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CONDITIONS ON CONSONANT SEQUENCES CREATED THROUGH REDUPLICATION IN ROVIANA: A PRELIMINARY STUDY

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Abstract

Roviana is a little described Austronesian language of the Solomon Islands. Roviana does not have syllable codas in un-reduplicated surface forms; however, the most common reduplicant shape is CVC-. The coda of the reduplicant and the onset of the base create a sequence of consonants, the only such place in the language where consonant sequences are permitted. There are several conditions on acceptable consonant sequences. If a CVC- reduplicant would create an unacceptable coda-onset sequence, then the reduplicant surfaces as CV-. Homorganic consonant sequences are generally avoided, but the pattern of acceptable and prohibited homorganic sequences is idiosyncratic and cannot be couched in a natural class. The patterns of reduplication in Roviana are interesting because CVC- reduplication in a language which otherwise avoids codas is rare, and the pattern of banned and permitted sequences cannot be neatly fit into a natural class. Roviana reduplication stands to act as a valuable data point in phonological typology, highlighting the need to investigate little-described languages.

1. Introduction

Roviana, an Austronesian language of the Solomon Islands, displays an interesting pattern of reduplication. Roviana does not permit syllable codas in words that have not undergone reduplication, but codas appear in the context of reduplication where the most common reduplicant shape is CVC-. The coda of the CVC-reduplicant creates a sequence of consonants with the onset of the base. This is the only environment where consonant sequences occur in Roviana, but there is a series of conditions on acceptable and unacceptable consonant sequences. Reduplication that would lead to a prohibited sequence results in CV- reduplication instead of CVC- reduplication, thus avoiding the prohibited sequence. This paper provides a descriptive account of the patterns of eligible and prohibited sequences as well as a limited discussion of its relevance to phonological theory, particularly Optimality Theory (Prince and Smolensky 1993/2004). While OT can readily account for some apparently problematic aspects of the phenomena observed in Roviana, other constraints would have to be so idiosyncratic that it would not support the notion that the constraints were universal.

Additionally, this paper demonstrates the importance of theoretical investigation into little-described languages like Roviana. By some estimates, 37% of the world's languages that were spoken in 1950 are currently endangered or extinct (Simons and Lewis 2013) and 50-90% of the world's languages could be extinct within 100 years (Krauss 1992). It is difficult to accurately calculate the current level of description of the world's languages. There are 2,679 that have enough description to be included in WALS survey (Dryer and Haspelmath 2019) while

Ethnologue (Simons and Fennig 2018) lists 7,097 known languages. Therefore, it is safe to estimate that less than half of the world's languages have an adequate level of description.

1.1 Reduplication

Reduplication is a process whereby all or part of a word is copied and affixed to the base. There are two widely recognized categories of reduplication, 1) full reduplication which involves copying the entire base, and 2) partial reduplication which involves incomplete copying of the base. An example of each type is given in (1) and (2) respectively. Example (1) demonstrates full reduplication in Indonesian plural marking and example (2) demonstrates partial reduplication in Ughele intensifier marking.

(1) Indonesian plural reduplication (adapted from Cohn 1989 via Kager 1999)

wanita	'woman'	*wanita-wanita*	'women'
mašarakat	'society'	*mašarakat-mašarakat*	'societies'

(2) CV- intensifying reduplication in Ughele (Frosdat 2012)

taraza	'destroy'	***ta-****taraza*	'completely destroy'
gura	'can (ability)'	***gu-****gura*	'really can'

Partial reduplicants are commonly based on a prosodic template, as per Gafos (1998) and Kager (1999), which is generally thought to be determined by the phonology of the language (Downing 2006, Blenkiron and Alderete 2015, Kager 1999, Gafos 1998). Reduplicated segments typically do not display structures that are marked compared to the general phonology of the language, an observation called "The emergence of the unmarked" (McCarthy and Prince 1994). Furthermore, in accordance with the emergence of the unmarked, reduplication is often an environment which will contain structures that are less marked, cross-linguistically, than other environments in the same language. For example, Nootka, a Wakashan language (Stonham 1990), allows only a CV or CVV syllable as the template for partial reduplication, even though the language allows codas in root words. Codas are a marked structure cross-linguistically, thus reduplicants in Nootka are less marked than the root words which allow codas. Example (3) demonstrates the emergence of less marked structures in Nootka reduplication.

(3) Partial reduplication in Nootka (Adapted from Kager 1999 (from Stonham 1990))

a.	CV	*čims-ʻiːħ*	***či-****čims-ʻiːħ*	'hunting bear'	(* ***čim-****čims-ʻiːħ*)
b.	CVV	*waːs-čił*	***waː-****waːs-čił*	'naming where…'	(****waːs-****waːs-čił*)

Sometimes, structures which are marked in the general phonology appear in reduplicants (Takeda 1998). Rotuman, an Oceanic language (Lynch, Ross, and Crowley 2002), generally has a CV or CVV syllable shape (Blenkiron and Alderete 2015); however, various morphological processes, including reduplication, can create closed syllables (Schmidt 2002). Rotuman displays

a variety of reduplicant shapes, but the preferred shape is a heavy syllable. This can be accomplished by copying the first CVV or CV: of a base, as in (4a) and (4b), in other cases this might involve copying the first CVC, as in (4c) and (4d). Example (4) demonstrates heavy syllable reduplication through the copying of the first three segments of the base in Rotuman.

(4) Heavy syllable reduplication in Rotuman (Adapted from Blenkiron and Alderete 2015).

	CVV- reduplication	
a.	*ta:-ta:tu:*	'to bang, thus'
b.	*sui-sui*	'covered with spikes'
	CVC- reduplication	
c.	*fan-fana*	'to shoot repeatedly'
d.	*maʔ-maʔɔnu*	'muddy'

In (1-4), the reduplicants are consistent and predictable based on their status as full or partial combined with the phonotactics of the language and the shape of the root itself. In many cases, however, a single language with partial reduplication may have multiple reduplicant shapes. Shape variance within a language may be conditioned by either 1) different functions or 2) phonological properties of the language. Shape variance dictated by function is discussed first, then shape dictated by phonology. In section 2.2, this distinction is revisited to demonstrate that shape variance in Roviana is not dictated by function.

Urbanczyk (2006) demonstrates different functions for different reduplicant shapes in Lushootseed, demonstrated in example (5). To express the diminutive function, a CV- reduplicant is used, but, for the same root word, a CVC- reduplicant is used to express the distributive function. If reduplication for the diminutive function would result in a consonant followed by schwa, the schwa is strengthened to [í], as in (5a). The CVC- reduplication is based on a different template which is why it allows both a coda and a stressed schwa.

(5) Reduplicant shape influenced by function in Lushootseed (adapted from Urbanczyk 2006)

a. Diminutive (CV-) reduplication

ǰəsəd	'foot'	*ǰí-ǰəsəd*	'little foot'

b. Distributive (CVC-) reduplication

ǰəsəd	'foot'	*ǰəs-ǰəsəd*	'feet'

Phonology is the other factor which can condition reduplicant shape variance within a single language without regard to function. Example (6) demonstrates two common reduplication patterns among the possible reduplicant shapes in Rotuman. One way to create heavy syllables while preserving as many segments as possible is to copy the first CVCV of the base and then metathesize the second vowel and consonant to CVVC, creating a diphthong inside the reduplicant,

as in example (6b). In example (6a), the base displays a CVCV pattern, but the resulting reduplicant is CVC- rather than CVVC, as in example (6b). The difference in reduplicant shape in example (6a) can be accounted for by proposing that the first CVCV- is copied and then metathesized to CVVC, and then the long vowel is reduced to create a CVC- reduplicant, which is preferred when metathesis creates a long vowel instead of a diphthong. The dis-preference for long vowels results in two different outputs for CVCV reduplication, demonstrating that phonological factors can condition reduplicant shape. As previously mentioned, Rotuman contains more than just two reduplication shapes and has a variety of phonological factors which condition metathesis; however, a full account of the phonological conditions which predict whether a CVCV base string will surface as CVC- or CVVC- is beyond the scope of this paper. For a fuller discussion of metathesis and reduplication in Rotuman, please see Blenkiron and Alderete (2015) and Schmidt (2002).

(6) Reduplicant shape variance in Rotuman (Adapted from Blenkiron and Alderete 2015)

a. CVCV→ CVC-
fan-fana 'to shoot repeatedly'

b. CVCV→CVVC-
moil-milo 'peaked head-dress with feathers'

In summary, reduplicants, cross-linguistically, are sensitive to the phonological properties of the base. Reduplicant shape variance within a single language may either correlate with separate function or be phonologically conditioned. In Roviana reduplicant shape is dictated entirely by phonology as the same shape variance is observed across different functions. Before discussing form and function of reduplication in Roviana, it is useful to first introduce some background on Roviana language.

1.2 Roviana background

Roviana is an Austronesian language of the Solomon Islands. Roviana is part of the Northwest Solomonic subgroup within the Oceanic language family within Austronesian (Lynch, Ross, and Crowley 2002), and is spoken as a first language by approximately 5,000-6,000 people (Oxenham, Pearce, and Terraschke 2005). There is still consistent intergenerational transmission of the Roviana language; however, it is threatened by the encroaching usage of Solo Pijin (the creole lingua franca of the Solomon Islands) in everyday life. Roviana is spoken primarily in the Western Province of the Solomon Islands around the Roviana lagoon area of the island of New Georgia; it is also commonly spoken on the islands of Kohinggo, Parara, and Kolombangara. The data for this study was collected from speakers from Tolavae and Rarumana villages on Parara Island, Noro and Munda towns on New Georgia Island, Jah Mountain on Gizo Island, the Solomon Islands capitol city of Honiara, and speakers living abroad in Wellington, New Zealand.

Roviana has 16 phonemic consonants and 5 vowels, displayed in figures 1 and 2 respectively. Voiced stops are pre-nasalized. There are no vowel length distinctions or complex onsets/codas. Roviana does not allow sequences of identical segments.

Figure 1. Roviana Consonants

	bilabial	alveolar	velar	glottal
voiceless stop	p	t	k	
pre-nasalized voiced stop	^{m}b	^{n}d	^{ŋ}g	
voiceless fricative		s		h
voiced fricative	β	z	ɣ	
nasal	m	n	ŋ	
trill		r		
lateral liquid		l		

Figure 2. Phonemic vowel inventory of Roviana

	Front	Back/Rounded
High	i	u
Mid	e	o
Low	a	

Roviana has two surface syllable shapes in un-reduplicated forms, CV and V. I examined 3,680 Roviana words from Waterhouse's (1949) dictionary as well as my own field notes, and not a single form was represented with a coda. Outside of reduplication, it appears that Roviana actively avoids codas in surface forms. Evidence of avoidance comes from the observed alternation of verb-final echo vowels and object indexing enclitics.

Echo vowels are inserted after verbs that end in a consonant in the underlying form. Evidence for the insertion of the echo vowel comes from the observation that infinitive forms of these verbs have a final vowel that is not present when an object index is added in a transitive context. For example, the surface form of /ɣarat/, *ɣarata*, does not have the final vowel that it has in its infinitive form when an object agreement enclitic is attached, as in *ɣarat=ia* 'bite 3SG.OBJ,' demonstrated in example (7a)[1]. The final vowel in *ɣarata* contrasts with the behavior of final vowels of infinitive verbs that end in vowels in the underlying form, such as *taka*, 'kick.' Example (7b) demonstrates that the final vowel in *taka* is preserved when agreement is added, as in *taka=ia*, 'kick 3SG.OBJ.'

[1] Indeed, the Proto Oceanic reconstruction of 'bite' *kaRat (Blust and Trussel 2018) had a word final consonant.

(7) Roviana echo-vowel insertion

	Underlying	Surface IFTV			Surface with OBJ.AGR	
a.	/*ɣarat*/	[*ɣarata*]	‘to bite’	/*ɣarat=ia*/	[*ɣaratia*]	‘to bite it’
b.	/*taka*/	[*taka*]	‘to kick’	/*taka=ia*/	[*takaia*]	‘to kick it’

The echo-vowel insertion phenomenon is characterized by a rule in example (8). Positing that the final vowel in *ɣarata* is epenthetic is the best way to account for the difference in forms which have the object agreement *=ia* in examples (7a) and (7b).

(8) Roviana echo-vowel insertion rule
$\emptyset \rightarrow V_i / V_i$ C__#

The echo-vowel insertion suggests that Roviana phonology generally avoids codas in surface forms. In terms of OT constraints, this would suggest that a markedness constraint which prohibits final codas, such as NO CODA, outranks a faithfulness constraint which prohibits insertions, such as DEP. The dis-preference for codas in surface forms runs contrary to the common pattern of CVC- reduplication which is discussed in the following section.

2. Roviana reduplication

Roviana exhibits partial reduplication through prefixation of a partial copy of the base. Two reduplicant shapes are observed in natural speech: CV- and CVC-. Examples (9) and (10) display both types, with further examples listed in the appendix. The use of CVC- reduplicants creates a sequence of consonants from the coda of the reduplicant and the onset of the base, a syllable shape that is otherwise banned in root words. This sequence will be referred to as a coda-onset sequence.

(9) CVC- reduplication in Roviana with various functions

hena	‘to eat’	*hen-hena*	‘eating’
petu	‘mangrove’	*pet-petu*	‘a place with mangroves’
zupe	‘to clear as a bulldozer’	*zup-zupe*	‘a pile of dirt from clearing’

Regarding CV reduplication, two sub-types are observed. In the first type, displayed in example (10a), the base begins with a CVV sequence. CVC- reduplication is impossible in this case because of the lack of a second coda in the base. The second type; however, contains a second consonant that is ignored and the reduplicant realizes as CV- as demonstrated in example (10b). The phonological factors that condition the second type of CV- reduplication are the focus of this paper.

(10) CV- reduplication in Roviana

a. CV- reduplication in base beginning with CVV

lea	'good (adj.)'	*le-leana*	'be good (stative)'

b. CV- reduplication in base beginning with CVCV

lete	'to plant'	*le-lete*	'a planter'	**let-lete*
rizu	'move'	*ri-rizu*	'moving'	**riz-rizu*
maho	'cut with an axe'	*ma-maho*	'cutting with axe'	**mah-maho*

Most consonants surface with the same features in either onset or coda environments. However; the pre-nasalized voiced stops, /ᵐb, ⁿd, ᵑg/ become plain nasals in the coda position of a CVC- reduplicant. That is, in coda position, /ᵐb/ surfaces as [m], /ⁿd/ surfaces as [n], and /ᵑg/ surfaces as [ŋ]. Phonemic nasals, /m, n, ŋ/ also surface as nasal stops when in coda position. This positional neutralization is demonstrated in example (11). It is worth noting that when the pre-nasalized voiced stop is the first segment of the base there is no reduction of features, as when *ⁿdiβe* 'to strike water to stun fish,' reduplicates to *ⁿdiβ-ⁿdiβe* 'striking water to stun fish.'

(11) Neutralization of pre-nasalized voiced stops and nasal stops in coda position

ᵐbɣ:	*ɣoᵐba*	'to wall'	*ɣom-ɣoᵐba*	'a wall'	**ɣoᵐb-ɣoᵐba*
mɣ:	*ɣomu*	'…has lost a limb'	*ɣom-ɣomu*	'… has lost a limb'	
ⁿdk:	*kuⁿdu*	'small island name'	*kun-kuⁿdu*	'bigger island near kudu'	**kuⁿd-kuⁿdu*
nk:	*kina*	'cook with fire'	*kin-kina*	'cooking'	
ᵑgt:	*tuᵑge*	'to hold/grasp'	*tuŋ-tuᵑge*	'holding/grasping'	**tuᵑg-tuᵑge*
ŋt:	*taŋini*	'to touch, take hold'	*taŋ-taŋini*	'touching or taking hold of'	

In vowel-initial roots the first two segments, VC-, are copied. Examples of vowel initial reduplication are demonstrated in example (12). Note that pre-nasalized stops do not neutralize in VC- reduplication as they automatically become the onset of the following syllable. (12a) demonstrates a prenasalized stop that does not reduce as it is neither a coda nor part of a cluster. This is consistent with the CVC- template with the understanding that in the case of vowel initial bases there is no initial consonant to be copied.

(12) Vowel initial base reduplication in Roviana

a.	*aᵑga*	'to wait'	*aᵑg-aᵑga*	'waiting'
b.	*aβoso*	'to listen'	*aβ-aβoso*	'listening'

2.1 A note on methodology

To test the permissibility of sequences, the first step was to search through the Waterhouse (1949) dictionary for root words which, when reduplicated, could create each of the 256 logically possible coda-onset sequence based on the onset of the first syllable and the onset of the second syllable. 775 words were entered into a spreadsheet which formed the basis of an elicitation schedule. The aim of the elicitation schedule was to provide 3-5 root words for each logically possible coda-onset sequence. These roots would then be elicited in reduplicated form to test their behavior. However, there were some obstacles preventing the use of an elicitation schedule based entirely on existing words.

The first obstacle was that for some coda-onset sequences the only existing word which could be used to test the sequence was a word that does not reduplicate. Nonetheless, these words were tested for the phonological eligibility of the reduplication, even if the resulting reduplication was not grammatical. This was carried out by first checking if each word had a reduplicated form and then asking what the reduplicated form would be for words which did not have a reduplicated form. In some cases, it was useful to practice applying other morphology to the form first and then checking how reduplication would work, despite the fact that the resulting reduplicated form was ungrammatical.

The second obstacle was that the lexicon of Roviana has co-occurrence restrictions on certain consonants as sequential syllable onsets in the same word. For example, /pVbV/ never occurs; that is, no root word has /p/ as the onset of the first syllable and /b/ as the onset of the second syllable. Avoidance of certain distribution of consonants within a single word is a common feature of Austronesian languages. Blust (2013) suggests that there were limitations of the co-occurrence of some homorganic consonants in Proto Austronesian, specifically mentioning a constraint against dissimilar labials. Co-occurrence of labials created through infixation has been observed to trigger a variety of repairs in Tagalog (Austronesian, Philippines) (Zuraw and Lu 2009). Samoan, an Oceanic Austronesian language, also avoids the co-occurrence of certain classes of homorganic consonants across syllables, specifically the co-occurrence of labials in disyllabic roots and the co-occurrence of coronals in disyllabic roots (Alderete and Bradshaw 2013). Consistent with Austronesian consonant co-occurrence restrictions, many avoidance patterns in Roviana involve homorganic onsets of the first and second syllable. In total there are no words which start with the sequences /ᵐbVβ/, /ᵐbVⁿd/, /ᵐbVᵑg/, /ᵐbVz/, /βVp/, /mVp/, /ⁿdVᵐb/, /ⁿdVᵑg/, /ⁿdVz/, /sVz/, /zVⁿd/, /zVᵑg/, /zVs/, /zVh/, /rVl/, /ᵑgVᵐb/, /ᵑgVⁿd/, /ᵑgVk/, /ᵑgVz/, /ᵑgVŋ/, /ɣVk/, /ɣVᵑg/, /ɣVŋ/, /ŋVᵑg/, or /hVŋ/. In order to overcome the twenty-five lexical gaps, nonce words were created with the consultation of native speakers for coda-onset sequences which could not be tested with words from the Roviana lexicon. Consultants were presented with these nonce forms and asked to reduplicate them. This approach proved to be valid as speakers independently agreed on the permissibility or prohibition of sequences created by nonce words. Both reduplicated and un-reduplicated nonce words are labeled as “nonce word” in the appendixes.

In addition to "nonce words," there are reduplicated, and un-reduplicated words labeled as "nonword" and "meaning unknown" in the appendixes. There are a few commonly reduplicated words which have lost meaning in their un-reduplicated form, that is, the un-reduplicated form is not a word in modern Roviana. The un-reduplicated forms which have no meaning are labeled as "nonwords." The reduplicated forms of nonwords were still included in the elicitation schedule because they act the same phonologically as words which are productively reduplicated. In other cases, a word may have been grammatically reduplicated, but the meaning was either unclear or not indicated. Follow up elicitations were conducted with several speakers to identify the meaning of grammatically reduplicated words with unknown meanings; however, this task was not entirely completed, leaving some grammatically reduplicated words with the label "meaning unknown." Future work will address the meanings of the grammatically reduplicated words with unknown meanings.

The elicitation schedule was completed in its entirety by one speaker and targeted follow up elicitations were conducted with some additional speakers, but potential variation warrants further data collection. Nonetheless, multiple reduplicated words were collected for many sequences, confirming the permissibility or avoidance of the coda-onset sequences. Appendix I contains a representative example for each of the 240 non-identical sequences.

2.2 Ruling out function, syllabicity, and vowel quality

Reduplicant shape variance within a single language is typically accounted for either by correlating distinct functions with the separate shapes (Urabanczyk 2006, Palmer 2009) or by the general phonology of the language (Gafos 1998, Kager 1999, Blenkiron and Alderete 2015, Downing 2006). This section demonstrates that Roviana reduplicant shape variance is not correlated with function, it is entirely governed by phonological considerations.

Examples (13-22) show both CVC- and CV- reduplication for a variety of semantic functions. For each function, both CVC- and CV- reduplication is attested suggesting that function does not determine reduplicant shape in Roviana. Functions of reduplication in Roviana include expressing progressive aspect, deriving nouns, deriving locations, deriving verbs, and deriving statives.

(13) CVC- Progressive reduplication

hena	'to eat'	*hen-hena*	'eating'
kopu	'take care'	*kop-kopu*	'taking care'
taβete	'work'	*taβ-taβete*	'working'

(14) CV- Progressive reduplication

pe^{m}bili	'bend tree branch down'	*pe-pe^{m}bili*	'bending down tree branch'
paβo	'visit the sick'	*pa-paβo*	'visiting the sick'
^{n}duta	'collide'	*^{n}du-^{n}duta*	'colliding'

(15) CVC- nominalization derivational reduplication

zupe	'to clear as a bulldozer'	*zup-zupe*	'a pile of dirt from clearing'
ne^{m}be	'to fan'	*nem-ne^{m}be*	'a fan, fanning'
komolo	'smile'	*kom-komolo*	'cheeks'
ŋuzu	'beak'	*ŋuz-ŋuzu*	'War-canoe prow figure carving'

(16) CV- nominalization derivational reduplication

lete	'to plant'	*le-lete*	'a planter (to be planted)'
sa^{n}da	'outside'	*sa-sa^{n}da*	'an entrance'

(17) CVC- locative derivational reduplication

ku^{n}du	'small island name'	*kun-ku^{n}du*	'bigger island near *ku^{n}du*'
^{ŋ}gizo	't.o. tree'	*^{ŋ}giz-^{ŋ}gizo*	'place with *^{ŋ}gizo*'
zinu	't.o. large leaf plant'	*zin-zinu*	'place where *zinu* grows'

(18) CV- locative derivational reduplication

kaɣumu	pineapple/banana shoot	*ka-kaɣumu*	place with *kaɣumu*
βuhe	'beetle'	*βu-βuhe*	'place with beetle'
ɣohere	't.o. of plant'	*ɣo-ɣohere*	'place with *ɣohere*'
ŋohara	'coconut'	*ŋo-ŋohara*	'coconut plantation'
rahi	'taro pudding'	*ra-rahi*	'place with *rahi*'
liho	'new growth, shoots'	*li-liho*	'place with *liho*'

(19) CVC- verbal derivational reduplication

tepa	'ask'	*tep-tepa*	'beg'
roβe	'lace together'	*roβ-roβe*	'hoping or thinking'
laβe	'a shield'	*laβ-laβe*	'guard with shield'

(20) CV- verbal derivational reduplication

ŋoto	'broken as tree with fruit'	*ŋo-ŋoto*	'break straight'
te^{n}doro	'glide'	*te-te^{n}doro*	'skip stones'
tasa	'counting particle'	*ta-tasa*	'to ration'
sire	'change'	*si-sire*	'joke'

(21) CVC- stative derivational reduplication

ɣe^{n}de	‘left (direction)’	*ɣen-ɣe^{n}de*	‘left handed’
kure	‘shy’	*kur-kure*	‘being shy’
silaβa	‘restless with pain’	*sil-silaβa*	‘be restless with pain’
ŋali	‘industrious’	*ŋal-ŋali*	‘be industrious’
taɣo	‘have, possess’	*taɣ-taɣo*	‘rich’

(22) CV- stative derivational reduplication

^{m}bupara	‘brown’	*^{m}bu-^{m}bupara*	‘be/make brown’
^{m}buma	‘green’	*^{m}bu-^{m}buma*	‘be/make green’
noso	‘quiet or patient’	*no-noso*	‘be quiet or patient’

Examples (13-22) demonstrate that function does not dictate reduplicant shape and, as previously mentioned, reduplicant shape can be influenced by the phonological properties of the base. The phonological conditions which govern the realization of a CVC- or CV- reduplicant in Roviana are not immediately obvious. Examining the complete data set (Appendix I) suggests two phonological generalizations which, as it turns out, do not condition reduplicant shape. The first is that it appears that CVC- reduplication is more common with disyllabic bases than trisyllabic bases. The second is that it appears that high vowels are more commonly associated with CV- reduplicants than CVC- reduplicants. However, CVC- and CV- reduplication are observed for disyllabic and trisyllabic bases of all vowel qualities, demonstrated in examples (23-32).

(23) CiC- high front vowel reduplicant

nipaha	‘bail out, as canoe’	*nip-nipaha*	‘bailing out’
sipu	‘wave, beckon’	*sip-sipu*	‘waving, beckoning’

(24) Ci- high front vowel reduplicant

ni^{n}deke	‘walk slowly’	*ni-ni^{n}deke*	‘walking slowly’
βima	(nonce word)	*βi-βima*	(nonce word)

(25) CuC- high back vowel reduplicant

hupulu	‘to gut fish or animal’	*hup-hupulu*	‘gutting’
zupe	‘to clear as a bulldozer’	*zup-zupe*	‘a pile of dirt from clearing’

(26) Cu- high back vowel reduplicant

^{m}bupara	‘brown’	^{m}*bu-^{m}bupara*	‘be/make brown’
mupi	(nonce word)	*mu-mupi*	(nonce word)

(27) CeC- mid front vowel reduplicant

te^{m}bo ehara	'bruise'	*tem-te^{m}bo ehara*	'bruising'
tepa	'ask'	*tep-tepa*	'beg'

(28) Ce- mid front vowel reduplicant

pe^{m}bili	'bend tree branch down'	*pe-pe^{m}bili*	'bending down tree branch'
neti	'trample upon'	*ne-neti*	'trampling upon'

(29) CoC- mid back vowel reduplicant

^{n}dopala	'death spirit'	*^{n}dop-^{n}dopala*	(nonce word)
kopu	'take care'	*kop-kopu*	'taking care'

(30) Co- mid back vowel reduplicant

pohaka	'to blister'	*po-pohaka*	'blistering'
ŋoto	'broken as tree with fruit'	*ŋo-ŋoto*	'break straight'

(31) CaC- low central vowel reduplicant

ŋaputu	'close as shellfish'	*ŋap-ŋaputu*	'closing as shell fish'
^{m}baβa	(nonce word)	*^{m}baβ-^{m}baβa*	(nonce word)

(32) Ca- low central vowel reduplicant

kaɣumu	'pineapple/banana shoot'	*ka-kaɣumu*	'place with *kaɣumu*'
paβo	'visit the sick'	*pa-paβo*	'visiting the sick'

It has been shown that the variance of reduplicant shape in Roviana is not governed by function, number of syllables, or vowel quality. Rather, as section 2.3 demonstrates, in most cases the use of a CVC- or CV- reduplicant shape can be predictable from the phonological eligibility of the coda-onset sequence. However, it is worth noting that there is at least one known exception to reduplicant shape being determined by phonology. As will be discussed further in section 3.4, the high frequency word *huβe* 'to swim or bathe,' reduplicates as *huhuβe*.

2.3 Conditions on consonant sequences

The realization of a CVC- or CV- reduplicant can be predicted by considering the sequence of consonants created by the coda of the reduplicant and the onset of the base. That is, some coda-onset sequences are permitted while others are prohibited. Reduplicants realize as CVC- unless the coda of the reduplicant would create a prohibited coda-onset sequence, in which case reduplicants realize as CV-. There are four general conditions on the permissibility of a coda-onset sequence: 1) /h/ cannot be the first element, the coda, of a coda-onset sequence. 2) /ŋt/ is a banned coda onset sequence. 3) Geminate coda-onset sequences (i.e. sequences of identical segments) are banned. 4) Homorganic coda-onset sequences are typically banned, though not always.

Reduplication which would lead to the creation of a banned coda-onset sequence results in CV-reduplication instead of CVC- reduplication. The complete set of acceptable and prohibited sequences are illustrated in Table 1; the cell of a prohibited sequence is shaded in. Acceptable sequences that are not found in the lexicon were tested through the creation of nonce words; these sequences are in bold.

TABLE 1
LIST OF ACCEPTABLE CODA-ONSET SEQUENCES IN ROVIANA

	p	ᵐb	β	m	t	ⁿd	s	z	n	r	l	k	ᵑg	ɣ	ŋ	h
p					p.t	**p.ⁿd**	p.s	p.z	p.n	p.r	p.l	p.k	p.ᵑg	p.ɣ	p.ŋ	p.h
ᵐb					ᵐb.t	**ᵐb.ⁿd**	ᵐb.s	**ᵐb.z**	ᵐb.n	ᵐb.r	ᵐb.l	ᵐb.k	**ᵐb .ᵑg**	ᵐb.ɣ	ᵐb.ŋ	ᵐb.h
β		**β.ᵐb**			β.t	β.ⁿd	β.s	**β.z**	β.n	β.r	β.l	β.k	β.ᵑg	β.ɣ	β.ŋ	β.h
m	m.p				m.t	m.ⁿd	m.s	m.z	m.n	m.r	m.l	m.k	m.ᵑg	m.ɣ	m.ŋ	m.h
t	t.p	t.ᵐb	t.β	t.m								t.k	t.ᵑg	t.ɣ		t.h
ⁿd	ⁿd.p	**ⁿd.ᵐb**	ⁿd.β	ⁿd.m								ⁿd.k	**ⁿd.ᵑg**	ⁿd.ɣ	ⁿd.ŋ	ⁿd.h
s	s.p	s.ᵐb	s.β	s.m		**s.ⁿd**					s.l	s.k	s.ᵑg	s.ɣ	s.ŋ	s.h
z	z.p	**z.ᵐb**	**z.β**	z.m							z.l	z.k	z.ᵑg	z.ɣ	z.ŋ	**z.h**
n	n.p	n.ᵐb	n.β	n.m			n.s	n.z		n.r	**n.l**	n.k	n.ᵑg	n.ɣ	n.ŋ	n.h
r	r.p	r.ᵐb	r.β	r.m		r.ⁿd			r.n			r.k	r.ᵑg	r.ɣ	r.ŋ	r.h
l	l.p	l.ᵐb	l.β	l.m		l.ⁿd	l.s					l.k	l.ᵑg	l.ɣ	l.ŋ	l.h
k	k.p	k.ᵐb	k.β	k.m	k.t	k.ⁿd	k.s	k.z	k.n	k.r	k.l					k.h
ᵑg	ᵑg.p	**ᵑg.ᵐb**	ᵑg.β	ᵑg.m	ᵑg.t	ᵑg.ⁿd	ᵑg.s	**ᵑg.z**	ᵑg.n	ᵑg.r	ᵑg.l					ᵑg.h
ɣ	ɣ.p	ɣ.ᵐb	ɣ.β	ɣ.m	ɣ.t	ɣ.ⁿd	ɣ.s	ɣ.z	ɣ.n	ɣ.r	ɣ.l					ɣ.h
ŋ	ŋ.p	ŋ.ᵐb	ŋ.β	ŋ.m	ŋ.t	ŋ.ⁿd	ŋ.s	ŋ.z	**ŋ.n**	ŋ.r	ŋ.l	ŋ.k				**ŋ.h**
h																

The first condition, demonstrated in example (33), is that /h/ cannot be the coda in a coda-onset sequence in any of the words that were tested. There is some cross-linguistic tendency for the ban of [h] in coda position, for English bans [h] from coda position. Silverman (2003) notes the rarity of pre-aspirated stops and across the board pre-aspiration and suggests that a lack of phonetic salience accounts for the rarity. Perhaps this same lack of phonetic salience accounts for the ban on /h/ from coda position in Roviana, as a sequence of /h/ and another consonant would be phonetically similar to pre-aspiration of consonants. This prohibition might be handled straightforwardly in a formal Optimality Theoretic account by stipulating a ban on /h/ in coda position. A full list of the tested words in which /h/ was prohibited from being the coda in all the possible coda-onset sequences can be found in Appendix 1.

(33) /h/ banned from coda

hp:	*pohaka*	‘to blister’	*po-pohaka*	‘blistering’	**poh-pohaka*
hŋ:	*ŋohara*	‘coconut’	*ŋo-ŋohara*	‘coconut plantation’	**ŋoh-ŋohara*
hl	*liho*	‘new growth, shoots’	*li-liho*	‘place with *liho*’	**lih-liho*

The second condition, demonstrated in example (35), is that identical sequences are banned. This sort of phenomenon is widely observed and easily accounted for in OT with a constraint that prohibits geminates, such as No-Gem (McCarthy 1986, Gouskova 2009).

(35) Anti-geminate

kk:	*keke*	‘one’	*ke-keke mo*	‘one more’	**kek-keke mo*
ss:	*sasara*	‘sweep’	*sa-sasara*	‘sweeping’	**sas-sasara*
rr:	*roro*	‘desire, love’	*ro-roro*	‘desiring, loving’	**ror-roro*

The third condition is that homorganic sequences are avoided. There are 82 logically possible homorganic sequences in Roviana. Some of these combinations are ruled out by other conditions, for example the homorganic sequence /hh/ is ruled out as it has /h/ as the coda and it is geminate. After eliminating homorganic sequences ruled out by other conditions, there are 66 logically possible homorganic sequences; of these only 14 are permissible. Example (36) demonstrates some of the banned sequences; examples of all possible homorganic sequences can be found in Appendix II.

(36) Some examples of banned homorganic sequences

p^{m}b:	^{m}*bupara*	‘brown’	^{m}*bu-*^{m}*bupara*	‘be/make brown’	*^{m}*bup-*^{m}*bupara*
βp:	*paβo*	‘visit the sick’	*pa-paβo*	‘visiting the sick’	**paβ-paβo*
βm:	*maβa*	‘yawn’	*ma-maβa*	‘yawning’	**maβ-maβa*
t^{n}d:	^{n}*duta*	‘collide’	^{n}*du-*^{n}*duta*	‘colliding’	*^{n}*dut-*^{n}*duta*
ts:	*suti*	‘comb’	*su-suti*	‘combing’	**sut-suti*
tn:	*neti*	‘trample upon’	*ne-neti*	‘trampling upon’	**net-neti*
tl:	*lete*	‘to plant’	*le-lete*	‘a planter’	**let-lete*
^{n}ds:	*sa*^{n}*da*	‘outside’	*sa-sa*^{n}*da*	‘an entrance’	**sa*^{n}*d-sa*^{n}*da*
st:	*tasa*	‘counting particle’	*ta-tasa*	‘to ration’	**tas-tasa*
sn:	*noso*	‘quiet or patient’	*no-noso*	‘be quiet or patient’	**nos-noso*
kŋ:	*ŋaki*	(nonce word)	*ŋa-ŋaki*	(nonce word)	**ŋak-ŋaki*
^{ŋ}gk:	*ka*^{ŋ}*gi*	‘crust’	*ka-ka*^{ŋ}*gi*	(meaning unknown)	**kaŋ-ka*^{ŋ}*gi*
ɣk:	*kaɣumu*	‘pineapple/banana shoot’	*ka-kaɣumu*	‘place with *kaɣumu*’	**kaɣ-kaɣumu*
ɣ^{ŋ}g:	^{ŋ}*geɣa*	‘desert/partly cooked in *motu*’	^{ŋ}*ge-*^{ŋ}*geɣa*	(meaning unknown)	*^{ŋ}*geɣ-*^{ŋ}*geɣa*

There are 14 acceptable homorganic sequences: β^{m}b, mp, s^{n}d, sl, zl, ns, nz, nr, nl, r^{n}d, rn, l^{n}d, ls, ŋk. Example (37) demonstrates some of the permitted sequences, examples for every possible homorganic sequence are available in Appendix I and Appendix II.

(37) Some examples of permitted homorganic sequences

mp:	*pamaŋa* ‘to respect’		*pam-pamaŋa*	‘respecting’
β^{m}b:	*^{m}baβa*	(nonce word)	*^{m}baβ-^{m}baβa*	(nonce word)
s^{n}d:	*^{n}dusi*	(nonce word)	*^{n}dus-^{n}dusi*	(nonce word)
sl:	*losoβo* ‘to doze when laying’		*los-losoβo*	‘dozing while laying’
ŋk:	*kaŋa*	‘drink poured water overhead’	*kaŋ-kaŋa*	‘drinking poured water…’

There is no generalization which accounts for pattern of banned and permitted homorganic sequences across the different places of articulation. Each place of articulation, labial, alveolar, and velar, displays a unique pattern of permitted and banned homorganic sequences. Due to this idiosyncrasy, the discussion of banned and permitted homorganic sequences is divided by place of articulation beginning with labial, then alveolar, and finally velar.

Only two of the 16 possible homorganic labial sequences are permissible. Figure 3 displays all the logically possible homorganic labial consonant sequences. /β/ is never the second element of a homorganic sequence and /m/ is never the second element of a homorganic sequence. Permissible sequences are indicated in bold type and prohibited sequences are marked with a strike.

Figure 3. Homorganic labial sequences

	p	^{m}b	β	m
p	~~pp~~	~~p^{m}b~~	~~pβ~~	~~pm~~
^{m}b	~~^{m}bp~~	~~^{m}b^{m}b~~	~~^{m}bβ~~	~~^{m}bm~~
β	~~βp~~	**β^{m}b**	~~ββ~~	~~βm~~
m	**mp**	~~m^{m}b~~	~~mβ~~	~~mm~~

The two permissible sequences, /mp/ and /β^{m}b/ do not constitute a natural class. It is worth noting that, due to a lexical gap, evidence for the acceptability of /β^{m}b/ is from reduplication of the nonce word *^{m}baβa* to *^{m}baβ-^{m}baβa*. /mp/ is the only homorganic labial sequence produced by existing Roviana words. Nonetheless, speakers independently agree that *^{m}baβ-^{m}baβa* is an acceptable reduplicated form of the nonce word which suggests that the sequence /β^{m}b/ is valid.

11 of the 49 possible homorganic alveolar sequences are permissible. Figure 5 displays the logically possible homorganic alveolar consonant sequences. Permissible sequences are indicated in bold type and prohibited sequences are marked with a strike.

Figure 4. Homorganic Alveolar sequences

	t	ⁿd	s	z	n	r	l
t	~~tt~~	~~tⁿd~~	~~ts~~	~~tz~~	~~tn~~	~~tr~~	~~tl~~
ⁿd	~~ⁿdt~~	~~ⁿdⁿd~~	~~ⁿds~~	~~ⁿdz~~	~~ⁿdn~~	~~ⁿdr~~	~~ⁿdl~~
s	~~st~~	**sⁿd**	~~ss~~	~~sz~~	~~sn~~	~~sr~~	**sl**
z	~~zt~~	~~zⁿd~~	~~zs~~	~~zz~~	~~zn~~	~~zr~~	**zl**
n	~~nt~~	~~nⁿd~~	**ns**	**nz**	~~nn~~	**nr**	**nl**
r	~~rt~~	**rⁿd**	~~rs~~	~~rz~~	**rn**	~~rr~~	~~rl~~
l	~~lt~~	**lⁿd**	**ls**	~~lz~~	~~ln~~	~~lr~~	~~ll~~

The 11 permissible alveolar sequences do not constitute a natural class. /t/ is never the onset of a homorganic onset sequence. /n/ cannot be the second element of a homorganic sequence unless it follows /r/. /z/ cannot be the second element of a homorganic sequence unless it is preceded by /n/, nor can /z/ be the first element of a homorganic sequence unless it precedes /l/.

Only one homorganic velar sequence, /ŋk/, is acceptable. No voiced velar consonant is the second element of a homorganic velar sequence. Figure 5 displays the logically possible homorganic velar consonant sequences. Permissible sequences are indicated in bold type and prohibited sequences are marked with a strike.

Figure 5. Homorganic velar sequences

	k	ᵑg	ɣ	ŋ
k	~~kk~~	~~kᵑg~~	~~kɣ~~	~~kŋ~~
ᵑg	~~ᵑgk~~	~~ᵑgᵑg~~	~~ᵑgɣ~~	~~ᵑgŋ~~
ɣ	~~ɣk~~	~~ɣᵑg~~	~~ɣɣ~~	~~ɣŋ~~
ŋ	**ŋk**	~~ŋᵑg~~	~~ŋɣ~~	~~ŋŋ~~

When considering labial, alveolar, and velar sequences altogether, there are two descriptive generalizations available for the homorganic consonant sequences. 1) Geminate sequences, which are homorganic by definition, are banned. 2) Stops cannot be the first element, the coda, of a homorganic coda-onset sequence. Aside from these two generalizations, the pattern of acceptable and prohibited homorganic sequences is idiosyncratic. A proposed set of conditions which generalize the pattern of banned and permissible homorganic sequences can be found in section 3.5.

The pattern of nasal-voiceless stop sequences is particularly perplexing. /mp/ and /ŋk/ are the only acceptable homorganic sequences for labials and velars, respectively, that are observed in lexical words. This pattern would suggest that nasal-voiceless stop is the preferred homorganic sequence; however, /nt/ is banned, thus further demonstrating the idiosyncrasy of the pattern of acceptable homorganic sequences. In order to account for which homorganic sequences are banned

or permitted, it would ultimately require the proposal of extremely idiosyncratic constraints, such as a ban on all homorganic velar sequences except /ŋk/, specifically stipulating that the source of [ŋ] has to be /ŋ/ as [ŋk] is banned if the source of [ŋ] is /ᵑg/ underlyingly.

The fourth condition, demonstrated in example (34a), is that /tŋ/ is a banned coda-onset sequence. The ban on this sequence is idiosyncratic and cannot be explained as a constraint against /t/ coda or /ŋ/ onset. /t/ is acceptable as a coda in some other environments, as illustrated in example (34b). /t/ cannot occur before either /n/ or /ŋ/, the only nasal it can proceed is /m/, as demonstrated by the word *mut-muti* 'making an appointment.' /ŋ/ is also acceptable as an onset, as demonstrated in example (34c). This sort of ban on a specific sequence is easily handled in Optimality Theory with a constraint on the sequence; however, this constraint is not more explanatory than merely stipulating the banned sequence. Furthermore, there is little cross-linguistic evidence to motivate such a constraint. Perhaps the best way to explain the ban on /tŋ/ is that it is merely an idiosyncratic ban that cannot be couched in a natural class, similar to the idiosyncratic patterns of acceptable and banned homorganic sequences discussed below.

(34) *tŋ

a. *tŋ

ŋoto	'broken as tree with fruit'	*ŋo-ŋoto*	'break straight' *ŋot-ŋoto*

b. /t/ as coda in other environments

kito	'distract, disturb'	*kit-kito*	'distracting or disturbing'
ᵑgetu	'happy'	*ᵑget-ᵑgetu*	'being happy'
βute	'to plait with straw'	*βut-βute*	'plating with…'
muti	'make appointment'	*mut-muti*	'making an appointment'

c. /ŋ/ as onset in other environments

ŋuzu	'beak'	*ŋuz-ŋuzu*	'*tomoko* prow carving statue'
ŋiᵐburu	'howl, rage, as wind'	*ŋim-ŋiᵐburu*	'howling, raging, as wind'
ŋali	'industrious'	*ŋal-ŋali*	'be industrious'

3. Discussion

The reduplication patterns in Roviana are interesting for several reasons: 1) it is an example of CVC- reduplication in a language which, otherwise, avoids codas. 2) The acceptability of nasals in coda position is different for those derived from underlying nasals and those derived from underlying pre-nasalized voiced stops, suggesting that acceptability is not only conditioned by surface forms. 3) The pattern of banned and permitted homorganic coda-onset sequences appears to follow the Obligatory Contour Principle as a trend, but the exceptions appear to be idiosyncratic. These points are addressed in sections 3.1, 3.2, and 3.3.

After addressing the theoretically interesting aspects of Roviana reduplication, section 3.4 discusses lexical frequency effects on reduplication. The discussion section concludes by arguing that the pattern of banned and permitted consonant sequences in Roviana is sufficiently idiosyncratic that merely stipulating what is banned and permitted is no more complex than couching the pattern in a constraint ranking.

3.1 The emergence of codas in a language with no codas in root words

Phonological theory predicts that the shape of a reduplicant will be governed by the general phonology of the language (Gafos 1998, Kager 1999, Blenkiron and Alderete 2015, Downing 2006). The lack of surface-level codas in non-reduplicated words and the insertion of echo vowels after word final consonants could be taken as evidence that the general phonology of Roviana avoids codas.

In a constraint-based approach CVC- reduplication in a language which otherwise avoids codas is accounted for by proposing that the realization a CVC- reduplicant instead of CVCV- can be seen as sort of compromise between preserving the identity of the base while minimizing the total number of syllables. An alternate approach proposes that the CVC- reduplicants in languages without codas is actually the result of reducing CVCV- reduplicants for reasons of predictability. This section discusses both approaches as applied to Roviana reduplication.

As previously stated, the Emergence of The Unmarked (McCarthy and Prince 1994, Kager 1999) (henceforth TETU) is a hypothesis within constraint-based approaches to phonology which predicts that reduplication is an environment which will be less phonologically marked than the rest of the language. At first glance, the presence of codas in Roviana reduplicants appears to run counter to TETU.

However, Kennedy (2008) accounts for the presence of codas in the CVC- reduplicants of Hoava, another Northwest Solomonic language which doesn't have codas in root words. He accounts for this with alignment, faith, and syllabicity constraints which select for CVC- over CVCV-. That is, syllables themselves are marked, thus two syllable reduplicants are more marked than single syllable reduplicants while still maintaining more faithfulness than a CV- reduplicant. Kennedy's account demonstrates that the general phonological principles of a language without codas in root words can account for the presence of codas without violating TETU. That is, he shows that codas on reduplicants are not necessarily a marked structure. Although Kennedy's account is able to explain the emergence of codas in reduplication, Kennedy does not propose any phonological conditioning for the observation that Hoava has both CVC- and CV- reduplicants performing the same function (Davis 2003). The realization of CVC- and CV- reduplicants in Roviana could be accounted for under this approach by proposing a "banned sequence" constraint which is defined by the stipulated banned sequences. The banned sequence constraint would merely need to outrank syllabicity and reduplicant faithfulness in order to produce the pattern of

CVC- and CV- reduplicants in Roviana. This same approach could be applied to the examples Rotuman reduplication which transform a CVCV copy of the base into either CVC or CVVC.

Blevins (2005) proposes an alternate approach to CVC- reduplication in Hoava by proposing that predictability accounts for the reduplicant shape. A reduplicant is a copy of the base and is therefore 100% predictable. Under Blevins' approach, CVCV- is the basic reduplicant shape and it reduces to CVC- due to the predictability of the final vowel.

Blevins, also comments on Roviana reduplication stating that Roviana has CVCV-, CVC-, and CV- reduplication for all words which do not have a nasal consonant as the onset of the second syllable. Blevins proposes that the variance in forms is optional and largely a product of fast speech. Overall, Blevin's predictability approach does account for CVC- reduplication in a language which lacks codas in root words. However; there are a few problems with this account of Roviana reduplication.

First, if CV- reduplicants were truly a product of fast speech, as Blevins suggests, then CVC- reduplication should be acceptable for all bases. However; my own data contradict this account as multiple Roviana speakers independently agree that certain reduplicants cannot be CVC- and must realize as CV-, as demonstrated in examples (33-36). Blevins posits that CVCV- is the basic reduplicant shape; however native speakers reject CVCV- reduplication as foreign sounding. Finally, Blevins suggests that nasals do not delete if they are the onset of the second syllable of the root. This claim is contradicted by the multiple examples of nasal consonants deleting before homorganic onsets as demonstrated in example (36) and figures (3-5). Blevins based her analysis on the sketch by Corston-Oliver (2002), which contains little information on reduplication, as syntax was the focus of Corston-Oliver's study. The problems created by the lack of rigorous descriptive materials highlight the critical need to describe un-described or little-described languages.

Descriptive issues aside, the patterns of reduplication in Roviana are largely consistent with theoretical accounts of CVC- reduplication in a language which otherwise avoids codas. Kennedy (2008) suggests a constraint ranking which accounts for CVC- reduplication in a language with no codas in root words can be accounted for without violating TETU. Under a functional approach, a theory of predictability also accounts for the realization of CVC- reduplicants instead of CVCV- reduplicants as suggested by Blevins (2005). Both Blevins' and Kennedy's approaches adequately account for CVC- reduplication in a language like Roviana; however, neither approach directly addresses the realization of CVC- versus CV- reduplicants. Kennedy's approach is more easily modified to account for the principled realization of CVC- or CV- reduplication in Roviana.

3.2 Opacity in treatment of surface nasals derived from underlying stops

Another interesting aspect of Roviana reduplication is the distinct treatment of nasal codas which come from underlying stops compared to coda nasals which come from underlying nasals. As previously mentioned, pre-nasalized voiced stops neutralize to nasals when they are in the coda of a reduplicant, as demonstrated in example (38).

(38) Pre-nasalized voiced stops neutralize to nasal stops in coda position

ᵐbk:	*keᵐbo*	complain piteously	*kem-keᵐbo*	complaining piteously
mk:	*komolo*	'smile'	*kom-komolo*	'cheeks'
ⁿdp:	*paⁿda*	measure	*pan-paⁿda*	'measuring'
np:	*pino*	(nonword)	*pin-pino*	'star, firefly'
ᵑgp:	*peᵑga*	'to gather at funeral'	*peŋ-peᵑga*	'wake at a funeral'
ŋp:	*poŋa*	'soak in water'	*poŋ-poŋa*	'plant taro or *maseda*'

Despite the fact that the pre-nasalized voiced stops surface as nasals in coda position, they are not treated the same as surface nasals which are derived from underlying nasals. In several cases, the surface nasal derived from an underlying stop will be banned from appearing as a coda before a particular segment, but the same sequence is acceptable if the nasal coda derives from an underlying nasal. For example, the sequence */ᵐbp/ is banned, but /mp/ is permitted, even though both sequences would realize as [mp], suggesting that the permissibility of a sequence does not rely fully on surface forms. The contrast is observed for labial, alveolar, and velar places of articulation, as demonstrated in example (39).

(39) Different acceptability of surface nasals depending on underlying form

ᵐbp:	*peᵐbili*	bend tree branch down	*pe-peᵐbili*	bending down tree branch
mp:	***pamaŋa***	**to respect**	***pam-pamaŋa***	**respecting**
ⁿds:	*saⁿda*	outside	*sa-saⁿda*	an entrance
ⁿdz:	*zaⁿda*	(nonce word)	*za-zaⁿda*	(nonce word)
ⁿdr:	*riⁿda*	faded, grey, dull	*ri-riⁿda*	being faded, grey, …
ⁿdl:	*loⁿdu*	sink	*lo-loⁿdu*	sinking
ns:	***suni***	**prick, inject**	***sun-suni***	**pricking, injecting**
nz:	***zinu***	**t.o. large leaf plant**	***zin-zinu***	**place where zinu grows**
nr:	***ronu***	**to rely, depend upon**	***ron-ronu***	**relying, depending upon**
nl:	***luna***	**(nonce word)**	***lun-luna***	**(nonce word)**
ᵑgk:	*kaᵑgi*	crust	*ka-kaᵑgi*	(meaning unknown)
ŋk:	***kaŋa***	**drink poured water overhead**	***kaŋ-kaŋa***	**drinking poured water…**

The distinct treatment of underlying stops and underlying nasals which both surface as nasals appears to pose problems to theories which claim that phonology only evaluates surface forms, such as Optimality Theory (Prince and Smolensky 2004). However; this sort of phenomenon can be accounted for in OT with conjoined constraints (Kirchner 1996, Shih 2017, Smolensky 1993, 2006; Ito & Mester 1998, 2003; Baković 2000, Crowhurst & Hewitt 1997, Lubowicz 2005).

If a conjoined constraint approach were applied to Roviana, there would be a constraint which assigns a violation for a sequence of a nasal and voiceless stop, such as *NC. The *NC constraint would be ranked lower than a faithfulness constraint mitigating against deletion, such as MAX. Thus, the underlying nasal coda would not delete before the voiceless stops /p/ and /k/. There would be a separate constraint violating against having a voiced stop in the coda, *D, resulting in the pre-nasalized voiced stops surfacing as a nasal. These two constraints, separately, would be ranked lower than a conjoined constraint *NC+*D, which would cause total deletion of a pre-nasalized voiced stop preceding a voiceless stop.

3.3 Arbitrary pattern of permitted and banned homorganic sequences

The pattern of banned and permitted homorganic sequences aligning with segmental features, such as place, follows a trend suggested by theoretical work on the Obligatory Contour Principle (henceforth OCP) (McCarthy 1986, Odden 1986, 1988, Ito and Mester 1996, Myers 1997, Yip 1988). However; there is are also exceptions to the trend which demonstrate that the pattern is idiosyncratic and does not strictly follow the OCP.

The OCP is a theoretical principle of phonology which pressures against adjacent identical elements. Cross-linguistically, the OCP interacts with both place and manner, sometimes displaying gradient, rather than categorical behavior. The OCP interacts with four recognized places of articulation: labial, coronal, dorsal, and pharyngeal (Van Goch 2010). Of the four places, McCarthy (1986) notes that coronal seems to be the least affected, this appears to align with the pattern in Roviana as adjacent coronals are the most commonly acceptable homorganic sequences; however, they are also a larger class than labials and velars and, when considering comparable segments, coronals are not significantly less affected than labials and velars. It is also widely observed that the OCP can apply to manner of articulation (Kenstowicz 1994, Van der Torre 2003, Van Goch 2010). Coronals tend to show OCP phenomena along the distinction of obstruent and sonorant (Van Goch 2010), and there is evidence that the OCP particularly affects liquids (Kenstowicz 1994 and Van der Torre 2003). In keeping with these observations, acceptable homorganic sequences in Roviana all have different sonority. Van Goch (2010) discusses gradience in the OCP, that is, the OCP generally applies as more of a tendency than an absolute. Roviana aligns with the principle of gradience as avoidance of homorganic sequences is a tendency rather than an absolute. In the case of Roviana, a ban on a particular sequence, such as /nt/ is

absolute, but the ban on homorganic sequences is not absolute as several homorganic sequences are acceptable. The idiosyncratic pattern of acceptable homorganic sequences cannot be strictly described in terms of shared features, but it does confirm some predictions of the OCP.

Roviana is not unique for having a phonological process that does not neatly align with a set of shared features. Individual segments that share a feature, such as place or manner, are often described as forming a "natural class." Mielke (2004) surveyed 6,077 phonologically active classes from 561 languages and attempted to classify them in one of three classic natural class systems (Jakobson, Fant and Halle 1954, Chomsky and Halle 1968, Clements and Hume 1995). Of the phonologically active classes investigated 59.9 % could be classified in the natural class system proposed by Jakobson, Fant and Halle (1954), 70.97% could be classified in Chomsky and Halle's (1968) system, and 63.72% could be classified by Clements and Hume's (1995) system. Of the active classes observed by Mielke, only 75.25% aligned with any of the three natural class systems. That is, roughly one quarter of the observed phonologically active classes do not align with any of the three natural class systems. With this context, the lack of a neat natural class which can describe the phonologically active class of prohibited homorganic sequences in Roviana is less exceptional. Furthermore, Mielke (2004, 2005) suggests that natural classes and phonologically active classes are explained through a historical lens, which may be a promising route of investigation in the case of Roviana, though it is beyond the scope of this paper.

3.4 The mystery of *hu-huβe*

It is worth noting that there is a single high frequency word that is known to realize with CV- reduplicant, even though other similar bases would realize with a CVC- reduplicant. The words *huβe* 'to swim,' which typically reduplicates as *hu-huβe* 'swimming,' rather than the expected *huβ-huβe*. This high frequency word displays CV- reduplication, even though the coda-onset sequence is acceptable with other words such as *hoβ-hoβa* 'stabbing.' Phonetic reduction in high frequency words has been widely observed (Turnbull 2018), it follows that frequent exposure to a particular form facilitates interpretation even when the form is reduced. These exceptions to the more general pattern can likely be explained by lexical frequency effects; however, the current frequency estimates for Roviana words are impressionistic. It may also be relevant that /u/ is deleted before a bilabial coda thus further research calls for the creation of a large corpus which can be used to calculate more rigorous frequency statistics and a more complete data set of reduplicated words.

3.5 Stipulative description and ranked constraints

This section will first discuss stipulative conditions that would describe the pattern of permissible and banned homorganic sequences. Then it will discuss constraints which could be used to account for the idiosyncratic ban of the sequence /tŋ/ and the general ban on /h/ from coda position.

In the case of homorganic consonant sequences in Roviana, the easiest way to describe the occurrence of CVC- or CV- reduplication is to merely stipulate which ones are permitted and banned. Figure 6 demonstrates this point by stipulating "conditions" on homorganic consonant sequences.

Figure 6. Conditions on homorganic consonant sequences in Roviana

- *Geminate: geminate (identical) sequences are banned
- *Homorganic stop-coda sequence: underlying stops cannot be the 1st element (the coda) of a homorganic coda-onset sequence created through reduplication
- Sonority clash avoidance: homorganic sequences with the same sonority are banned (stop-fricative(+/r/)-nasal-liquid), /r/ is both a liquid and a nasal
- */t/ Homorganic onset: /t/ cannot be second element of homorganic sequence
- *Homorganic voiced fricative preceding voiceless stop: a voiced fricative cannot precede a homorganic voiceless stop
- */β/ onset of homorganic sequence: /β/ cannot be the second element (onset) of homorganic sequence
- */m/ onset of homorganic sequence: /m/ cannot be the second element (onset) of homorganic sequence
- */n/ onset after homorganic non-rhotic: /n/ cannot be second element (onset) of homorganic sequence which does not have /r/ as the first element (coda)
- */z/ onset after homorganic non-nasal: /z/ cannot be the second element (onset) of a homorganic sequence which does not have /n/ as the first element (coda)
- */z/ coda preceding homorganic non-lateral: /z/ cannot be the first element (coda) of a homorganic sequence which does not have /l/ as the second element (onset)
- *Homorganic voiced velar onset: a voiced velar consonant cannot be the second element (onset) of a homorganic sequence

The conditions in Figure 6 accurately describe for the patterns of acceptable and prohibited homorganic sequences. However, rather than accounting for the complicated pattern with a few simple principles, the conditions themselves are complicated and do not amount to a theoretical explanation.

One potential route to simplify a constraint ranking account of homorganic sequences in Roviana is to propose a constraint that stipulates the banned homorganic sequences. For example, a constraint called "Legal Sequence," which stipulates that a violation is assigned for any sequences of homorganic consonants that is not derived from the phonemes: β^{m}b, mp, s^{n}d, sl, zl, ns, nz, nr, nl, r^{n}d, rn, l^{n}d, ls, or ŋk.

Additional constraints could be added to militate against the sequence /tŋ/, and occurrence of /h/ in coda position. A search of the literature has not revealed another instance of a constraint specifically banning the sequence /tŋ/; however, it is worth considering if the apparent idiosyncratic constraint could be the result of constraint interaction. Common constraints against codas and homorganic sequences could not account for the seemingly idiosyncratic ban of /tŋ/, and there are counter-examples to potential constraints that would prohibit /t/ as coda or /ŋ/ as onset. Furthermore, the sequence /tk/ is acceptable, thus ruling out a constraint against sequential alveolar and velar closures.

In order to produce a CV- surface form for the reduplicant, these constraints only need to outrank a constraint, MAX, in which there is a violation for each segment in the underlying form which does not have a correspondent in the surface form. One drawback to this approach is that there is no cross-linguistic motivation to propose a constraint which specifically bans homorganic sequences except β^{m}b, mp, s^{n}d, sl, zl, ns, nz, nr, nl, r^{n}d, rn, l^{n}d, ls, or ŋk. Such a constraint would simplify a constraint-based analysis of Roviana but do little to advance the study of theoretical phonology. Perhaps the most elegant presentation of the pattern of banned and permitted homorganic sequences is to merely stipulate which ones are banned or permitted.

4. Conclusion

Roviana employs CVC- reduplication to inflect a variety of functions. The coda of the reduplicant creates a coda-onset sequence with the onset of the base. Roviana lacks consonant sequences in root words; however, there are a series of conditions on consonant sequences which, when violated, will result in CV- reduplication instead of CVC- reduplication. There are four general conditions on acceptable and prohibited sequences: 1) /h/ cannot be the first element (the coda) of a coda-onset sequence. 2) The sequence /tŋ/ is banned. 3) Geminate or identical sequences are banned. 4) Homorganic sequences are generally banned.

Consonant sequences created through reduplication in Roviana are interesting for several reasons. Roviana lacks codas and consonant sequences in root words, yet they appear in reduplication. The pattern of banned and acceptable sequences cannot be couched in any known system of natural class. The theoretically interesting nature of reduplication in Roviana highlights the need for careful description and analysis of little-described languages.

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Appendix I: All possible coda-onset sequences arranged by coda

/p/

pp:	N/A			
p^{m}b:	*^{m}bupara*	‘brown’	*^{m}bu-^{m}bupara*	‘be/make brown’
pt:	*tepa*	‘ask’	*tep-tepa*	‘beg’
p^{n}d:	*^{n}dopala*	‘death spirit’	*^{n}dop-^{n}dopala*	(nonce word)
pk:	*kopu*	‘take care’	*kop-kopu*	‘taking care’
p^{ŋ}g:	*^{ŋ}gopu*	‘t.o. canoe’	*^{ŋ}gop-^{ŋ}gopu*	(meaning unknown)
pβ:	*βopa*	(nonce word)	*βo-βopa*	(nonce word)
ps:	*sipu*	‘wave, beckon’	*sip-sipu*	‘waving, beckoning’
pz:	*zupe*	‘to clear as a bulldozer’	*zup-zupe*	‘a pile of dirt from clearing’
pɣ:	*ɣepi*	‘to scratch or claw’	*ɣep-ɣepi*	‘scratching, clawing’
ph:	*hupulu*	‘to gut fish or animal’	*hup-hupulu*	‘gutting’
pm:	*mupi*	(nonce word)	*mu-mupi*	(nonce word)
pn:	*nipaha*	‘bail out, as canoe’	*nip-nipaha*	‘bailing out’
pŋ:	*ŋaputu*	‘close as shellfish’	*ŋap-ŋaputu*	‘closing as shell fish’
pr:	*ripu*	(nonword)	*rip-ripu*	‘completely covered’
pl:	*lopi*	‘play’	*lop-lopi*	‘playing, sport’

/^{m}b/

^{m}bp:	*pe^{m}bili*	‘bend tree branch down’	*pe-pe^{m}bili*	‘bending down tree branch’
^{m}b^{m}b:	N/A			
^{m}bt:	*te^{m}bo ehara*	‘bruise’	*tem-te^{m}bo ehara*	‘bruising’
^{m}b^{n}d:	*^{n}du^{m}bu*	(nonce word)	*^{n}dum-^{n}du^{m}bu*	(nonce word)
^{m}bk:	*ke^{m}bo*	‘complain piteously’	*kem-ke^{m}bo*	‘complaining piteously’
^{m}bg:	*^{ŋ}gi^{m}bi*	(nonce word)	*^{ŋ}gim-^{ŋ}gibi*	(nonce word)
^{m}bβ:	*βa^{m}bi*	(nonce word)	*βa-βa^{m}bi*	(nonce word)
^{m}bs:	*si^{m}ba*	‘break loose’	*sim-si^{m}ba*	‘walk with hands swaying’
^{m}bz:	*ze^{m}bi*	(nonce word)	*zem-ze^{m}bi*	(nonce word)
^{m}bɣ:	*ɣo^{m}ba*	‘to wall’	*ɣom-ɣo^{m}ba*	‘a wall’
^{m}bh:	*ha^{m}bu*	‘to fish’	*ham-ha^{m}bu*	‘fishing’
^{m}bm:	*ma^{m}bo*	‘tired’	*ma-ma^{m}bo*	‘being tired’
^{m}bn:	*ne^{m}be*	‘to fan’	*nem-ne^{m}be*	‘a fan, fanning’
^{m}bŋ:	*ŋi^{m}buru*	‘howl, rage, as wind’	*ŋim-ŋi^{m}buru*	‘howling, raging, as wind’
^{m}br:	*ra^{m}beke*	‘to pick and choose’	*ram-ra^{m}beke*	‘picking and choosing’
^{m}bl:	*lo^{m}biti*	‘to pluck or pick out’	*lom-lo^{m}biti*	‘plucking or picking out’

/β/

βp:	*paβo*	‘visit the sick	*pa-paβo*	‘visiting the sick’
β^{m}b:	*^{m}baβa*	(nonce word)	*^{m}baβ-^{m}baβa*	(nonce word)

βt:	*taβete*	‘work’	*taβ-taβete*	‘working’
βⁿd:	*ⁿdiβe*	‘strike water to stun fish’	*ⁿdiβ-ⁿdiβe*	‘striking water…’
βk:	*kiβara*	‘fasten a line’	*kiβ-kiβara*	‘fastening a line’
βᵑg:	*ᵑgeβi*	‘to clear and burn refuse’	*ᵑgeβ-ᵑgeβi*	‘clearing…’
ββ:	N/A			
βs:	*suβu*	‘go under water’	*suβ-suβu*	‘going underwater’
βz:	*zeβa*	(nonce word)	*zeβ-zeβa*	(nonce word)
βɣ:	*ᵑgaβoro*	‘acquire precious item’	*ᵑgaβ-ᵑgaβoro*	‘acquiring…’
βh:	*hoβa*	‘stab’	*hoβ-hoβa*	‘stabbing’
βm:	*maβa*	‘yawn’	*ma-maβa*	‘yawning’
βn:	*neβe*	‘spread as clouds’	*neβ-neβe*	‘spreading as clouds’
βŋ:	*ŋaβa*	‘a fathom’	*ŋaβ-ŋaβa*	(meaning unknown)
βr:	*roβe*	‘lace together’	*roβ-roβe*	‘hoping or thinking’
βl:	*laβe*	‘a shield’	*laβ-laβe*	‘guard with shield’
/m/				
mp:	*pamaŋa*	‘to respect’	*pam-pamaŋa*	‘respecting’
mᵐb:	*ᵐbuma*	‘green’	*ᵐbu-ᵐbuma*	‘be/make green’
mt:	*tome*	‘hide’	*tom-tome*	‘hiding’
mⁿd:	*ⁿdoma*	‘daydream’	*ⁿdom-ⁿdoma*	‘daydreaming’
mk:	*komolo*	‘smile’	*kom-komolo*	‘cheeks’
mᵑg:	*ᵑgimutu*	‘mouth words without noise’	*ᵑgim-ᵑgimutu*	‘mouthing words as…’
mβ:	*βima*	(nonce word)	*βi-βima*	(nonce word)
ms:	*somana*	‘gather, join, attend’	*som-somana*	‘gathering, joining, attending’
mz:	*zomue*	‘eat greedily’	*zom-zomue*	‘eating greedily’
mɣ:	*ɣomu*	‘one who has lost a limb’	*ɣom-ɣomu*	‘state of having lost a limb’
mh:	*hamu*	‘chew’	*ham-hamu*	‘chewing’
mm:	N/A			
mn:	*nama-na*	‘preparation’	*βa-nam-nama*	‘prepare’
mŋ:	*ŋame*	‘crawl’	*ŋam-ŋame*	‘crawling’
mr:	*rimata*	‘sun’	*rim-rimata*	‘bask in sun’
ml:	*lemese*	‘pick bones clean’	*lem-lemeso to*	‘picking bones clean’
/t/				
tp:	*petu*	‘mangrove’	*pet-petu*	‘a place with mangroves’
tᵐb:	*ᵐbutu*	‘strike water with open hand’	*ᵐbut-ᵐbutu*	‘striking water with…’
tt:	N/A			
tⁿd:	*ⁿduta*	‘collide’	*du-ⁿduta*	‘colliding’
tk:	*kito*	‘distract, disturb’	*kit-kito*	‘distracting or disturbing’
tᵑg:	*ᵑgetu*	‘happy’	*ᵑget-ᵑgetu*	‘being happy’

tβ:	*βute*	‘to plait with straw’	*βut-βute*	‘plating with…’
ts:	*suti*	‘comb’	*su-suti*	‘combing’
tz:	*zutu*	‘condemn, judge’	*zu-zutu*	‘condemning, judging’
tɣ:	*ɣoti*	‘ceremonial stone’	*ɣot-ɣoti*	‘side by side, as fingers’
th:	*hite*	‘little’	*hit-hite*	‘slowly’
tm:	*muti*	‘make appointment’	*mut-muti*	‘making an appointment’
tn:	*neti*	‘trample upon’	*ne-neti*	‘trampling upon’
tŋ:	*ŋoto*	‘broken as tree with fruit’	*ŋo-ŋoto*	‘break straight’
tr:	*rita*	‘hook a fish’	*ri-rita*	‘hooking a fish’
tl:	*lete*	‘to plant’	*le-lete*	‘a planter’

/ⁿd/

ⁿdp:	*paⁿda*	‘measure’	*pan-paⁿda*	‘measuring’
ⁿdᵐb:	*ᵐbaⁿda*	(nonce word)	*ᵐban-ᵐbaⁿda*	(nonce word)
ⁿdt:	*teⁿdoro*	‘glide’	*te-teⁿdoro*	‘skip stones’
ⁿdⁿd:	N/A			
ⁿdk:	*kuⁿdu*	‘small island name’	*kun-kuⁿdu*	‘bigger island near kudu’
ⁿdᵑg:	*ᵑgaⁿdo*	(nonce word)	*ᵑgan-ᵑgaⁿdo*	(nonce word)
ⁿdβ:	*βiⁿde*	‘split in half’	*βin-βiⁿde*	‘splitting in half’
ⁿds:	*saⁿda*	‘outside’	*sa-saⁿda*	‘an entrance’
ⁿdz:	*zaⁿda*	(nonce word)	*za-zaⁿda*	(nonce word)
ⁿdɣ:	*ɣeⁿde*	‘left (direction)’	*ɣen-ɣeⁿde*	‘left handed’
ⁿdh:	*hoⁿdu*	‘walking stick’	*hon-hoⁿdu*	‘strike down as with w. stick’
ⁿdm:	*maⁿdi*	‘to abstain’	*man-maⁿdi*	‘abstaining’
ⁿdn:	*niⁿdeke*	‘walk slowly’	*ni-niⁿdeke*	‘walking slowly’
ⁿdŋ:	*ŋeⁿdala*	‘shiny, shine’	*ŋen-ŋeⁿdala*	‘shining’
ⁿdr:	*riⁿda*	‘faded, grey, dull’	*ri-riⁿda*	‘being faded, grey, …’
ⁿdl:	*loⁿdu*	‘sink’	*lo-loⁿdu*	‘sinking’

/s/

sp:	*pisi*	‘fart’	*pis-pisi*	‘farting’
sᵐb:	*ᵐbesu*	‘mourn’	*ᵐbes-ᵐbesu*	‘mourning’
st:	*tasa*	‘counting particle’	*ta-tasa*	‘to ration’
sⁿd:	*ⁿdusi*	(nonce word)	*ⁿdus-ⁿdusi*	(nonce word)
sk:	*kusolo*	(nonword)	*kus-kusolo*	‘immature squid stage’
sᵑg:	*ᵑgusa*	‘to graze, as a stone on canoe’	*ᵑgus-ᵑgusa*	‘grazing as…’
sβ:	*βisu*	‘small sea shell’	*βis-βisu*	‘fingernail, claw’
ss:	N/A			
sz:	*zesi*	(nonce word)	*ze-zesi*	(nonce word)
sɣ:	*ɣasi*	‘make or scratch a mark’	*ɣas-ɣasi*	‘making or scratching a…’

sh:	*βa-hesi*	‘to praise’	*βa-hes-hesi*	‘praising’
sm:	*masa*	‘beach or shore’	*mas-masa*	‘shallow or shallows’
sn:	*noso*	‘quiet or patient’	*no-noso*	‘be quiet or patient’
sŋ:	*ŋisili*	‘giggle’	*ŋis-ŋisili*	‘giggling’
sr:	*resi*	‘split pandanus leaves’	*re-resi*	‘splitting pandanus leaves’
sl:	*losoβo*	‘to doze when laying’	*los-losoβo*	‘dozing while laying’
/z/				
zp:	*pizo*	(nonword)	*piz-pizo*	‘shell bracelet or anklet’
z^{m}b:	*^{m}biza*	(nonce word)	*^{m}biz-^{m}biza*	(nonce word)
zt:	*tozi*	‘tell’	*to-tozi*	‘telling’
z^{n}d:	*^{n}duzi*	(nonce word)	*^{n}du-^{n}duzi*	(nonce word)
zk:	*kiza*	‘beat a tattoo’	*kiz-kiza*	‘beating a tattoo’
z^{ŋ}g:	*^{ŋ}gizo*	‘t.o. tree’	*^{ŋ}giz-^{ŋ}gizo*	‘place with *^{ŋ}gizo*’
zβ:	*βizoŋo*	‘curly, to curl’	*βiz-βizoŋo*	‘curling or twisting’
zs:	*sizu*	(nonce word)	*si-sizu*	(nonce word)
zz:	N/A			
zɣ:	*ɣiza*	‘t.o. tree’	*ɣiz-ɣiza*	‘t.o. weed’
zh:	*hezi*	(nonce word)	*hez-hezi*	(nonce word)
zm:	*muzi*	‘rotten, decayed’	*muz-muzi*	‘be rotten or decayed’
zn:	*nuziki*	‘to put/lie under to hide’	*tinoa nu-nuziki*	‘life of former native people’
zŋ:	*ŋuzu*	‘beak’	*ŋuz-ŋuzu*	‘*tomoko* prow carving statue’
zr:	*rizu*	‘move’	*ri-rizu*	‘moving’
zl:	*lozoko*	‘to shed skin as a snake’	*loz-lozoko*	‘shedding skin as a snake’
/n/				
np:	*pino*	(nonword)	*pin-pino*	‘star, firefly’
n^{m}b:	*^{m}bana*	‘raft’	*^{m}ban-^{m}bana*	‘rafting’
nt:	*tunuru*	‘swim’	*tu-tunuru*	‘swimming’
n^{n}d:	*^{n}duna*	(nonce word)	*^{n}du-^{n}duna*	(nonce word)
nk:	*kina*	‘cook with fire’	*kin-kina*	‘cooking’
n^{ŋ}g:	*^{ŋ}gena*	(nonword)	*^{ŋ}gen-^{ŋ}gena*	‘call, laugh, talk to opposite sex’
nβ:	*βanu*	‘to gargle’	*βan-βanu*	‘swill or wash pot’
ns:	*suni*	‘prick, inject’	*sun-suni*	‘pricking, injecting’
nz:	*zinu*	‘t.o. large leaf plant’	*zin-zinu*	‘place where *zinu* grows’
nɣ:	*ɣani*	‘to eat (coarse word)’	*ɣan-ɣani*	‘eating (coarse word)’
nh:	*hena*	‘to eat’	*hen-hena*	‘eating’
nm:	*munu*	(nonword)	*mun-munu*	‘morning’
nn:	N/A			

nŋ:	*ŋuna*	‘to rub’	*ŋun-ŋuna*	‘rubbing’
nr:	*ronu*	‘to rely, depend upon’	*ron-ronu*	‘relying, depending upon’
nl:	*luna*	(nonce word)	*lun-luna*	(nonce word)

/r/

rp:	*pera*	‘enter, take by force’	*per-pera*	‘entering, taking by…’
r^{m}b:	*^{m}biri*	(nonword)	*^{m}bir-^{m}biri*	‘a beach tree’
rt:	*taru*	‘pity’	*ta-taru*	‘pitying’
r^{n}d:	*^{n}doroko*	‘look intently but not see’	*^{n}dor-^{n}doroko*	‘looking intently but not…’
rk:	*kure*	‘shy’	*kur-kure*	‘being shy’
r^{ŋ}g:	*^{ŋ}gora*	‘betray’	*^{ŋ}gor-^{ŋ}gora*	‘betraying’
rβ:	*βeru*	(nonword)	*βer-βeru*	‘t.o. precious clam shell’
rs:	*sire*	‘change’	*si-sire*	‘joke’
rz:	*zoru*	‘shake down as fruit from tree’	*zo-zoru*	‘shaking down as fruit…’
rɣ:	*ɣore*	‘go down, descend’	*ɣar-ɣore*	‘going down, descending’
rh:	*hira*	‘to breed, of lower animals’	*hir-hira*	‘breeding, of lower animals’
rm:	*meru*	(nonword)	*mer-meru*	‘heirloom, inheritance’
rn:	*neri*	‘to shave’	*ner-neri*	‘shaving’
rŋ:	*ŋarezo*	‘try something difficult’	*ŋar-ŋarezo*	‘trying something difficult’
rr:	N/A			
rl:	*loro*	‘to spit, expectorate’	*lo-loro*	‘spitting, expectorating’

/l/

lp:	*pule*	‘return’	*pul-pule*	‘returning’
l^{m}b:	*^{m}bole*	(nonword)	*^{m}bol-^{m}bole*	‘sand bank or sand pit’
lt:	*toli*	‘watch, supervise	*to-toli*	‘watching or supervising’
l^{n}d:	*^{n}dalo*	‘wash face’	*^{n}dal-^{n}dalo*	‘washing face’
lk:	*koli*	(nonword)	*kol-koli*	‘lever up with piece of wood’
l^{ŋ}g:	*^{ŋ}gelu*	‘oar’	*^{ŋ}gel-^{ŋ}gelu*	‘roll or lever a log’
lβ:	*βelu*	(nonword)	*βel-βelu*	‘afternoon’
ls:	*silaβa*	‘restless with pain’	*sil-silaβa*	‘be restless with pain’
lz:	*zalo*	‘take or destroy other’s prop.’	*za-zalo*	‘taking or destroying…’
lɣ:	*ɣeli*	‘to dig’	*ɣel-ɣeli*	‘digging’
lh	*halo*	‘to catch, as a ball’	*hal-halo*	‘catching as a ball’
lm:	*mila*	‘chew betelnut, lime, and noi’	*mil-mila*	‘chewing betelnut, lime and noi’
ln:	*nolo*	‘fall as ripe fruit’	*no-nolo*	‘falling as ripe fruit’
lŋ:	*ŋali*	‘industrious’	*ŋal-ŋali*	‘be industrious’
lr:	*relu*	(nonce word)	*re-relu*	(nonce word)
ll:	N/A			

/k/

kp:	*peka*	‘dance’	*pek-peka*	‘dancing’
k^{m}b:	*^{m}bekolo*	‘paddle in woman’s style’	*^{m}bek-^{m}bekolo*	‘paddling in woman’s style’
kt:	*toka*	‘help’	*tok-toka*	‘helping’
k^{n}d:	*^{n}diki*	(nonword)	*^{n}dik-^{n}diki*	‘variety of potato’
kk:	N/A			
k^{ŋ}g:	*^{ŋ}goki*	(nonce word)	*^{ŋ}go-^{ŋ}goki*	(nonce word)
kβ:	*βeko*	‘put down’	*βek-βeko*	‘line-fishing’
ks:	*sekei*	(nonword)	*sek-sekei*	‘subtle, deceitful’
kz:	*zuka*	‘support’	*zuk-zuka*	‘supporting’
kɣ:	*ɣaki*	(nonce word)	*ɣa-ɣaki*	(nonce word)
kh:	*hiko*	‘steal, rob’	*hik-hiko*	‘stealing, robbing’
km:	*moko*	‘stop crying’	*mok-moko*	‘being quiet, hush’
kn:	*nekele*	‘stumble, overbalance’	*nek-nekele*	‘stumbling, overbalancing’
kŋ:	*ŋaki*	(nonce word)	*ŋa-ŋaki*	(nonce word)
kr:	*ruku*	‘rain’	*ruk-ruku*	‘raining’
kl:	*loku*	(nonword)	*lok-loku*	‘t.o. tree’

/^{ŋ}g/

^{ŋ}gp:	*pe^{ŋ}ga*	‘to gather at funeral’	*peŋ-pe^{ŋ}ga*	‘wake at a funeral’
^{ŋ}g^{m}b:	*^{m}ba^{ŋ}ga*	(nonce word)	*^{m}baŋ-^{m}ba^{ŋ}ga*	(nonce word)
^{ŋ}gt:	*tu^{ŋ}ge*	‘to hold/grasp’	*tuŋ-tu^{ŋ}ge*	‘holding/grasping’
^{ŋ}g^{n}d:	*^{n}di^{ŋ}gi*	‘dingy (loan)’	*^{n}diŋ-^{n}di^{ŋ}gi*	‘using a dingy’
^{ŋ}gk:	*ka^{ŋ}gi*	‘crust’	*ka-ka^{ŋ}gi*	(meaning unknown)
^{ŋ}g^{ŋ}g:	N/A			
^{ŋ}gβ:	*βi^{ŋ}go*	‘anal yaws’	*βiŋ-βi^{ŋ}go*	‘to walk in awkward manner’
^{ŋ}gs:	*su^{ŋ}gumu*	‘t.o. frond basket’	*suŋ-su^{ŋ}gumu*	‘t.o. frond basket’
^{ŋ}gz	*zo^{ŋ}ga*	(nonce word)	*zoŋ-zo^{ŋ}ga*	(nonce word)
^{ŋ}gɣ:	*ɣa^{ŋ}gu*	(nonce word)	*ɣa-ɣa^{ŋ}gu*	(nonce word)
^{ŋ}gh:	*ha^{ŋ}gala*	‘run’	*haŋ-ha^{ŋ}gala*	‘running’
^{ŋ}gm:	*ma^{ŋ}go*	‘ghost/spirit’	*maŋ-ma^{ŋ}go*	‘Holy Spirit/picture’
^{ŋ}gn:	*ni^{ŋ}gi*	(nonword)	*niŋ-ni^{ŋ}gi*	‘frond mat’
^{ŋ}gŋ:	*ŋa^{ŋ}go*	(nonce word)	*ŋa-ŋa^{ŋ}go*	(nonce word)
^{ŋ}gr:	*ri^{ŋ}gihi*	‘hook a fish’	*riŋ-ri^{ŋ}gihi*	‘hooking a fish’
^{ŋ}gl:	*lo^{ŋ}gu*	‘covered load’	*loŋ-lo^{ŋ}gu*	‘move a covered load’

/ɣ/

ɣp:	*paɣala*	‘noise of breaking sticks’	*paɣ-paɣala*	(meaning unknown)
ɣ^{m}b:	*^{m}biɣo*	(nonword)	*^{m}biɣ-^{m}biɣo*	‘rainbow’
ɣt:	*taɣo*	‘have, possess’	*taɣ-taɣo*	‘rich’

ɣⁿd:	*ⁿduɣala*	‘sound of stomping, striking’	*ⁿduɣ-ⁿduɣala*	(meaning unknown)
ɣk:	*kaɣumu*	‘pineapple/banana shoot’	*ka-kaɣumu*	(meaning unknown)
ɣᵑg:	*ᵑgeɣa*	‘desert/part cooked *motu* food’	*ᵑge-ᵑgeɣa*	(meaning unknown)
ɣβ:	*βaɣi*	‘get, obtain, capture’	*βaɣ-βaɣi*	‘getting, obtaining, capturing’
ɣs:	*siɣiti*	‘pain’	*siɣ-siɣiti*	‘being painful’
ɣz:	*zeɣara*	‘sit inappropriately, as child’	*zeɣ-zeɣara*	‘sitting inappropriately…’
ɣɣ:	N/A			
ɣh:	*heɣere*	‘laugh’	*heɣ-heɣere*	‘laughing’
ɣm:	*maɣu*	‘cut’	*maɣ-maɣu*	‘cutting’
ɣn:	*naɣo*	‘reach for a person’	*naɣ-naɣo*	‘reaching for a person’
ɣŋ:	*ŋoɣa*	(nonce word)	*ŋo-ŋoɣa*	(nonce word)
ɣr:	*raɣi*	‘choppy waves’	*raɣ-raɣi*	(meaning unknown)
ɣl:	*leɣi*	‘sing out badly’	*leɣ-leɣi*	‘singing out badly’

/ŋ/

ŋp:	*poŋa*	‘soak in water’	*poŋ-poŋa*	‘plant taro or *maseda*’
ŋᵐb:	*ᵐbaŋu*	‘cross piece at top of paddle’	*ᵐbaŋ-ᵐbaŋu*	‘breaking cross piece of paddle’
ŋt:	*taŋini*	‘to touch, take hold of ‘	*taŋ-taŋini*	‘touching or taking hold of’
ŋⁿd:	*ⁿdoŋo*	‘look’	*ⁿdoŋ-ⁿdoŋo*	‘looking’
ŋk:	*kaŋa*	‘drink poured water overhead’	*kaŋ-kaŋa*	‘drinking poured water…’
ŋᵑg:	*ᵑgaŋi*	(nonce word)	*ᵑga-ᵑgaŋi*	(nonce word)
ŋβ:	*βaŋunu*	‘wake up’	*βaŋ-βaŋunu*	‘waking up’
ŋs:	*siŋo*	‘to breath’	*siŋ-siŋo*	‘breathing’
ŋz:	*zoŋa*	‘specially, superlatively good’	*zoŋ-zoŋa*	‘to be special, …’
ŋɣ:	*ɣaŋi*	(nonce word)	*ɣa-ɣaŋi*	(nonce word)
ŋh:	*huŋi*	(nonce word)	*huŋ-huŋi*	(nonce word)
ŋm:	*maŋini*	‘hot’	*maŋ-maŋini*	‘being hot’
ŋn:	*nuŋi*	(nonce word)	*nuŋ-nuŋi*	(nonce word)
ŋŋ:	N/A			
ŋr:	*raŋe*	‘believe, have faith’	*raŋ-raŋe*	‘believing, having faith’
ŋl:	*liŋi*	‘flavor, taste’	*liŋ-liŋi*	(meaning unknown)

/h/

hp:	*pohaka*	‘to blister’	*po-pohaka*	‘blistering’
hᵐb:	*ᵐbuhi*	‘uncle’	*ᵐbu-ᵐbuhi*	(*buhi* does not reduplicate)
ht:	*tihe*	‘to sneeze’	*ti-tihe*	‘sneezing’
hⁿd:	*ⁿdaho*	(nonce word)	*ⁿda-ⁿdaho*	(nonce word)
hk:	*kihu*	‘pick at skin’	*ki-kihu*	‘picking at skin/
hᵑg:	*ᵑgaha*	‘to transfix’	*ᵑga-ᵑgaha*	(meaning unknown)
hβ:	*βuhe*	‘beetle’	*βu-βuhe*	‘place with *βuhe*’

hs:	*sihe*	(nonce word)	*si-sihe*	(nonce word)
hz:	*zoha*	(nonce word)	*zo-zoha*	(nonce word)
hɣ:	*ɣohere*	'type of plant'	*ɣo-ɣohere*	'place with *ɣohere*'
hm:	*maho*	'cut with axe'	*ma-maho*	'cutting with an axe'
hn:	*nehe*	(nonce word)	*ne-nehe*	(nonce word)
hŋ:	*ŋohara*	'coconut'	*ŋo-ŋohara*	'coconut plantation'
hr:	*rahi*	'native taro pudding'	*ra-rahi*	'place with *rahi*'
hl	*liho*	'new growth, shoots'	*li-liho*	'place with *liho*'

Appendix II: Homorganic sequences

LABIAL

Homorganic labial sequences

	p	^{m}b	β	m
p	~~pp~~	~~p^{m}b~~	~~pβ~~	~~pm~~
^{m}b	~~^{m}bp~~	~~^{m}b^{m}b~~	~~^{m}bβ~~	~~^{m}bm~~
β	~~βp~~	**β^{m}b**	~~ββ~~	~~βm~~
m	**mp**	~~m^{m}b~~	~~mβ~~	~~mm~~

/p/

pp:	N/A			
p^{m}b:	*^{m}bupara*	'brown'	*^{m}bu-^{m}bupara*	'be/make brown'
pβ:	*βopa*	(nonce word)	*βo-βopa*	(nonce word)
pm:	*mupi*	(nonce word)	*mu-mupi*	(nonce word)

/^{m}b/

^{m}bp:	*pe^{m}bili*	'bend tree branch down'	*pe-pe^{m}bili*	'bending down tree branch'
^{m}b^{m}b:	N/A			
^{m}bβ:	*βa^{m}bi*	(nonce word)	*βa-βa^{m}bi*	(nonce word)
bm:	N/A			

/β/

βp:	*paβo*	'visit the sick'	*pa-paβo*	'visiting the sick'
β^{m}b:	***^{m}baβa***	**(nonce word)**	***^{m}baβ-^{m}baβa***	**(nonce word)**
ββ:	N/A			
βm:	*maβa*	'yawn'	*ma-maβa*	'yawning'

/m/

mp:	***pamaŋa***	**'to respect'**	***pam-pamaŋa***	**'respecting'**

$m^{m}b$:	N/A			
mβ:	*βima*	(nonce word)	*βi-βima*	(nonce word)
mm:	N/A			

ALVEOLARS

Homorganic Alveolar sequences

	t	^{n}d	s	z	n	r	l
t	~~tt~~	~~t^{n}d~~	~~ts~~	~~tz~~	~~tn~~	~~tr~~	~~tl~~
^{n}d	~~^{n}dt~~	~~^{n}d^{n}d~~	~~^{n}ds~~	~~^{n}dz~~	~~^{n}dn~~	~~^{n}dr~~	~~^{n}dl~~
s	~~st~~	**s^{n}d**	~~ss~~	~~sz~~	~~sn~~	~~sr~~	**sl**
z	~~zt~~	~~z^{n}d~~	~~zs~~	~~zz~~	~~zn~~	~~zr~~	**zl**
n	~~nt~~	~~n^{n}d~~	**ns**	**nz**	~~nn~~	**nr**	**nl**
r	~~rt~~	**r^{n}d**	~~rs~~	~~rz~~	**rn**	~~rr~~	~~rl~~
l	~~lt~~	**l^{n}d**	**ls**	~~lz~~	~~ln~~	~~lr~~	~~ll~~

/t/

tt:	N/A			
t^{n}d:	*^{n}duta*	‘collide’	*^{n}du-^{n}duta*	‘colliding’
ts:	*suti*	‘comb’	*su-suti*	‘combing’
tz:	*zutu*	‘condemn, judge’	*zu-zutu*	‘condemning, judging’
tn:	*neti*	‘trample upon’	*ne-neti*	‘trampling upon’
tr:	*rita*	‘hook a fish’	*ri-rita*	‘hooking a fish’
tl:	*lete*	‘to plant’	*le-lete*	‘a planter’

/^{n}d/

^{n}dt:	*te^{n}doro*	‘glide’	*te-te^{n}doro*	‘skip stones’
^{n}d^{n}d:	N/A			
^{n}ds:	*sa^{n}da*	‘outside’	*sa-sa^{n}da*	‘an entrance’
^{n}dz:	*za^{n}da*	(nonce word)	*za-za^{n}da*	(nonce word)
^{n}dn:	N/A			
^{n}dr:	*ri^{n}da*	‘faded, grey, dull’	*ri-ri^{n}da*	‘being faded, grey, …’
^{n}dl:	*lo^{n}du*	‘sink’	*lo-lo^{n}du*	‘sinking’

/s/

st:	*tasa*	‘counting particle’	*ta-tasa*	‘to ration’
s^{n}d:	***^{n}dusi***	**(nonce word)**	***^{n}dus-^{n}dusi***	**(nonce word)**
ss:	N/A			
sz:	*zesi*	(nonce word)	*ze-zesi*	(nonce word)
sn:	*noso*	‘quiet or patient’	*no-noso*	‘be quiet or patient’
sr:	*resi*	‘split pandanus leaves’	*re-resi*	‘splitting pandanus leaves’
sl:	***losoβo***	**‘to doze when laying’**	***los-losoβo***	**‘dozing while laying’**

/z/

zt:	*tozi*	'tell'	*to-tozi*	'telling'
z^{n}d:	*^{n}duzi*	(nonce word)	*^{n}du-^{n}duzi*	(nonce word)
zs:	*sizu*	(nonce word)	*si-sizu*	(nonce word)
zz:	N/A			
zn:	*nuziki*	'to put/lie under to hide'	*tinoa nu-nuziki*	'life of former native people'
zr:	*rizu*	'move'	*ri-rizu*	'moving'
zl:	***lozoko***	**'to shed skin as a snake'**	***loz-lozoko***	**'shedding skin as snake'**

/n/

nt:	*tunuru*	'swim'	*tu-tunuru*	'swimming'
n^{n}d:	N/A			
ns:	***suni***	**'prick, inject'**	***sun-suni***	**'pricking, injecting'**
nz:	***zinu***	**'t.o. large leaf plant'**	***zin-zinu***	**'place where *zinu* grows'**
nn:	N/A			
nr:	***ronu***	**'to rely, depend upon'**	***ron-ronu***	**'relying, depending upon'**
nl:	***luna***	**(nonce word)**	***lun-luna***	**(nonce word)**

/r/

rt:	*taru*	'pity'	*ta-taru*	'pitying'
r^{n}d:	***^{n}doroko***	**'look intently but not see'**	***^{n}dor-^{n}doroko***	**'looking intently but not…'**
rs:	*sire*	'change'	*si-sire*	'joke'
rz:	*zoru*	'shake down as fruit from tree'	*zo-zoru*	'shaking down as fruit…'
rn:	***neri***	**'to shave'**	***ner-neri***	**'shaving'**
rr:	N/A			
rl:	*loro*	'to spit, expectorate'	*lo-loro*	'spitting, expectorating'

/l/

lt:	*toli*	'watch, supervise'	*to-toli*	'watching or supervising'
l^{n}d:	***^{n}dalo***	**'wash face'**	***^{n}dal-^{n}dalo***	**'washing face'**
ls:	***silaβa***	**'restless with pain'**	***sil-silaβa***	**'be restless with pain'**
lz:	*zalo*	'take or destroy other's prop'.	*za-zalo*	'taking or destroying…'
ln:	*nolo*	'fall as ripe fruit'	*no-nolo*	'falling as ripe fruit'
lr:	*relu*	(nonce word)	*re-relu*	(nonce word)
ll:	N/A			

VELARS

Homorganic velar sequences

	k	ᵑg	ɣ	ŋ
k	~~kk~~	~~kᵑg~~	~~kɣ~~	~~kŋ~~
ᵑg	~~ᵑgk~~	~~ᵑgᵑg~~	~~ᵑgɣ~~	~~ᵑgŋ~~
ɣ	~~ɣk~~	~~ɣᵑg~~	~~ɣɣ~~	~~ɣŋ~~
ŋ	**ŋk**	~~ŋᵑg~~	~~ŋɣ~~	~~ŋŋ~~

/k/

kk:	N/A			
kᵑg:	*ᵑgoki*	(nonce word)	*ᵑgo-ᵑgoki*	(nonce word)
kɣ:	*ɣaki*	(nonce word)	*ɣa-ɣaki*	(nonce word)
kŋ:	*ŋaki*	(nonce word)	*ŋa-ŋaki*	(nonce word)

/ᵑg/

ᵑgk:	*kaᵑgi*	‘crust’	*ka-kaᵑgi*	(meaning unknown)
ᵑgᵑg:	N/A			
ᵑgɣ:	*ɣaᵑgu*	(nonce word)	*ɣa-ɣaᵑgu*	(nonce word)
ᵑgŋ:	N/A			

/ɣ/

ɣk:	*kaɣumu*	‘pineapple/banana shoot’	*ka-kaɣumu*	(meaning unknown)
ɣᵑg:	*ᵑgeɣa*	‘desert/part cooked *motu* food’	*ᵑge-ᵑgeɣa*	(meaning unknown)
ɣɣ:	N/A			
ɣŋ:	*ŋoɣa*	(nonce word)	*ŋo-ŋoɣa*	(nonce word)

/ŋ/

ŋk:	***kaŋa***	**drink poured water overhead**	***kaŋ-kaŋa***	**‘drinking poured water…’**
ŋᵑg:	N/A			
ŋɣ:	*ɣaŋi*	(nonce word)	*ɣa-ɣaŋi*	(nonce word)
ŋŋ:	N/A			