder of this paper is organized as follows: § 2 provides a brief introduction to Isbukun Bunun phonology. § 3 starts by examining CV reduplication based on the author's fieldwork on the Isbukun dialect spoken in Kaohsiung City and providing generalization to the variable RED placements. The section ends by discussing the problems found in Yeh's (2000) and Istanda's (2009) proposals regarding the RED placement. § 4 provides an analysis of the observed generalizations based on Optimality Theory. § 5 concludes the paper.

## 2. Phonology of Isbukun Bunun

Isbukun Bunun has fourteen consonants and three vowels, as shown in (2) (cf. He et al. 1986; Li 1997). Before /i/, /s/ and /t/ are palatalized to [ç] and [tç], respectively (L. Huang 1997; Li 1997). For example, /siva/ ‘nine’ > [çiva], /tina/ ‘mother’ > [tçina]. Surface glides [w] and [j] exist but are not included in the phonemic inventory in (2) because they are derived from the underlying vowels /u/ and /i/ (H.-H. Lin 1996).

### (2) Isbukun Bunun phonemic inventory

Consonants:				Vowels:	
p	t	k	ʔ	i	u
b	d				
	v	s	χ		a
	ð				
m	n	ŋ			
	l				

The roots of content words in Isbukun Bunun are typically disyllabic (/bimoraic) (cf. Li 1997: 306). If a content word contains only an underlying vowel, the vowel is lengthened to satisfy word minimality (i.e. a content word must be minimally bimoraic). For example, /χud/ > [χuud] ‘drink’ (Li 1997: 307; Zeitoun 2000: 45). Isbukun Bunun does not allow surface vowel sequence. Underlying vowel sequences are repaired by either gliding or coalescence. Gliding occurs when the adjacent vowels are different, e.g. /mindia/ > [mindja] ‘pick up (AF)’, /tupa-un/ > [tupa-wn] ‘tell (PF)’; coalescence, on the other hand, occurs when the adjacent vowels are identical, e.g. /tutu-un/ > [tutu-un] ‘pour out (PF)’, /astala-av/ > [astala-av] ‘wait (Imp, PF)’.<sup>3</sup> (H. Huang 2005).

Stress in Isbukun Bunun most often falls on the penultimate syllable (e.g. [malúdaχ] ‘beat (AF)’). But word final syllables containing offglides, post-consonantal onglides or coalesced vowels are heavy and attract stress (e.g. /mindia/ [mindjá] ‘pick up (AF)’; /tupa-un/ [tupá-wn] ‘tell (PF)’, /astala-av/ [astalá-av] ‘wait (Imp, PF)’ because the underlying vowels that are coalesced or glided preserve moraicity (H. Huang 2005; 2008). The stress pattern in Isbukun Bunun is due to the construction of a quantity sensitive trochaic foot at the right edge of a word, under the assumption that glides are moraic but codas are not (H. Huang 2005). Finally, due to the fact the derived glides are located in the nucleus position, Isbukun Bunun can allow complex nuclei containing up to two vocalic elements (i.e. GV/VG) (H. Huang 2005); complex syllable margins are prohibited (H.-H. Lin 1996: 32; Li 1997: 306).

3. Notice that instead of transcribing the coalesced vowel as a single vowel (i.e. [tutun] and [astalav]), the coalesced vowels are transcribed as a tautosyllabic  $\widehat{vv}$  in this paper to show that the vowels are bimoraic.

### 3. CV reduplication in Isbukun Bunun

#### 3.1 Generalizations

This section examines CV reduplication and provides generalizations to the variable RED placements.

Consider first the examples in (3). The examples show that prefixes are ignored in reduplication. The RED copies from the root-initial syllable, skipping over the coda if there is any. The roots of the examples range from monosyllabic to trisyllabic. In all the examples, the RED is prefixed to the root, no matter whether the root is monosyllabic (3a–d), disyllabic (3e–h), or trisyllabic (3i–j).

#### (3) Prefixal reduplication

- |    |                  |                                 |
|----|------------------|---------------------------------|
| a. | [ma-χajs]        | ‘mark boundary (AF)’            |
|    | [ma-χa~χajs]     | ‘keep on marking boundary (AF)’ |
| b. | [is-kawn]        | ‘eat (IF)’                      |
|    | [is-ka~kawn]     | ‘keep on eating (IF)’           |
| c. | [xuud]           | ‘drink (AF)’                    |
|    | [χu~χuud]        | ‘is drinking (AF)’              |
| d. | [mu-baas]        | ‘repay (AF)’                    |
|    | [mu-ba~baas]     | ‘keep on repaying (AF)’         |
| e. | [tɕin-χuða]      | ‘scared (AF)’                   |
|    | [tɕin-χu~χuða]   | ‘scared frequently (AF)’        |
| f. | [ma-patað]       | ‘kill (AF)’                     |
|    | [ma-pa~patað]    | ‘keep on killing (AF)’          |
| g. | [ma-tuxdun]      | ‘black (AF)’                    |
|    | [ma-tu~tuxdun]   | ‘all black (AF)’                |
| h. | [ma-davus]       | ‘sweet (AF)’                    |
|    | [ma-da~davus]    | ‘all sweet (AF)’                |
| i. | [mal-baŋkiki]    | ‘kneel down (AF)’               |
|    | [mal-ba~baŋkiki] | ‘keep on kneeling down (AF)’    |
| j. | [ma-χaçila]      | ‘add salt (AF)’                 |
|    | [ma-χa~χaçila]   | ‘keep on adding salt (AF)’      |

Examples in (4) show that for roots beginning with  $CG_iV_{ii}$ , which are derived from  $/CV_iV_{ii}/$ , the RED consistently copies up to the first *underlying* vowel, but never to the first *surface* vowel. Since prevocalic glides derived from vowels are moraic (H. Huang 2005), the fact the RED copies  $CV_i$  instead of  $CG_iV_{ii}$  or  $CV_{ii}$  suggests that the RED must be monomoraic (i.e.  $CV_{\mu}$ , \* $CG_{\mu}V_{\mu}$ ) and that it must copy a continuous string from the base (i.e.  $\underline{CV}_i \sim CG_iV_{ii}$ , \* $\underline{CV}_{ii} \sim CG_iV_{ii}$ ), despite the fact that copying results in unfaithful feature mapping between the base and the RED, since a [–syllabic] glide, in the base corresponds to a [+syllabic] vowel in the RED.

## (4) CGV roots generate CV- RED

- a. [mjaχdi] 'work hard (AF)'  
/miaχdi/  
[mi~mjaχdi] 'keep on working hard (AF)'
- b. [matu-ɕjaχut] 'stare (AF)'  
/matu-siaχut/  
[matu-ɕi~ɕjaχut] 'keep on staring (AF)'
- c. [tɕin-tɕjaχav] 'close eyes (AF)'  
/tin-tiaχav/  
[tɕin-tɕi~tɕjaχav] 'keep on closing eyes (AF)'
- d. [ma-djaχu] 'feel thirsty (AF)'  
/ma-diaχu/  
[ma-di~djaχu] 'feel thirsty frequently (AF)'

The examples in (3) and (4) show that CV reduplication copies the CV sequence from the root-initial syllable and the RED is *prefixed* to the root. However, in some examples, as illustrated in (5), the RED copies a root *internal* CV sequence.

## (5) Root-initial syllable skipped when it is vowel-initial (root is in boldface)

- a. [uχajv-an] 'disappear (LF)'  
[u-χa~χajv-an] 'always disappear (LF)'
- b. [indja-v] 'pick (Imp, PF)'  
/india-av/  
[in-di~dja-v] 'pick frequently (Imp, PF)'  
/in-di~dia-av/
- c. [udaap-an] 'help (PF)'  
[u-da~daap(-an)] 'help frequently (PF)'
- d. [alusðan-an] 'accompany (PF)'  
[a-lu~lusðan-an] 'keep on accompanying (PF)'
- e. [asχajlan-un] 'admire (PF)'  
[as-χa~χajlan-un] 'admire frequently (PF)'
- f. [astala(-av)] 'wait (Imp, PF)'  
[as-ta~tala(-av)] 'keep on waiting (Imp, PF)'
- g. [asχajlj-un] 'wear cross-body (PF)'  
[as-χa~χajlj-un] 'keep on wearing cross-body (PF)'
- h. [m-almananu] 'do one's utmost (AF)'  
[m-al-ma~mananu] 'keep on doing one's utmost (AF)'

While the examples in (3) and (4), which involve prefixal CV- reduplication, all begin with consonants, examples that skip the root-initial syllable in reduplication, as illustrated in (5), always have a root that begins with a vowel in the

underlying representation.<sup>4</sup> The vowel-initial roots range from two to four syllables. The RED skips over the onsetless root-initial syllable and copies the CV sequence from the second syllable. Consequently, the RED is infixal between the skipped vowel-initial syllable and the copied second syllable. Phonological studies on reduplication have shown that reduplicants tend to be phonologically less marked than the non-reduplicated forms and that the avoidance of marked structures could result in a shift of the RED placement. Onsetless syllables, for instance, are found to be skipped in several languages, such as Timugon Murut (Prentice 1971; cited in McCarthy & Prince 1993), Orokaiva (Healey, Isoroembo & Chittleborough 1969), Yareba (Weimer & Weimer 1975), IsiXhosa (Cassimjee 1998), KiNande (Mutaka & Hyman 1990), SiSwati (Downing 1994), and Axininca Campa (Spring 1990; McCarthy & Prince 1993). Therefore, a plausible explanation for infixal -CV- reduplication is to avoid copying an onsetless syllable.

Notice, however, that though onsetless root-initial syllables are generally skipped in reduplication, the initial onsetless syllable is not skipped when the root is disyllabic and ends with a light syllable, as illustrated by the examples in (6).

(6) Onsetless initial syllable not skipped when the root is bimoraic  
(root is in boldface)

- |    |                       |                                    |
|----|-----------------------|------------------------------------|
| a. | [ <b>adas</b> -un]    | 'bring (PF)'                       |
|    | [a~ <b>adas</b> -un]  | 'always bring (PF)'                |
| b. | [ <b>utmaŋ</b> -an]   | 'have no principle (LF)'           |
|    | [u~ <b>utmaŋ</b> -an] | 'keep on having no principle (LF)' |
| c. | [ <b>asðaŋ</b> -un]   | 'equalize (PF)'                    |
|    | [a~ <b>asðaŋ</b> -un] | 'always equalize (PF)'             |
| d. | [ <b>utaχ</b> -an]    | 'vomit (LF)'                       |
|    | [u~ <b>utaχ</b> -an]  | 'vomit (LF)'                       |

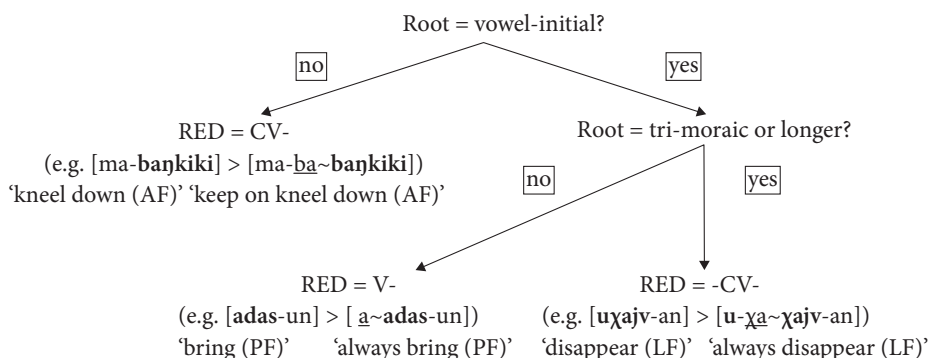
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4. A reviewer raises the question whether the roots in (5) can be analyzed as containing a vowel-initial prefix (e.g. [al-], [as-], [u-], [in-]) followed by a consonant-initial root. Such an analysis has the advantage of treating CV- reduplication as being always prefixal; namely, the RED is always prefixed to the root. But such an analysis needs to assume that there are some prefixes which are probably historical and, therefore, meanings unknown (e.g. [as-], [u-]) and that the historical prefixes are not copied in CV reduplication. However, since such an analysis assumes some unknown historical prefixes, it cannot exclude the possibility that examples like [mjaχdi] 'work hard (AF)' > [mi~mjaχdi] 'keep on working hard (AF)' may also contain a historical prefix (e.g. [mi-]), which unexpectedly undergoes reduplication. Besides, it will be hard for such an analysis to explain why the prefixes that are skipped, as in (5), are always vowel-initial. The present study does not refute the possible existence of historical prefixes and the role they may play in reduplication but simply tries to show that there is no need to rely on some unknown historical prefixes when the RED placement can be determined by phonological evidence.

As mentioned, the vowel-initial roots in (5) that undergo internal -CV- reduplication range from disyllabic to tetrasyllabic. Unlike (6), the disyllabic roots in (5) all end with a heavy syllable (5a–c; e.g. (5a) [u.χa<sub>μ</sub>j<sub>μ</sub>v]). While disyllabic roots with final light syllables are bimoraic, disyllabic roots with final heavy syllables, trisyllabic roots and tetrasyllabic roots are at least trimoraic. Skipping over the root-initial syllable, the RED in (5) copies the CV sequence from the second mora of a trimoraic or longer root and attaches to it. In these examples, the P-Root to which the RED attaches is bimoraic or longer (e.g. (5d) [alusɔ̃an-an] ‘accompany (PF)’ > [a-lu~[lus<sub>μ</sub>ɔ̃a<sub>μ</sub>n-an] ‘keep on accompanying (PF)’). On the other hand, the onsetless root-initial syllables that are copied, as in (6), are within the final foot. If the RED skips over the root-initial syllable, it will copy the final mora of the root and attach to it. The P-Root to which the RED attaches is, therefore, only monomoraic (e.g. (6a) [adas-un] ‘bring (PF)’ > \*[a-da~[da<sub>μ</sub>s-un]). As roots of content words in Isbukun Bunun are minimally bimoraic in general (cf. discussion in §2) the reason root-initial onsetless syllables, which are normally left out in CV reduplication, are copied in (6) should be to achieve a minimally bimoraic P-Root.

To summarize this section, the RED in CV reduplication generally copies from the root-initial syllable and is prefixal. But when a root is vowel-initial and is trimoraic or longer, the RED skips the root-initial syllable. The motivation for the skipping of the vowel-initial syllable is to avoid copying a marked onsetless syllable; the reason only trimoraic or longer root can have the initial onsetless syllable skipped is to ensure the P-Root to which the RED attaches is at least bimoraic. The generalization of the RED placement is summarized in (7).

- (7) Correlation between the prosodic structure of the root and RED placement (root in boldface)



The generalization that only longer vowel-initial roots undergo infixation and that shorter (bimoraic) ones, as well as consonant-initial roots, undergo prefixation is not unique to CV reduplication in Isbukun Bunun. A similar phenomenon is



found in other languages such as the Bantu language of IsiXhosa (Cassimjee 1998; Downing 1998) and the Maipurean language of Axininca Campa (Spring 1990; McCarthy & Prince 1993; Downing 1998). For instance, the examples in (8) from Axininca Campa show that root-initial onsetful syllables are copied (i.e. 8a), but onsetless root-initial syllables are not (i.e. 8b), unless the root is disyllabic (i.e. 8c), even if the initial vowel is syllabified with a preceding prefix.

(8) Axininca Campa

	Unprefixed form	Prefixed form	Gloss
a.	<i>Consonant-initial roots (root-initial syllable copied)</i>		
	t <sup>h</sup> aan̥ki~t <sup>h</sup> aan̥ki	(non-)t <sup>h</sup> aan̥ki~t <sup>h</sup> aan̥ki	'hurry'
	kint <sup>h</sup> a~kint <sup>h</sup> a	(non-)kint <sup>h</sup> a~kint <sup>h</sup> a	'tell'
	tason̥ka~tason̥ka	(non-)tason̥ka~tason̥ka	'fan' /tason̥k/
b.	<i>Vowel-initial roots of three or more syllables (root-initial syllable skipped)</i>		
	osampi~sampi	(n-)osampi~sampi	'ask'
	aacika~cika	(n-)aacika~cika	'stop' /aacik/
	orin̥ka~rin̥ka	(n-)oirin̥ka~rin̥ka	'lower' /orin̥k/
c.	<i>Disyllabic vowel-initial roots (root-initial syllable copied)</i>		
	ooka~ooka	(n-)ooka~nooka	'abandon' /ook/
	aka~aka	(n-)aka~naka	'answer' /ak/

(Spring 1990; McCarthy & Prince 1993; cited from Downing 1998: 20)

### 3.2 Seemingly counterexamples

There are two sets of examples that seem to be at odds with the generalization that root-initial syllables are skipped when the roots are vowel-initial and are trimoraic or longer. The first set of examples is given in (9).

(9) Seemingly counterexamples-I

a.	[ma-aðuŋʔuŋ]	'flourishing (AF)'
	[ma-a~aðuŋʔuŋ]	'all flourishing (AF)'
b.	[alasan]	'not catch up with (AF)'
	[a~alasan]	'keep on not catching up with (AF)'
c.	[mal-anuχu]	'sit (AF)'
	[mal-a~anuχu]	'keep on sitting (AF)'
d.	[uvajv-un]	'change (PF)'
	[u~uvajv-un]	'keep on changing (PF)'
e.	[ma-awsvaj]	'repel (AF)'
	[ma-a~awsvaj]	'keep on repelling (AF)'

Roots in (9) have syllable structures that are very similar to those in (5). The roots in (9) are trimoraic; the roots are either trisyllabic (9a–c) or disyllabic with final heavy syllables (9d–e). However, unlike (5), the root-initial syllables in (9) are copied. Since consonant-initial roots of the same syllable structure have the first syllable copied (cf. 10),<sup>5</sup> a plausible explanation as to why the first syllables in (9), but not in (5), are copied is that roots in (9), but not in (5), are preceded by a glottal stop in the underlying representation, as illustrated in (11).

(10) Consonant-initial trimoraic roots have the first syllable copied

- |    |                           |                                 |
|----|---------------------------|---------------------------------|
| a. | [an-bajlulu]              | ‘grab (AF)’                     |
|    | [an- <u>ba</u> ~bajlulu]  | ‘keep on grabbing (AF)’         |
| b. | [mal-baŋkiki]             | ‘kneel down (AF)’               |
|    | [mal- <u>ba</u> ~baŋkiki] | ‘keep on kneeling down (AF)’    |
| c. | [ma-χačila]               | ‘add salt (AF)’                 |
|    | [ma- <u>χa</u> ~χačila]   | ‘keep on adding salt (AF)’      |
| d. | [mal-χajjap]              | ‘know (AF)’                     |
|    | [mal- <u>χa</u> ~χajjap]  | ‘always know (AF)’              |
| e. | [ma-χanwas]               | ‘admire (AF)’                   |
|    | [ma- <u>χa</u> ~χanwas]   | ‘keep on admiring (AF)’         |
| f. | [tçin-bulawk]             | ‘get blisters (AF)’             |
|    | [tçin- <u>bu</u> ~bulawk] | ‘keep on getting blisters (AF)’ |

(11) The roots in (9) begin with a glottal stop

- |    |                           |               |                              |
|----|---------------------------|---------------|------------------------------|
| a. | [ma-ʔaḏuŋʔuŋ]             | /ma-ʔaḏuŋʔuŋ/ | ‘flourishing (AF)’           |
|    | [ma- <u>ʔa</u> ~ʔaḏuŋʔuŋ] |               | ‘all flourishing (AF)’       |
| b. | [ʔalasan]                 | /ʔalasan/     | ‘not make it (AF)’           |
|    | [ <u>ʔa</u> ~ʔalasan]     |               | ‘keep on not making it (AF)’ |
| c. | [mal-ʔanuχu]              | /mal-ʔanuχu/  | ‘sit (AF)’                   |
|    | [mal- <u>ʔa</u> ~ʔanuχu]  |               | ‘keep on sitting (AF)’       |
| d. | [ʔuvajv-un]               | /ʔuvaiv-un/   | ‘change (PF)’                |
|    | [ <u>ʔu</u> ~ʔuvajv-un]   |               | ‘keep on changing (PF)’      |
| e. | [ma-ʔawsvaj]              | /ma-ʔausvai/  | ‘repel (AF)’                 |
|    | [ma- <u>ʔa</u> ~ʔawsvaj]  |               | ‘keep on repelling (AF)’     |

The glottal stops in root-initial (as well as root final) positions are often left unmarked in Isbukun Bunun literature presumably because glottal stops are placeless and perceptually weak.<sup>6</sup> That is why roots that begin with an underlying glottal stop,

5. Actually, consonant-initial roots of any syllable structure have the first syllable copied in CV reduplication.

6. For example, [ʔanuχu] is transcribed without the initial glottal stop in Lin et al. (2001: 186) and in the online *Isbukun Bunun dictionary* (Jeng 2010).

such as those in (11 = 9), may be mistaken as vowel-initial roots. But the different RED placements, as observed in (5) and (9 = 11), show that the nature of the roots undergoing reduplication must be different and that the roots the prefixal CV- RED attaches to must be preceded by an underlying glottal stop.

That the roots in (9 = 11) begin with a glottal stop is supported by evidence from affixation. As mentioned in § 2, Isbukun Bunun does not permit surface vowel clusters; underlying vowels in adjacent position result in either coalescence or gliding. Thus, if there is a vowel cluster spanning across a morpheme boundary in the surface representation, it normally implies there is an underlying glottal stop standing between the vowels. For instance, H. Huang (2002: 451) proposes that in the Takituduh dialect of Bunun, the fact suffixation results in surface vowel clusters in (12), but not in (13), shows that the roots in (12), but not in (13), end with an underlying glottal stop which blocks gliding, though the word final glottal stop in (12) is almost perceptually unnoticeable.<sup>7</sup>

- (12) Takituduh Bunun H. Huang (2002: 451)
- |    |       |              |                |                   |
|----|-------|--------------|----------------|-------------------|
| a. | tupaʔ | ‘ask (AF)’   | tupaʔ-i [aʔ-i] | ‘ask (Imp, AF)’   |
| b. | mamaʔ | ‘carry (AF)’ | amaʔ-i [aʔ-i]  | ‘carry (Imp, AF)’ |
| c. | mamaʔ | ‘carry (AF)’ | amaʔ-un [aʔ-u] | ‘carry (PF)’      |
- (13) Takituduh Bunun H. Huang (2002: 452)
- |    |       |               |               |                    |
|----|-------|---------------|---------------|--------------------|
| a. | tanʔa | ‘listen (AF)’ | tanʔa-i [aj]  | ‘listen (Imp, AF)’ |
| b. | ʔasa  | ‘like (AF)’   | ʔasa-i [aj]   | ‘like (Imp, AF)’   |
| c. | tanʔa | ‘listen (AF)’ | tanʔa-un [aw] | ‘listen (PF)’      |

Just as in suffixation, prefixation may also result in vowel adjacency. Take the formation of Agent Focus (AF) for instance. Except for zero marking Ø, AF in Isbukun Bunun has two variants, [ma-] and [m-] (L. Huang 1997: 359). The [m-] variant does not precede consonant-initial roots presumably to avoid consonant clusters at syllable margin (e.g. [χanɕjap] > [ma-χanɕjap] ‘know (AF)’, \*[m-χanɕjap]). On the other hand, the [ma-] variant does not precede vowel-initial roots presumably to avoid vowel clusters (e.g. [astala] > [m-astala] ‘wait (AF)’, \*[ma-astala]). As shown in (14), roots that undergo -CV- reduplication (cf. 5) are always prefixed by the AF marker [m-] to form Agent Focus. On the other hand, roots that undergo

7. There are two other possible reasons for surface vowel clusters in Takituduh Bunun. One is word minimality and the other is stressed vowel preservation. The former prevents a word that has only two underlying vowels from undergoing gliding (e.g. /χaɪp/ > [χaɪp] ‘now’ (H. Huang 2002: 448)) while the latter prevents a stressed vowel in the base form from undergoing change (e.g. [cɪcɪlɪa] ‘imitate (Imp, AF)’; base = [cɪcɪlɪ] ‘imitate (AF)’). For details, please refer to H. Huang (2002).

CV- reduplication (cf. 9) are never preceded by the AF marker [m-], as shown in (15). Thus, the roots in (15, cf. 9), but not in (14 = 5), must begin with a glottal stop in the underlying representation (cf. 11).

- (14) Roots that undergo -CV- reduplication in (5) are prefixed by the AF marker [m-]

	<u>Root</u>	<u>Prefixed form</u>	
a.	[alusðan]	[m-alusðan]	'parallel (AF)'
b.	[asχajlan]	[m-asχajlan]	'admire (AF)'
c.	[astala]	[m-astala]	'wait (AF)'
d.	[asχajli]	[m-asχajli]	'wear cross-body (AF)'
e.	[uχajv]	[m-uχajv]	'sunset (AF)'
f.	[indjav]	[m-indjav]	'pick (AF)'
g.	[udaap]	[m-udaap]	'help (AF)'

- (15) Roots that undergo CV- reduplication in (9) are never prefixed by the AF marker [m-]

	<u>Root</u>		<u>Prefixed form</u>	
a.	[ʔuvajv]	/ʔuvaiv/	[ma-ʔuvajv]	'change (AF)'
b.	[ʔawsvaj]	/ʔausvai/	[ma-ʔawsvaj]	'repel (AF)'
c.	[ʔaðuŋʔuŋ]	/ʔaðuŋʔuŋ/	[ma-ʔaðuŋʔuŋ]	'flourish (AF)'

In sum, the examples in (9) are consonant-initial and do not constitute counterexamples to the generalization that only initial onsetless syllables of longer roots are skipped in reduplication.<sup>8</sup>

The second set of examples that seems to be at odd with the generalization of the RED placement is given in (16). The examples in (16) all begin with a consonant, but they still undergo infixal -CV- reduplication. Thus, they seem to constitute counterexamples to the claim that only vowel-initial syllables are skipped in CV reduplication. Nonetheless, though these examples all begin with consonants, the beginning consonants are actually bare consonantal prefixes, which are attached

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8. Just as in (5), roots in (6) are vowel-initial since they are preceded by the AF marker [m-], not [ma-], as shown below. Notice that even though the roots in (6) are vowel-initial, the initial onsetless syllables are copied in CV reduplication to prevent generating an undersized P-Root.

	<u>Root</u>	<u>Prefixed form</u>	
a.	[asðan]	[m-asðan]	'alike (AF)'
b.	[utman]	[m-utman]	'have no principle (AF)'
c.	[adas]	[m-adas]	'bring (AF)'
d.	[utaχ]	[m-utaχ]	'vomit (AF)'

to vowel-initial roots.<sup>9</sup> Since these examples contain vowel-initial roots which are trimoraic, following the current generalization the initial onsetless syllable is not copied together with the bare consonantal prefix, resulting in -CV- reduplication, as illustrated in (17). Thus, these examples still conform to the generalization that only vowel-initial syllables of longer roots are skipped in CV reduplication.

(16) Seemingly counterexamples-II

- a. [miliskin] 'think (AF)'  
[mi-li~liskin] 'keep on thinking (AF)'
- b. [muliva] 'err (AF)'  
[mu-li~liva] 'keep on erring (AF)'
- c. [minχalab] 'dress up (AF)'  
[min-χa~χalab] 'always dress up (AF)'
- d. [muχajv] 'sunset (AF)'  
[mu-χa~χajv] 'sunset every day (AF)'
- e. [munawl] 'draw water (AF)'  
[mu-na~nawl] 'keep on drawing water (AF)'
- f. [mudaap] 'help (AF)'  
[mu-da~daap] 'keep on helping (AF)'
- g. [kusbaj] 'fly (AF)'  
[kus-ba~baj] 'keep flying (AF)'

(17) The bare consonantal prefix is not copied when the roots are trimoraic or longer (root in boldface)

- a. [m-**iliskin**] 'think (AF)'  
[m-i~li~**liskin**] 'keep on thinking (AF)'
- b. [m-**uliva**] 'err (AF)'  
[m-u~li~**liva**] 'keep on erring (AF)'
- c. [m-**inχalab**] 'dress up (AF)'  
[m-in~χa~**χalab**] 'always dress up (AF)'

9. That word-initial consonants in the examples in (16 = 17) are prefixes is evidenced by the morphologically related forms below:

The roots in (16) are vowel-initial

	<i>Prefixed form</i>		<i>Root</i>		<i>Suffixed form</i>	
a.	[m-iliskin] 'think (AF)'		[iliskin]	cf.	[iliskin-un]	'think (PF)'
b.	[m-uliva] 'err (AF)'		[uliva]	cf.	[in-uliva~an]	'err (PF)'
c.	[m-inχalab] 'dressed up (AF)'		[inχalab]	cf.	[in-inχalab-an]	'dress (PF)'
d.	[m-uχajv] 'sunset (AF)'		[uχajv]	cf.	[uχajv-an]	'place of sunset (LF)'
e.	[m-unawl] 'draw water (AF)'		[unawl]	cf.	[unawl-an]	'place to draw water (LF)'
f.	[m-udaap] 'help (AF)'		[udaap]	cf.	[udaap-an]	'help (PF)'
g.	[k-usbaj] 'fly (AF)'		[usbaj]	cf.	[m-usbaj]	'flee, run away (AF)'

(cf. De Busser 2009: 301)

- |    |               |                              |
|----|---------------|------------------------------|
| d. | [m-uχajv]     | ‘sunset (AF)’                |
|    | [m-u~χa~χajv] | ‘sunset every day (AF)’      |
| e. | [m-unawl]     | ‘draw water (AF)’            |
|    | [m-u~na~nawl] | ‘keep on drawing water (AF)’ |
| f. | [m-udaap]     | ‘help (AF)’                  |
|    | [m-u~da~daap] | ‘keep on helping (AF)’       |
| g. | [k-usbaj]     | ‘fly (AF)’                   |
|    | [k-us~ba~baj] | ‘keep flying (AF)’           |

In sum, examples in (9) and (16) either have roots that begin with underlying glottal stops or vowel-initial roots that are preceded by bare consonantal prefixes; therefore, they do not constitute counterexamples.

### 3.3 Affixes in CV reduplication

Before ending the discussion on CV reduplication, it is worth examining whether affixes are copied in CV reduplication. As mentioned, prefixes are skipped in CV reduplication (cf. 3–4, 9–11). Nonetheless, there exists a group of examples in which the prefixes are copied, as exemplified in (18).<sup>10</sup>

- (18) Prefixes copied in CV reduplication (root in boldface)
- |    |                                |                                    |
|----|--------------------------------|------------------------------------|
| a. | [k- <b>uskun</b> ]             | ‘eat together (AF)’                |
|    | [ <b>ku</b> ~k- <b>uskun</b> ] | ‘keep on eating together (AF)’     |
| b. | [m-as <b>ðaŋ</b> ]             | ‘alike (AF)’                       |
|    | [ <b>ma</b> ~m-as <b>ðaŋ</b> ] | ‘always alike (AF)’                |
| c. | [m-at <b>muð</b> ]             | ‘full (AF)’                        |
|    | [ <b>ma</b> ~m-at <b>muð</b> ] | ‘all full (AF)’                    |
| d. | [m-a <b>das</b> ]              | ‘bring (AF)’                       |
|    | [ <b>ma</b> ~m-a <b>das</b> ]  | ‘keep on bringing (AF)’            |
| e. | [m-as <b>χut</b> ]             | ‘tight (AF)’                       |
|    | [ <b>ma</b> ~m-as <b>χut</b> ] | ‘all tight (AF)’                   |
| f. | [m-u <b>χna</b> ]              | ‘do it over again (AF)’            |
|    | [ <b>mu</b> ~m-u <b>χna</b> ]  | ‘keep on doing it over again (AF)’ |

---

10. That the word-initial consonants in the examples in (18) are prefixes is evidenced by the morphologically related forms below:

- |    |           |                         |            |                           |
|----|-----------|-------------------------|------------|---------------------------|
| a. | [k-uskun] | ‘eat together (AF)’     | [uskun-an] | ‘do things together (PF)’ |
| b. | [m-asðaŋ] | ‘like, same (AF)’       | [asðaŋ-un] | ‘equalize (PF)’           |
| c. | [m-atmuð] | ‘full (AF)’             | [utmuð-an] | ‘full (PF)’               |
| d. | [m-adas]  | ‘bring (AF)’            | [adas-un]  | ‘bring (PF)’              |
| e. | [m-asχut] | ‘tight (AF)’            | [p-asχut]  | ‘cause to be tight (AF)’  |
| f. | [m-uχna]  | ‘do it over again (AF)’ | [uχna-un]  | ‘do it over again (PF)’   |

The prefixes copied are all bare consonantal prefixes which are attached to bimoraic vowel-initial roots. On the other hand, the prefixes that are skipped in CV reduplication in (3–4), (9–11) all form syllables by themselves (e.g. (3h) [ma-davus] ‘sweet (AF)’ > [ma-da~davus] ‘all sweet (AF)’).

Nonetheless, bare consonantal prefixes that form syllables with root segments are not always copied. The examples in (19), repeated from (17), show that bare consonantal prefixes are not copied when the roots are trimoraic or longer.

- (19) The bare consonantal prefix is not copied when the roots are trimoraic or longer (root in boldface)
- |    |                                       |                              |
|----|---------------------------------------|------------------------------|
| a. | [m-iliskin]                           | ‘think (AF)’                 |
|    | [m-i- <u>li</u> ~liskin]              | ‘keep on thinking (AF)’      |
| b. | [m-uliva]                             | ‘err (AF)’                   |
|    | [m-u- <u>li</u> ~liva]                | ‘keep on erring (AF)’        |
| c. | [m-in $\chi$ alab]                    | ‘dress up (AF)’              |
|    | [m-in- $\chi$ <u>a</u> ~ $\chi$ alab] | ‘always dress up (AF)’       |
| d. | [m-u $\chi$ ajv]                      | ‘sunset (AF)’                |
|    | [m-u- $\chi$ <u>a</u> ~ $\chi$ ajv]   | ‘sunset every day (AF)’      |
| e. | [m-unawl]                             | ‘draw water (AF)’            |
|    | [m-u- <u>na</u> ~nawl]                | ‘keep on drawing water (AF)’ |
| f. | [m-udaap]                             | ‘help (AF)’                  |
|    | [m-u- <u>da</u> ~daap]                | ‘keep on helping (AF)’       |

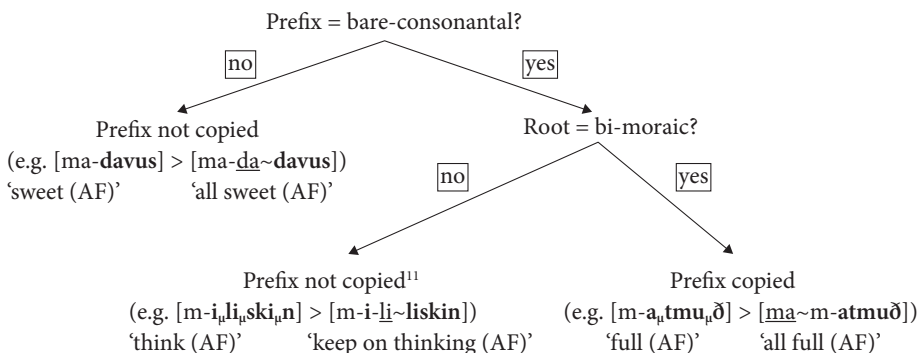
When the root is trimoraic or longer, the bare consonantal prefix can be skipped together with the root-initial syllable because the P-Root to which the RED attaches is at least bimoraic (e.g. (20a) [m-iliskin] ‘think (AF)’ > [m-i-li~lis<sub>μ</sub>ki<sub>μ</sub>n] ‘keep on thinking (AF)’). On the other hand, when the root the bare consonantal prefix attaches to is bimoraic, the prefix, together with the root-initial syllable, cannot be skipped because skipping the syllable containing the bare consonantal prefix and the root-initial onsetless syllable will cause the RED to attach to a P-Root that is smaller than bimoraic (e.g. (18a) [k-uskun] ‘eat together (AF)’ > \*[k-us~ku~ku<sub>μ</sub>n]). When the root is bimoraic, copying the consonantal prefix with the root-initial onsetless syllable can help the P-Root achieve a bimoraic size (e.g. (18a) [k-uskun] ‘eat together (AF)’ > [ku~|(k-)u<sub>μ</sub>sku<sub>μ</sub>n]). Thus, the reason why bare consonantal prefix has to be copied when the root is short (i.e. bimoraic) is to satisfy P-Root minimality.

Nonetheless, since the prefix is a bare consonant, skipping over the prefix can still satisfy the minimal bimoraic root requirement (e.g. (18a) [k-uskun] ‘eat together (AF)’ > [u~|(k-)us<sub>μ</sub>ku<sub>μ</sub>n], \*[(k-)u~|us<sub>μ</sub>ku<sub>μ</sub>n]). Yet, the bare consonantal prefix is not skipped but copied together with the onsetless root-initial syllable. This suggests that despite the fact that CV reduplication is always left out of the *coda*, the *onset* must always be copied in reduplication. The fact that the *coda* is

skipped but that the onset must be copied is not surprising because RED tends to be unmarked and the most unmarked syllable structure is the one with an onset and without a coda.

In sum, prefixes are copied only when they contain a bare consonant and form syllables with segments of roots that are no bigger than bimoraic. The correlation between prefix copying and the structures of the prefix/root is summarized in (20).

(20) Correlation between prefix copying and the structure of the root/prefix (root in boldface)



While prefixes are generally not copied, CV reduplication does not skip over the infix [-in-], which is inserted after the root-initial consonant, presumably because skipping over the infix would prevent the RED from forming a contiguous substring of the base (e.g. (21a) [k<in>ulut] 'sawed' > \*[ku~k<in>ulut] 'all sawn'). More examples are given in (21).

(21) Infix copied in CV reduplication (root in boldface)

- |    |               |                |                  |                    |
|----|---------------|----------------|------------------|--------------------|
| a. | [k<in>ulut]   | 'sawed'        | [ki~k<in>ulut]   | 'all sawn'         |
| b. | [ç<in>iða]    | 'married'      | [çi~ç<in>iða]    | 'all married'      |
| c. | [ç<in>awð-an] | 'planted (LF)' | [çi~ç<in>awð-an] | 'all planted (LF)' |
| d. | [χ<in>atul]   | 'piled up'     | [χi~χ<in>atul]   | 'kept piling up'   |
| e. | [χ<in>ud]     | 'drank'        | [χi~χ<in>ud]     | 'kept drinking'    |
| f. | [m<in>awn]    | 'ate'          | [mi~m<in>awn]    | 'ate frequently'   |

As for suffixes, since CV reduplication copies the CV sequence from the left edge of the root, which is typically minimally bimoraic, suffixes are always left out. As a matter of fact, suffixes are not only uncopied, they are also ignored in CV

11. Notice that as roots in Isbukun Bunun are minimally bimoraic, if a root is not bimoraic, it is trimoraic or bigger.



reduplication. Recall that onsetless root-initial syllables (and bare consonantal prefixes) are not copied unless to satisfy P-Root minimality. In other words, the RED must precede a P-Root that is minimally bimoraic. Suffixes cannot help prevent initial onsetless syllables (and bare consonantal prefixes) from being copied. For instance, in the example [adas-un] ‘bring (PF)’ > [a~a<sub>μ</sub>da<sub>μ</sub>s-u<sub>μ</sub>n], \*[a~da~da<sub>μ</sub>s-u<sub>μ</sub>n] ‘bring frequently (PF)’ the vowel-initial syllable is copied even if the suffix [-un] contributes a mora and makes the string after the RED bimoraic. In other words, vowel-initial syllables (and bare consonantal prefixes) are skipped when the *P-Root* is minimally bimoraic, not when the string of *P-Root* + *suffix* is bimoraic.

To summarize, this section has examined in depth the variable RED placements in CV reduplication as well as the role the non-reduplicative affixes (especially prefixes) play in CV reduplication. It has been shown that the non-reduplicative prefixes are normally left uncopied in CV reduplication except when the prefixes are bare consonantal and form syllables with segments of roots that are no bigger than bimoraic. The copying of the prefix is to satisfy P-Root minimality and to ensure no onset is left out in reduplication. For the variable RED placements, it has been shown that the RED normally copies from the left edge of the root and appears as a prefix to the root. However, when the root is vowel-initial and is trimoraic or longer, the RED will skip the root-initial syllable and appear root internally to avoid copying an onsetless syllable.

### 3.4 Problems in previous studies with respect to RED placement

That the RED can appear internal to the root is not first observed in this paper. L. Huang (1997), Yeh (2000), Zeitoun & Wu (2006), and Istanda (2009) point out that the RED may copy internal CV sequence, resulting in infixal -CV- reduplicant. (22) and (23) are examples involving internal -CV- reduplication in these studies.<sup>12</sup> (Data cited are accompanied by their source. For instance, data from L. Huang (1997) are cited as ‘LHx’, where ‘x’ refers to the page number, and data from Lin et al. (2001) are cited as ‘Leax’).<sup>13</sup>

12. Examples from Zeitoun & Wu (2006) are not considered because they are from Yeh (2000).

13. Most authors in previous studies make use of a Romanized orthographic system. Data cited from the previous studies are modified using IPA for purposes of this paper.

- (22) Infixal -CV- RED – Data from Yeh (2000)
- |    |                              |                                     |      |
|----|------------------------------|-------------------------------------|------|
| a. | [latlat-un]                  | ‘tear apart (PF)’                   | Y371 |
|    | [lat- <u>la</u> ~lat-un]     | ‘tear apart frequently (PF)’        |      |
| b. | [patas-un]                   | ‘write (PF)’                        | Y371 |
|    | [pa- <u>ta</u> ~tas-un]      | ‘write frequently (PF)’             |      |
| c. | [kalat-un]                   | ‘bite (PF)’                         | Y371 |
|    | [ka- <u>la</u> ~lat-un]      | ‘bite frequently (PF)’              |      |
| d. | [ʔama-wn]                    | ‘carry on the back (PF)’            | Y371 |
|    | [ʔa- <u>ma</u> ~ma-wn]       | ‘carry on the back frequently (PF)’ |      |
| e. | [χawχaŋ-un]                  | ‘scold (PF)’                        | Y371 |
|    | [χaw- <u>χa</u> ~χaŋ-un]     | ‘scold frequently (PF)’             |      |
| f. | [kilim-un]                   | ‘search (PF)’                       | Y371 |
|    | [ki- <u>li</u> ~lim-un]      | ‘often search (PF)’                 |      |
| g. | [pin-kajlas-un]              | ‘wake up (PF)’                      | Y371 |
|    | [pin-kaj- <u>la</u> ~las-un] | ‘wake up frequently (PF)’           |      |
- (23) Infixal -CV- RED – Data from L. Huang (1997) and Istanda (2009)
- |    |                         |                            |            |
|----|-------------------------|----------------------------|------------|
| a. | [maχanal]               | ‘shave (AF)’               | LH358      |
|    | [ma- <u>χa</u> ~χanal]  | ‘barber shop’              |            |
| b. | [mapaʔiw]               | ‘cure (AF)’                | LH358      |
|    | [ma- <u>pa</u> ~paʔiw]  | ‘doctor’                   |            |
| c. | [masnava]               | ‘teach (AF)’               | LH358      |
|    | [mas- <u>na</u> ~nava]  | ‘keep on teaching (AF)’    |            |
| d. | [maludaχ]               | ‘hit (AF)’                 | LH358; I36 |
|    | [ma- <u>lu</u> ~ludaχ]  | ‘keep on hitting (AF)’     |            |
| e. | [mastala] <sup>14</sup> | ‘wait (AF)’                | LH358; I36 |
|    | [mas- <u>ta</u> ~tala]  | ‘keep on waiting (AF)’     |            |
| f. | [mindanaz]              | ‘help (AF)’                | I36        |
|    | [min- <u>da</u> ~danaz] | ‘help frequently (AF)’     |            |
| g. | [cinpiçin]              | ‘afraid’                   | I36        |
|    | [cin- <u>pi</u> ~piçin] | ‘afraid frequently’        |            |
| h. | [ansaxan]               | ‘shoulder (AF)’            | I36        |
|    | [an- <u>sa</u> ~saxan]  | ‘shoulder frequently (AF)’ |            |

Except for Yeh (2000), discussions in the literature are descriptive in nature and do not explain what governs the different RED placements; namely, when the RED copies from the root-initial syllable and when from the root-internal syllable. According to Yeh (2000: 371), the PF marker plays an important role in determining whether

14. The examples in (23e) are recorded as [mastal] > [mas-ta~tal] in both L. Huang (1997: 358) and Istanda (2009: 36) presumably by mistake because the AF form of ‘wait’ is [mastala] according to the online *Isbukun Bunun dictionary* (Jeng 2010) and my consultant.

the RED copies from the root-initial syllable (involving prefixal CV- reduplication) or from the root internal syllable (involving infixal -CV- reduplication). As Yeh points out, -CV- RED only co-occurs with a PF marker. For instance, in the example [kalat-un] 'bite (PF)' > [ka-la~lat-un] 'bite frequently (PF)' (Y371), internal reduplication takes place to copy CV from the root final (not initial) syllable because the root is suffixed with the PF marker [-un]. When no PF marker is present, as in the example [kalat] 'bite (AF)' > [ka-kalat] 'bite frequently (AF)' (Y371), prefixal reduplication takes place, copying the root-initial CV. Yeh's analysis suggests that the variable RED placements are *morphologically* governed. However, Yeh's proposal is not consistent with the data in other previous studies nor the data collected first-hand in this study.

The examples in (24) are data from other previous studies. As (24) shows, the PF marker never causes internal -CV- reduplication. Notice that the unaffixed form of (24c) given in Lin et al. (2001) is identical to that of (22f) given in Yeh (2000). But while the root is shown to undergo infixal -CV- reduplication in Yeh, the same root is shown to undergo prefixal CV- reduplication in Lin et al. (2001).

(24) PF marker does not result in infixal -CV- reduplication –  
Data from L. Huang (1997), Li (1997), and Lin et al. (2001)

- |    |                          |                         |        |
|----|--------------------------|-------------------------|--------|
| a. | [tɕindun-un]             | 'weave (PF)'            | L345   |
|    | [tɕi~tɕindun-un]         | 'weave frequently (PF)' |        |
| b. | [ludaχ-un]               | 'hit (PF)'              | LH367  |
|    | [lu~ludaχ-un]            | 'hit frequently (PF)'   |        |
| c. | [kilim-un]               | 'search (PF)'           | Lea169 |
|    | [ki~kilim-un]            | 'often search (PF)'     |        |
| d. | [cida-wn]                | 'take (PF)'             | Lea169 |
|    | [ɕi~cida-wn]             | 'often take (PF)'       |        |
| e. | [mun-daða]               | 'climb (AF)'            | Lea169 |
|    | (root = daða             | 'up')                   |        |
|    | [un- <u>da</u> ~daða-wn] | 'climb frequently (PF)' |        |

The result of the first-hand data collected in this paper is similar to those in previous studies other than Yeh (2000). That is, the PF marker never causes infixal reduplication. According to my consultant, Yeh's data which involve internal -CV- reduplication consistently undergo prefixal CV- reduplication; compare (25) with (22).

(25) PF marker does not cause infixal -CV- reduplication – my fieldnote

- |    |                |                              |
|----|----------------|------------------------------|
| a. | [latlat-un]    | 'tear apart (PF)'            |
|    | [la~latlat-un] | 'tear apart frequently (PF)' |
| b. | [patas-un]     | 'write (PF)'                 |
|    | [pa~patas-un]  | 'write frequently (PF)'      |

- |    |                             |                                     |
|----|-----------------------------|-------------------------------------|
| c. | [kalat-un]                  | ‘bite (PF)’                         |
|    | [ <u>ka</u> ~kalat-un]      | ‘bite frequently (PF)’              |
| d. | [ʔama-wn]                   | ‘carry on the back (PF)’            |
|    | [ʔa~ʔama-wn]                | ‘carry on the back frequently (PF)’ |
| e. | [χawχaŋ-un]                 | ‘scold (PF)’                        |
|    | [χa~χawχaŋ-un]              | ‘scold frequently (PF)’             |
| f. | [kilim-un]                  | ‘search (PF)’                       |
|    | [ <u>ki</u> ~kilim-un]      | ‘often search (PF)’                 |
| g. | [pin-kajlas-un]             | ‘wake up (PF)’                      |
|    | [pin- <u>ka</u> ~kajlas-un] | ‘wake up frequently (PF)’           |

Not only does a PF marker not result in internal -CV- reduplication, the majority of the examples involving internal reduplication (cf. 5 and 19) collected first-hand in this paper also has no sign of a PF marker. It is possible that the inconsistency between Yeh’s (2000) proposal and the data in the other previous studies and this study is due to sub-dialectal difference since Yeh’s data are based on the Isbukun dialect in Taitung County while data in other previous studies and this study are not. But it is still worth noting that, as Yeh herself points out, even in the Isbukun dialect spoken in Taitung County, the PF marker does not always result in infixal -CV- reduplication, as exemplified in (26). Thus, the present paper believes that the PF marker should not be the cause for the shift of the RED into the root, at least not in the Isbukun dialect spoken in Kaohsiung City.

(26) PF marker does not result in infixal -CV- reduplication – Data from Yeh (2000)

- |    |             |              |                         |                    |      |
|----|-------------|--------------|-------------------------|--------------------|------|
| a. | [puχas-un]  | ‘break (PF)’ | [ <u>pu</u> ~puχas-un]  | ‘often break (PF)’ | Y372 |
| b. | [pudað-un]  | ‘break (PF)’ | [ <u>pu</u> ~pudað-un]  | ‘often break (PF)’ | Y372 |
| c. | [ludaχ-un]  | ‘hit (PF)’   | [ <u>lu</u> ~ludaχ-un]  | ‘often hit (PF)’   | Y372 |
| d. | [cida-wn]   | ‘take (PF)’  | [ <u>ci</u> ~cida-wn]   | ‘often take (PF)’  | Y372 |
| e. | [paklaŋ-un] | ‘grill (PF)’ | [ <u>pa</u> ~paklaŋ-un] | ‘often grill (PF)’ | Y372 |
| f. | [tunbak-un] | ‘open (PF)’  | [ <u>tu</u> ~tunbak-un] | ‘often open (PF)’  | Y372 |
| g. | [kawn-un]   | ‘eat (PF)’   | [ <u>ka</u> ~kawn-un]   | ‘often eat (PF)’   | Y372 |

Aside from Yeh (2000), Istanda (2009: 36) briefly mentions that in addition to the copying of the root-initial CV sequence, the RED can also copy CV sequences from the penultimate syllables of disyllabic or trisyllabic roots. Istanda’s description is not clear. When the root is disyllabic, copying of the penultimate syllable results in prefixal CV- reduplication just as in the normal case. But when the root is trisyllabic, copying of the CV sequence from the penultimate syllable suggests internal -CV- reduplication is involved. Thus, Istanda seems to imply that the variable RED placements are phonologically governed by syllable number; namely, infixal reduplication takes place when the root is trisyllabic. Istanda’s (2009) data are based on the Isbukun dialect spoken in Kaohsiung City just as the present paper. The analysis

implied in Istanda (2009) is problematic. First, not all trisyllabic roots undergo internal -CV- reduplication. This is evidenced by my fieldnote in (10) as well as data in (27) from Lin et al. (2001), which are also based on the Isbukun dialect spoken in Kaohsiung City.<sup>15</sup>

(27) Trisyllabic roots without internal -CV- reduplication –

Data from Lin et al. (2001)

- |    |                      |                     |        |
|----|----------------------|---------------------|--------|
| a. | [ʔanuχu]             | ‘sit’               | Lea175 |
|    | [mapal-ʔa~ʔanuχu]    | ‘cause to sit’      |        |
| b. | [χajðuŋðuŋ]          | ‘turn around’       | Lea176 |
|    | [matci-χa~χajðuŋðuŋ] | ‘is turning around’ |        |

Besides, roots smaller than trisyllabic can also undergo infixal -CV- reduplication, as evidenced by data in (5a–c). As mentioned, these *disyllabic* roots undergo reduplication not only because they are *trimoraic* (but not *trisyllabic*), but also because they are vowel-initial. Thus, neither is the variable RED placement governed solely by the size of the root, as implied in Istanda (2009), nor is trisyllabic the correct triggering size of infixal reduplication.

In sum, the variable RED placements are not morphologically governed by the PF marker, as suggested by Yeh (2000), nor is it governed solely by the size of the root, as implied in Istanda (2009). According to the present paper, the placement of the RED is simultaneously governed by the size and the syllable well-formedness of the root. The RED is normally a prefix to the root. However, when a root begins with a vowel and is trimoraic or longer, the RED will skip the root-initial syllable, copy the second syllable of the root, and occur root internally. Namely, onsetless root-initial syllables are not copied when the roots are trimoraic or longer. But when the roots are bimoraic, the onsetless syllables have to be copied to prevent an undersized P-Root.

Data from previous studies in (28), which are claimed to involve infixal reduplication conform to the generalization made in the present paper. Data in previous studies often do not have the boundary between the root and the prefix clearly marked. When the roots are separated from the prefixes, it becomes clear that the examples either contain vowel-initial trimoraic roots (e.g. 28c, e, f, h) or bimoraic roots + prefixes (e.g. 28a, b, d, g). Thus, the placement of the RED in these examples is as expected.

---

15. Data from the literature, as exemplified below, show that *trimoraic* roots do not undergo internal -CV- reduplication either when the roots are consonant-initial. My fieldnotes in (10d~f) show the same pattern.

- |    |            |               |               |                 |        |
|----|------------|---------------|---------------|-----------------|--------|
| a. | [χajsχajs] | ‘wipe (AF)’   | [χa~χajsχajs] | ‘wiper’         | Lea134 |
| b. | [vawlvawl] | ‘bounce (AF)’ | [va~vawlvawl] | ‘bouncing (AF)’ | Lea134 |

- (28) Data from L. Huang (1997) and Istanda (2009) involving claimed infixal reduplication

<u>Data given in L. Huang (1997) and Istanda (2009) for internal reduplication</u>			<u>Root</u>	<u>RED</u>
a.	[maχanal] 'shave (AF)' [ma-χa~χanal] 'barber shop'	LH358	[χanal]	CV-
b.	[mapaʔiw] 'cure (AF)' [ma-pa~paʔiw] 'doctor'	LH358	[paʔiw]	CV-
c.	[masnava] 'teach (AF)' [mas-na~nava] 'keep on teaching (AF)'	LH358	[isnava]	-CV-
d.	[maludaχ] 'hit (AF)' [ma-lu~ludaχ] 'keep on hitting (AF)'	LH358; I36	[ludaχ]	CV-
e.	[mastala] 'wait (AF)' [mas-ta~tala] 'keep on waiting (AF)'	LH358; I36	[astala]	-CV-
f.	[mindanaz] 'help (AF)' [min-da~danaz] 'help frequently (AF)'	I36	[indanaz]	-CV-
g.	[cinpičin] 'afraid' [cin-pi~pičin] 'afraid frequently'	I36	[pičin] <sup>16</sup>	CV-
h.	[ansaχan] 'shoulder (AF)' [an-sa~saχan] 'shoulder frequently (AF)'	I36	[ansaχan]	-CV-

#### 4. Formal analysis

This section provides a formal account of CV reduplication based on Optimality Theory. The generalizations that were obtained in the previous sections regarding CV reduplication are outlined in (29), and can be divided into those for RED size/shape and those for RED placement.

- (29) Generalizations of CV reduplication

RED size/shape

- The RED is monomoraic.
- The RED must not end with a coda.
- The RED forms a contiguous string of the base at the cost of unfaithful mapping between the base and the RED.

16. Though according to the online *Isbukun Bunun dictionary* (Jeng 2010), the root of (28i) is *kapičin*, the morphologically related words, *mapičin* 'afraid (AF)', *kapičin-un* 'afraid (PF)', and *cinpičin* 'afraid' suggest that the root should be *pičin*.

## RED placement

- d. The RED is normally a prefix to the root.
- e. The position of the RED shifts a syllable to the right to avoid copying onsetless syllables.
- f. The P-Root RED attaches to must be minimally bimoraic. Onsetless root-initial syllables are copied to satisfy P-Root minimality.
- f. Affixes are not copied unless it is to prevent reduplication without copying the onset or to prevent noncontiguous copying.

The RED size/shape and the RED placement can be accounted for by properly ranking the constraints in (30).

- (30) Constraints that are necessary to account for CV reduplication
- a. RED-MORA-L: Align the left edge of a RED with the left edge of a mora.
  - b. RED-MORA-R: Align the right edge of a RED with the right edge of a mora.
  - c. \*STRUC-SEG: No segments are allowed.
  - d. MAX-BR: Every segment in the base has a correspondent in the RED.
  - e. MAX-IO: Every segment in the input has a correspondent in the output.
  - f. IDENT-BR[SYL]: Base-RED correspondent segments have identical values for feature [syllabic]. (cf. McCarthy 2007; 2008: 211)
  - g. CONTIG-BR: No medial intrusion or skipping in the RED. (Kager 1999: 250)
  - h. ALIGN RED: Align the right edge of the RED with the left edge of the P-Root. (Downing 1998)
  - i. ONSET: Syllable must have onsets.
  - j. ALIGN P-ROOT- $\sigma$  (P-ROOT- $\sigma$ ): Align the left edge of a P-Root with the left edge of an onsetful syllable. (Downing 1998)<sup>17</sup>
  - k. MAX M-P: Every element of the M-Root has a correspondent in the P-Stem. (Downing 1998)
  - l. DEF M-P: Every element of the P-Root has a correspondent in the M-Root. (Downing 1998)
  - m. P-ROOT MINIMALITY (MIN): P-Roots cannot be smaller than two morae. (cf. Downing 1998)
  - n. ALIGN-ROOT-L: Align the left edge of the root with the left edge of the word.
  - o. ALIGN-RED-L: Align the left edge of a RED with the left edge of the word.
  - p. \*REPEAT(AF): Ban an output that contains two identical non-reduplicative affixal elements. (Tseng 2003: 77; H.-S. Lin 2010)

17. The present paper follows Inkelas (1989) and Downing (1998) in assuming that stem(/root)-initial vowels are extraprosodic and do not begin a syllable.

4.1 RED size/shape

Consider first the generalizations about the size and shape of the RED. As mentioned, the size of the RED is monomoraic and the RED must not end with a coda. As the templatic constraints (McCarthy & Prince 1993), which map RED to prosodic categories (i.e. RED = PCat), have the problem of predicting non-existing patterns (McCarthy & Prince 1995; Hendricks 1999, 2001; Crowhurst 2004), the present paper proposes an a-templatic analysis which incorporates two alignment constraints, RED-MORA-L (30a) and RED-MORA-R(30b), and a markedness constraint \*STRUC-SEG(30c). The analysis is a-templatic because the two alignment constraints together only require the left and right edges of the RED to be aligned with the left and right edges of some mora; candidates such as  $\underline{\mu}$ ~BASE,  $\underline{\mu\mu}$ ~BASE, and  $\underline{\mu\mu\mu}$ ~BASE all satisfy both constraints even though the reduplicants contain a different number of morae. The exact monomoraic size of the RED can be achieved by ranking \*STRUC-SEG below RED-MORA-L and RED-MORA-R since \*STRUC-SEG invites the RED to be as small as possible and will compress the RED to its minimal (monomoraic) size. Tableau 1 illustrates how  $||$ RED-MORA-L, RED-MORA-R  $>>$  \*STRUC-SEG $||$  works to predict the monomoraic size of the RED.

Tableau 1. Monomoraic RED size predicted by  $||$ RED-MORA-L, RED-MORA-R  $>>$  \*STRUC-SEG $||$



[tɕi- <u>da</u> ~daŋkul] ‘keep on jumping’ (<[tɕi-daŋkul] ‘jump’)			
Input: /ti-, RED, daŋkul/	RED-MORA-L	RED-MORA-R	*STRUC-SEG
a. tɕi- <u>d</u> ~da <sub>μ</sub> ŋku <sub>μ</sub> l	*!	*	*****
b. tɕi-da <sub>μ</sub> ŋku <sub>μ</sub> l ~da <sub>μ</sub> ŋku <sub>μ</sub> l			*****!***
c.  tɕi- <u>da</u> ~da <sub>μ</sub> ŋku <sub>μ</sub> l			*****

Tableau 2 shows that when \*STRUC-SEG outranks MAX-BR (30d) (which encourages copying), syllable coda is left out of the reduplication even though it is weightless in Isbukun Bunun because each additional segment copied would incur an additional violation in \*STRUC-SEG (cf. Tableau 2.b). On the other hand, \*STRUC-SEG must be outranked by MAX-IO (30e) to prevent non-RED elements from being deleted to satisfy MAX-BR (cf. Tableau 2.a).


Tableau 2. \*STRUC-SEG is sandwiched between MAX-IO and MAX-BR

[tɕi- <u>da</u> ~daŋkul] ‘keep on jumping’ (<[tɕi-daŋkul] ‘jump’)			
Input: /ti-, RED, daŋkul/	MAX-IO	*STRUC-SEG	MAX-BR
a. tɕi- <u>da</u> ~da <sub>μ</sub>	*!***	*****	
b. tɕi-da <sub>μ</sub> ŋ~da <sub>μ</sub> ŋku <sub>μ</sub> l		*****!	***
c.  tɕi- <u>da</u> ~da <sub>μ</sub> ŋku <sub>μ</sub> l		*****	****



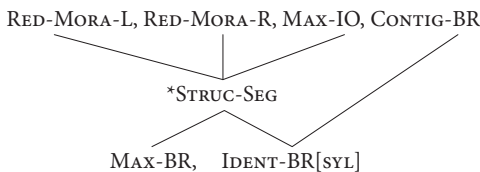
The other generalization about the RED size/shape is that the RED forms a contiguous string of the base at the cost of unfaithful feature correspondence between the base and the RED; thus for roots beginning with  $CG_iV_{ii}$ , the RED is  $CV_p$ , not  $CV_{ii}$ . Since the correspondence between a [-syllabic] glide in the base and a [+syllabic] vowel in the RED violates IDENT-BR[SYL] (30f), IDENT-BR[SYL] must be dominated by CONTIG-BR (30g), which encourages the RED to copy a contiguous string from the base, as illustrated in Tableau 3. Tableau 3 also shows that \*STRUC-SEG must also crucially outrank IDENT-BR[SYL] to ensure the no (trisegmental) CGV string is copied just to satisfy IDENT-BR[SYL] (cf. Tableau 3.b).

**Tableau 3.**  $||\text{CONTIG-BR}, *STRUC-SEG \gg \text{IDENT-BR[SYL]}||$  predicts  $CV_i\text{RED}$  for  $CG_iV_{ii}$  root  $[\underline{mi} \sim mja\chi di]$  ‘keep on working hard’ (<  $[mja\chi di]$  ‘work hard’)

Input: /RED, mia $\chi$ di/	CONTIG-BR	*STRUC-SEG	IDENT-BR [SYL]
a. <u>ma</u> <sub>ii</sub> ~ mjia <sub>ii</sub> $\chi$ di	*!	*****	
b. <u>mja</u> <sub>ii</sub> ~ mjia <sub>ii</sub> $\chi$ di		*****!	
c.  <u>mi</u> <sub>i</sub> ~ mjia <sub>ii</sub> $\chi$ di		*****	*

The constraint ranking for the RED size/shape is summarized in (31):

(31) Constraint ranking for RED size/shape



## 4.2 RED placement

We turn now to the phenomenon of RED placement in which the RED, which is normally a prefix to the root, shifts a syllable to the right to avoid copying an onsetless syllable except when the root is bimoraic.

The skipping of vowel-initial syllables in reduplication is quite common since RED tends to be less marked than non-reduplicated forms (McCarthy & Prince 1993; Downing 1994; Kager 1999; H.-S. Lin 2010; among others). Downing (1994) proposes that to account for the ignored vowel-initial syllables in reduplication, it is essential to assume two prosodic constituents, Prosodic Stem (P-Stem) and Prosodic Root (P-Root), which are smaller than the prosodic constituent of Prosodic Word (cf. also Inkelas 1989; 1993). Downing (1994) proposes that for reduplication that skips the initial onsetless syllable, the RED is not attached to

the Morphological-constituent (M-constituent) but to the Prosodic constituent (P-constituent) by the alignment constraint which aligns the left/right edge of the RED with the opposite edge of the P-constituent (cf. (30h) ALIGN RED). In the default case, the P-constituent is coextensive with the corresponding M-constituent, but misalignment between P-constituent and M-constituent may occur to ensure the P-constituent is unmarked for aligning with an onsetful syllable. Thus, when the stem (or root) is consonant-initial, the P-constituent and M-constituent are perfectly aligned, but when the stem (or root) is vowel-initial, in order to satisfy ONSET (30i) and ALIGN P-STEM- $\sigma$  (or (30j) ALIGN P-ROOT- $\sigma$ ), the vowel-initial syllable may be skipped, resulting in violation of MAX M-P (30k) because the P-Stem/Root excludes the vowel-initial syllable from the M-Stem/Root. Skipping of the initial onsetless syllable is not the only way to satisfy ONSET and ALIGN P-STEM- $\sigma$ ; the two constraints could also be satisfied by including elements not in the M-Stem/Root (such as prefixes), but in that case, DEP M-P (30l) would be violated.

To account for reduplication in Axininca Campa illustrated in (32), which is repeated from (8) for the ease of reference, Downing (1998) proposes the constraint ranking in (33).<sup>18</sup>

- (32) Axininca Campa (Spring 1990; McCarthy & Prince 1993; cited from Downing 1998: 20)

Unprefixed form	Prefixed form	Gloss
a. <i>Consonant-initial roots (root-initial syllable copied)</i>		
t <sup>h</sup> aan̥ki~t <sup>h</sup> aan̥ki	(non-)t <sup>h</sup> aan̥ki~t <sup>h</sup> aan̥ki	'hurry'
kint <sup>h</sup> a~kint <sup>h</sup> a	(non-)kint <sup>h</sup> a~kint <sup>h</sup> a	'tell'
tason̥ka~tason̥ka	(non-)tason̥ka~tason̥ka	'fan' /tason̥k/
b. <i>Vowel-initial roots of three or more syllables (root-initial syllable skipped)</i>		
osampi~sampi	(n-)osampi~sampi	'ask'
aacika~cika	(n-)aacika~cika	'stop' /aacik/
orin̥ka~rin̥ka	(n-)oirin̥ka~rin̥ka	'lower' /orin̥k/
c. <i>Disyllabic vowel-initial roots (root-initial syllable copied)</i>		
ooka~ooka	(n-)ooka~nooka	'abandon' /ook/
aka~aka	(n-)aka~naka	'answer' /ak/




- (33) Constraint ranking for Axininca Campa (cf. Downing 1998: 21)  
 ||ONSET, P-ROOT- $\sigma$ , MIN >> DEP M-P >> MAX B-R, MAX M-P||

As illustrated in Tableau 4, the ranking ||ONSET, P-ROOT- $\sigma$  >> DEP M-P, MAX M-P|| predicts that when the root is vowel-initial, P-Root and M-Root will be misaligned to ensure the P-Root can begin with an onsetful syllable. (Tableau 4.b, d, f, h) with

18. Two constraints, P-word and DEP I-O, which are irrelevant in the analysis of the Isbukun Bunun data are excluded for simplification. Thus, the edges of P-word, as well as some non-crucial candidates, are excluded accordingly.

their perfect M-P alignment are ruled out accordingly. The ranking  $||\text{DEP M-P} \gg \text{MAX M-P}||$  predicts that it is better to skip the initial vowel than to copy the prefix before it. Candidate (g) in Tableau 4 is ruled out accordingly. The ranking of MIN, which requires the P-Root to be no smaller than two syllables, over DEP M-P predicts that when the root is disyllabic, the initial vowel cannot be skipped in order to satisfy P-Root minimality. Prefixes are thus incorporated in P-Root to ensure the P-Roots can begin with an onset and be minimally disyllabic. Candidate (c) in Tableau 4 is correctly ruled out. Notice this ranking of MIN accounts for the fact that the initial vowel is copied when the root is disyllabic. The ranking also predicts that when the root is consonant-initial, no misalignment between P- and M-Root is necessary (as illustrated in Tableau 4.i-j).

**Tableau 4.** *Axininca Campa* reduplication ('↑' indicates P-Root edge; '↓' indicates M-Root edge; RED is underlined; <sup>19</sup> 'T' is epenthetic C; 'A' is epenthetic V) (Downing 1998: 21)

	ONSET	P-ROOT- σ	MIN	DEP M-P	DEP I-O	MAX B-R	MAX M-P
a.  [n{ookA~ <u>nooka</u>				*	*		
b. n{[ookA~ <u>ooka</u>	*!	*			*		
c. n{oo[kA~ <u>ka</u>			*!		*		*
d. n{[ookA-T~ <u>ooka</u>		*!			**		
e.  n{o[sampi~ <u>sampi</u>							*
f. n{[osampi~ <u>osampi</u>	*!	*					
g. [n{osampi~ <u>nosampi</u>				*!			
h. n{[osampi~ <u>Tosampi</u>		*!			*		
i.  non-↓{[kint <sup>h</sup> a~ <u>kint<sup>h</sup>a</u>							
j. [non-↓{kint <sup>h</sup> a~ <u>nonkint<sup>h</sup>a</u>				*!			

RED placement in Isbukun Bunun is quite similar to Axininca Campa in that while onsetless syllables of longer roots are not copied, those of shorter ones are. Therefore, the present paper follows Downing (1998) in assuming an undominated role of ALIGN RED, to ensure the affixation of RED to a P-Root rather than an M-Root, and adopts some constraints and rankings Downing proposes for Axininca Campa. The constraints and rankings adopted are as below:

(34) Constraint rankings adopted from Downing (1998)

- a. ONSET, P-ROOT-σ >> DEP M-P, MAX M-P
- b. DEP M-P >> MAX M-P

<sup>19</sup> RED is in boldface in Downing (1998). To be consistent to the data presentation of this paper, it is underlined in this paper.

The first ranking (34a) predicts that P-Root will skip the first syllable of M-Root if M-Root is vowel-initial in order to satisfy ONSET and P-ROOT-σ. It also predicts that the first syllable of M-Root will not be skipped if it begins with a consonant because perfect alignment between P- and M-Root will not result in violations of ONSET or P-ROOT-σ. As illustrated in Tableau 5, the ranking predicts that perfect alignment between M-Root and P-Root is suboptimal when the root is vowel-initial (cf. Tableau 5.a and e) and optimal when the root is consonant-initial (cf. Tableau 5.d). The second ranking (34b) predicts that when M-Root and P-Root have to misalign, it is better for P-Root to skip the initial onsetless syllable in the M-Root than to include elements not present in the M-Root, such as the prefix. The ranking rules out (Tableau 5.f).

**Tableau 5.** ||ONSET, P-ROOT-σ >> DEP M-P >> MAX M-P|| predicts the skipping of the first syllable of M-Root if M-Root is vowel-initial  
(‘|’ indicates P-Root edge; ‘{’ indicates M-Root edge; root is in boldface)

	ONSET	P-ROOT-σ	DEP M-P	MAX M-P
a.     a~{ astala}~av	*!*	*		
b.     ☞ {as~ tala}~av	*			**
c.     tɕin~{dan~ kul}~ kul				*!*
d.     ☞ tɕin~ dan~{ dan}kul				
e.     m~as~{ astala}~av	*!	*		
f.      ma~ m~{ astala}~av			*!	
g.     ☞ m~{as~ tala}~av				**


Reduplication in Isbukun Bunun also differs from Axininca Campa in three respects. First, the minimal size of the P-Root in Isbukun Bunun is bimoraic while that in Axininca Campa is disyllabic; thus, the MIN constraint which requires P-Roots to be minimally *disyllabic* in Downing (1998) is defined as requiring P-Roots to be minimally *bimoraic* in the present study (30m).<sup>20</sup>

20. Notice that MIN is not a templatic constraint because a templatic constraint is a constraint on prosody-morphology interface, with the constraint schema RED = PCat (McCarthy & Prince 1993) (cf. Gafos 1998; Kager 1999: 218). MIN is a well-formedness constraint that requires a prosodic structure P-Root to have a minimal prosodic size. Thus, it is similar to the widely used markedness constraint FTBIN. Notice also that the DEP M-P constraint, though low ranked, predicts the P-Root will not be too big since any segment P-Root has that is not present in the M-Root violates the constraint.

Second, in Isbukun Bunun, when a vowel-initial root is bimoraic and not preceded by a prefix, the RED can copy the root-initial vowel (e.g. [a~{a<sub>μ</sub>da<sub>μ</sub>s-un] ‘bring’), suggesting that it is more important to satisfy P-Root minimality than to avoid copying an onsetless syllable. Such an example, which is not considered in Downing (1998), requires the crucial domination of the size restricting constraint MIN over ONSET. Tableau 6 shows ||MIN >> ONSET|| correctly rules out candidate (b) in Tableau 6.

**Tableau 6.** ||MIN >> ONSET|| predicts onsetless syllable is copied to prevent undersized P-Root

(‘|’ indicates P-Root edge; ‘{’ indicates M-Root edge; root is in boldface)

		MIN	ONSET	P-ROOT-σ	DEP M-P	MAX M-P
a.	 <u>a</u> ~{ <u>a</u> <sub>μ</sub> <u>da</u> <sub>μ</sub> s -un		**	*		
b.	{ <u>a</u> <sub>μ</sub> ~ <u>da</u> <sub>μ</sub> ~  <u>da</u> <sub>μ</sub> s -u <sub>μ</sub> n	*	*			*

Third, the RED is suffixal in Axininca Campa but prefixal in Isbukun Bunun. That the RED is usually a prefix to the root suggests that the root and the RED are competing to be aligned with the left edge of the word and that ALIGN-ROOT-L (30n), which asks root to appear at the left edge of the word must be outranked by ALIGN-RED-L (30o), which requires RED to appear at the beginning of the word, as illustrated in (35).<sup>21</sup>

- (35) ||ALIGN-RED-L >> ALIGN-ROOT-L|| ensures the RED appears before the root  
 ALIGN-RED-L >> ALIGN-ROOT-L  
 [mi~mjaχdi] ‘keep on working hard’ (< [mjaχdi] ‘work hard’)  
 /RED, miaχdi/  
mi~mjaχdi > mjaχdi~di

21. The RED, though prefixal, is not in absolute initial position, as shown in examples like [mal-ba~baŋkiki] ‘keep on kneeling down’ (< [mal-baŋkiki] ‘kneel down’). It is preceded by the prefix [mal-]. In Isbukun Bunun, prefixes normally do not participate in reduplication and occur before RED. Placing the RED at the left edge of the word, before the non-reduplicative prefix, will violate either \*REPEAT (e.g. \*[ma~mal-baŋkiki]) or ANCHOR-BR (e.g. \*[ba~mal-baŋkiki]). Thus, ranking \*REPEAT and ANCHOR-BR above ALIGN-RED-L makes the correct prediction that the RED will appear after a non-reduplicative prefix, as illustrated below.


- [mal-ba~baŋkiki] ‘keep on kneeling down’ (< [mal-baŋkiki] ‘kneel down’)
- (i) \*REPEAT >> ALIGN-RED-L (ii) ANCHOR-BR >> ALIGN-RED-L  
 /mal-, RED, baŋkiki/ /mal-, RED, baŋkiki/  
 mal-ba~baŋkiki > ma~mal-baŋkiki mal-ba~baŋkiki > ba~mal-baŋkiki

Notice that ALIGN-ROOT-L must be dominated by the RED size constraints RED-MORA-L and RED-MORA-R to ensure that the desire for the root to be aligned with the left edge of the word will not compress the RED to be smaller than monomoraic, as illustrated in (36).

- (36) ||RED-MORA-L, RED-MORA-R >> ALIGN-ROOT-L|| ensures RED is at least monomoraic
- RED-MORA-L, RED-MORA-R >> ALIGN-ROOT-L
- [mi~mjaxdi] ‘keep on working hard’ (< [mjaxdi] ‘work hard’)
- /RED, miaχdi/
- mi<sub>E</sub>~mjaxdi > m~mjaxdi

Back to the RED placement. Since the RED will shift a syllable to the right to avoid copying an onsetless syllable when the root is long (trimoraic or longer), ALIGN-RED-L must be dominated by ONSET and P-ROOT-σ to account for infixal -CV- reduplication in vowel-initial words; compare (a) with (b) in Tableau 7.

**Tableau 7.** ||ONSET, P-ROOT-σ >> ALIGN-RED-L|| predicts infixal reduplication  
(‘|’ indicates P-Root edge; ‘{’ indicates M-Root edge; root is in boldface)

	ONSET	P-ROOT- σ	ALIGN-R ED-L	DEP M-P	MAX M-P
a. <u>a</u> ~{  <b>astala</b>  -av	**!	*			
b.  {as- <u>ta</u> ~  <b>tala</b>  -av	*		**		**

The final generalization that needs to be considered is that affixes, which are generally left out in CV reduplication, are copied in two circumstances; (1) to prevent reduplication without copying the onset, and (2) to avoid noncontiguous copying of the base. Copying of the non-reduplicative affixes will incur violations of \*REPEAT(AF) (30p). The domination of \*REPEAT(AF) over ALIGN-RED-L predicts that the non-reduplicative prefix is normally uncopied despite the fact the RED prefers to be left-aligned with the word (compare (b) with (c) in Tableau 8). On the other hand, reduplication without onset and noncontiguous copying violate ONSET and CONTIG-BR, respectively. Thus, the ranking ||ONSET >> \*REPEAT(AF)|| rules out reduplication that copies the vowel-initial syllable without its preceding onset, which comes from the prefix (e.g. Tableau 8.f). ||CONTIG-BR >> \*REPEAT(AF)||, on the other hand, rules out copying that skips the infix [-in-], as illustrated in (e.g. Tableau 8.h).

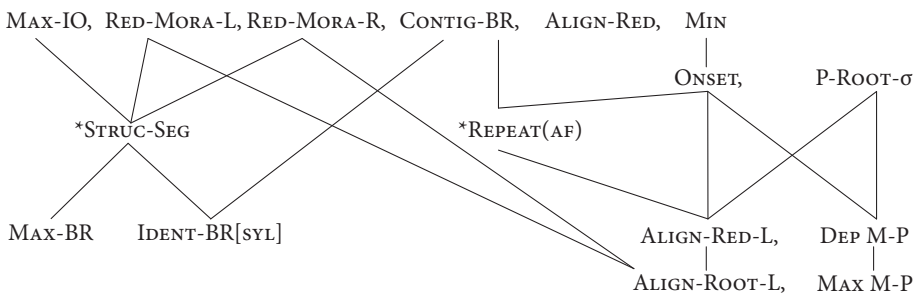
**Tableau 8.** ||CONTIG-BR, ONSET >> \*REPEAT(AF) >> ALIGN-RED-L||

(' indicates P-Root edge; ' indicates M-Root edge; root is in boldface)

		Min	CONTIG-BR	ONSET	P-ROOT-σ	*REPEAT (AF)	ALIGN-RED-L	DEP M-P	MAX M-P
a.	m- <u>as</u> ~{  a <sub>μ</sub> sta <sub>μ</sub> la <sub>μ</sub>   }-av			*!	*		*		
b.	<u>ma</u> ~ m-{a <sub>μ</sub> s ta <sub>μ</sub> la <sub>μ</sub> }-av					*!		*	
c.	☞ m-{as-t <u>a</u> ~ ta <sub>μ</sub> la <sub>μ</sub> }-av						***		**
d.	m-{ a <sub>μ</sub> - <u>da</u> <sub>μ</sub> ~ da <sub>μ</sub> s -u <sub>μ</sub> n	*!					**		*
e.	m- <u>a</u> ~{  a <sub>μ</sub> da <sub>μ</sub> s -u <sub>μ</sub> n			*!	*		*		
f.	<u>a</u> ~ m-{a <sub>μ</sub> da <sub>μ</sub> s -u <sub>μ</sub> n			*!				*	
g.	☞ <u>ma</u> ~ m-{a <sub>μ</sub> da <sub>μ</sub> s -un					*		*	
h.	<u>ku</u> ~{  k<i <sub>μ</sub> n>u <sub>μ</sub> lu <sub>μ</sub> t		*!					**	
i.	{k<i~ <u>nu</u> ~ n>u <sub>μ</sub> lu <sub>μ</sub> t					*	*!*	*	*
j.	☞ <u>ki</u> ~{  k<i <sub>μ</sub> n>u <sub>μ</sub> lu <sub>μ</sub> t					*			

The final constraint ranking for the CV reduplication, combining rankings for RED size/shape and for RED placement, is as below:

(37) Final constraint ranking for CV reduplication



## 5. Conclusion

This paper examines CV reduplication in Isbukun Bunun, which has variable RED placements. Normally, the RED is prefixed to the root. But in certain examples, the RED is infixed in the root, after the initial syllable. Previous studies have different opinions with respect to what governs the RED placement. On the one hand, Yeh

(2000) explicitly claims that the RED placement is morphologically governed by the PF marker; infixal RED co-occurs with PF marker. On the other hand, Istanda (2009) briefly mentions that the syllable number can influence the RED placement; internal reduplication occurs when the root is trisyllabic. Nonetheless, neither proposals can properly explain the variable RED placement in the Isbukun dialect spoken in Kaohsiung City; PF markers and trisyllabic roots do not always result in infixal reduplication nor do roots that undergo infixal reduplication always contain PF markers or three syllables.

Based on first-hand data, this paper argues that the variable RED placements are phonologically governed by both the size and the syllable well-formedness of the root. It is shown that the RED is generally a prefix to the root. But the initial syllable of a root can be skipped when it is onsetless, resulting in infixal reduplication. As shown, not every initial onsetless syllable is skipped. It is skipped only when the root is trimoraic or longer. When the root is bimoraic, the initial syllable cannot be skipped in order to satisfy P-Root minimality.

Obviously, several forces are competing in CV reduplication; the force to ensure a prefixal RED, the force to ensure an onsetful RED, and the force to ensure a minimally bimoraic P-Root. The outcome of the conflicting forces is accounted for by the proper ranking of OT constraints. The domination of ALIGN-RED-L over ALIGN-ROOT-L predicts the RED is prefixal. The domination of ONSET and P-ROOT- $\sigma$  over ALIGN-RED-L predicts internal reduplication occurs to ensure the RED is onsetful. Finally, the domination of MIN over ONSET and P-ROOT- $\sigma$  ensures that when a root is bimoraic, the initial syllable is copied to satisfy P-Root minimality, even if the root-initial syllable is onsetless.

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## Abbreviations

AF	Agent Focus
IF	Instrumental Focus
Imp	imperative
Int	intransitive
LF	Locative Focus
M-constituent	Morphological-constituent
M-Root	Morphological Root
OT	Optimality Theory
P-constituent	Prosodic constituent
PF	Patient Focus
P-Root	Prosodic Root
P-Stem	Prosodic Stem
RED	reduplicant

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