The truncated reduplication in Twana: Another case of synergistic weakening*

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Abstract: Drachman's (1969) examples of CVC reduplication are reanalyzed to show that the consonant cluster reduction of $C_1C_2C_1 \rightarrow C_2C_1$ that Kim and Gardiner (2016) analyzed under synergy of dissimilation and cluster simplification also occurs in Twana. Twana differs from Tillamook, however, as it also has newly formed surface $C_1C_2C_1$ clusters that do not reduce. The paper explains this inconsistency in consonant cluster reduction by referring to the type of CVC root. Even though the reduplicant vowel is unstressed in reduplications of both strong and weak roots, it is only in the latter that the vowel drops out, allowing early formation and reduction of $C_1C_2C_1$ clusters; the reduplicant vowel in the former, on the other hand, generally weakens to a schwa, except when it occurs between voiceless consonants where it devoices and drops. From this late deletion of reduplicant schwa emerges a new triconsonantal cluster, which remains unreduced because it was formed after the consonant cluster reduction rule has already occurred. Van Eijk's (1998) comparative work on stress patterns for CVC reduplication in Salish languages plays an important role in establishing this alternative explanation to Drachman's often complex rules of cluster reduction, while the remaining changes in the reduplicant shape are explained by interaction of the triconsonantal reduction with rules such as schwa insertion and deletion, assimilation of consonants between members of a cluster, and contraction of the reduplicant schwa with the following /w/ and /y/.

Keywords: CVC reduplication, synergistic weakening, dissimilation, cluster simplification, augmentatives, Tillamook, Twana, Salish

1 Introduction

It has been shown in Kim and Gardiner (2016) that $C_1C_2C_1$ reduces to C_2C_1 in Tillamook augmentative reduplication, by synergy of dissimilation and cluster simplification, as in the following examples from Edel (1939: 15):[1]

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[1] Throughout the paper, reduplicants are boldfaced.

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(1)	Root	Gloss	Reduplicated	Gloss
	tq	'to break'	dAc-**q**tE′q-en	'they tried to break it'
	tł	'to tell'	da s-**ł**tU′ł-En	'they went and told him'
	dak'	'to lie'	nic-**k**dUk' ns-adzAgil-agă′s	'they put her in their canoe'
	tsq-il	'to climb'	**q**dzU′qil	'they climb'
	gał	'eye'	a ns-**ł**gał	'my eyes'
	nica	'to be on	**c**nica-wi′sti	'I lie on my side' the side'
	łaq-il	'to sit'	nc-**q**łA′q-il	'he was sitting in it'

The analysis noted that these examples cannot be explained by simple cluster simplification as three (or more) consonant groups are generally permitted in Tillamook, e.g. Ti. *ts-qep-st-és* 'he habitually bandages it'; nor can they be explained by dissimilation, because they do not really meet the condition for Grassmann's Law type of dissimilation. It argued that they arise by a peculiar consonant cluster reduction that occurs when two processes that share the same function of weakening a consonant work together: After loss of the unstressed reduplicant vowel, the process of dissimilation weakens the first of the two identical consonants, and then cluster simplification weakens the pre-weakened consonant further, resulting in its eventual elision. Consider the following derivation of Ti. *dAc-qtE′q-en* 'they tried to break it' and Ti. *nc-qłA′q-il* 'he was sitting in it' based on the roots *tq* 'to break' and *łaq-il* 'to sit' respectively:

(2)	tq-en	łaq-il	
	tq-tq-en	łaq-łaq-il	reduplication
	——	łq-łaq-il	loss of unstressed vowel in the reduplicant
	t^{-}qt^{+}q-en	ł$^{-}$qł$^{+}$aq-il	dissimilation of identical consonants[2]
	qt^{+}q-en	qł$^{+}$aq-il	cluster simplification
	qtE′q-en	qłA′q-il	MR[3]

The goal of this paper is to show that the same synergistic weakening occurs in Twana, which, like Tillamook, also forms its augmentatives by reduplication of the root initial C(V)C.

[2] The symbols '$^{-}$' and '$^{+}$' indicate 'weakening' and 'strengthening', respectively. For the mechanism of dissimilation as 'strength fluxion' in which the first of two similar consonants weakens with concomitant strengthening of the second consonant, see Kim (1991) and Foley (1981). For more examples of consonant cluster reduction occurring under synergy of dissimilation and cluster simplification, see Kim (1991, Ch. 2). For the roles that strengthening and weakening play in phonological theory, see Foley (1977).

[3] Miscellaneous rules. These refer to the rules that have no direct bearing on the points made in the derivation, such as, for example, vowel epenthesis and stress placement in this case.

That Tillamook and Twana share the same consonant cluster reduction has already been noted by Thompson and Thompson (1985: 145, fn. 7):

> The details of a similar formation [of the truncated augmentative] in Twana have been worked out by Drachman (1969: 53ff), and it seems likely that similar constraints govern the cases in Tillamook. It is conceivable that the truncation rules in these two languages are historically related, but this can be determined only after the historical development of both is more fully understood…

Moreover, as mentioned in the quotation, Drachman (1969) himself knew that a form of similar consonant cluster reduction is in operation in Twana augmentatives, even though he did not define the process as 'synergistic weakening' by dissimilation and cluster simplification.

In this paper I reanalyze Drachmann's examples of consonant cluster reduction in Twana augmentative reduplication and show how they are subsumed under the simple rule of $C_1C_2C_1 \rightarrow C_2C_1$. Particularly important in this reanalysis is the stress pattern in reduplicating stem types in Salish languages, as described by van Eijk (1998: 460). In CVC reduplications of weak roots (WR), the reduplicant vowel is generally unstressed, so that it elides in languages like Twana, forming clusters of the type $C_1C_2C_1$, the first consonant of which then drops by the above rule of consonant cluster reduction. In reduplications of strong roots (SR), on the other hand, the reduplicant vowel, being stressed, is generally maintained in Salish languages. But in Twana, the stress generally moves to the second syllable of the reduplicative stem, so that the reduplicant vowel of strong roots that has just been bereft of its stress weakens to a schwa. Having been once stressed, this weakened schwa never drops in Twana except when it comes between voiceless consonants where it is devoiced and elides. It is thus only in reduplications of weak roots in Twana that the cluster reduction of $C_1C_2C_1 \rightarrow C_2C_1$ is observed, while elision of the weakened schwa between voiceless consonants in strong roots gives rise to new surface $C_1C_2C_1$ clusters to which the cluster reduction rule fails to occur. This alternative explanation of Twana augmentatives is not only simpler and more insightful than Drachman's rules[4] but it also shows how insights gained from a typologico-comparative description can help explain the problems that arise in synchronic phonology and morphology of reduplication.

[4] While Drachman (1969) provides us with precious data for CVC reduplication in Twana, the only reliable reference in existence, his rules of cluster reduction are often complex and sometimes even ad hoc; I have therefore generally refrained from referring to them directly, preferring instead to expose the alternative rules and let them speak for themselves.

2 The CVC reduplication in Twana augmentatives: truncation by synergy of dissimilation and cluster simplification.

As in Tillamook (Kim & Gardiner 2016; Edel 1939), Twana also exhibits unusual C_2-reduplication which at first glance appears to attach to the 'wrong side' (cf. Nelson 2005). Consider (3) in which the reduplicated C_2 appears to attach to the prefixal position rather than the usual suffixal position:[5]

(3)	Unaugmented	Augmented	Gloss
	sóq̓ʷay	**q̓ʷ**-sóq̓ʷay	'elder sister'
	s-teqéw	s-**q**-téqaw	'horse'
	s-táq	s-**q**-táq	'logjam'
	ʔas-báx̣	ʔəs-**x̣ə**-báx̣	'worn out'
	bəqsəd	**qə**-bə́qsəd	'nose'
	wəq̓áb	**q̓ə**-wə́q̓ab	'box'

There is, however, nothing unusual about this reduplication once we realize that this is just another case of truncated reduplication in which consonant clusters of the type $C_1C_2C_1$ reduce to C_2C_1 under synergy of dissimilation and cluster simplification, as has been reported in detail by Kim and Gardiner (2016) for Tillamook augmentatives. The only difference for the examples in (3) from those of Tillamook in (1) is that a schwa sometimes appears between C_2 of the reduplicant and the following C_1 of the root, as in the last three examples. This anaptyctic schwa is also predictable, as it occurs only when the two consonants are not voiceless: note the first three examples where the insertion fails to occur, or more precisely, it occurs but elides at once because the schwa is surrounded by voiceless consonants. Consider the following comparative derivation of *q̓ʷ-sóqʷay* < **soq̓ʷ-sóq̓ʷay*[6] and *ʔəs-x̣əbáx̣* < **ʔas-bax̣-báx̣*:

(4)	soqʷ-sóq̓ʷay	ʔas-bax̣-báx̣	
	sqʷ-sóq̓ʷay	ʔas-bx̣-báx̣	unstressed reduplicant vowel loss
	qʷ-sóq̓ʷay	ʔas-x̣-báx̣	synergistic weakening: $C_1C_2C_1 \rightarrow C_2C_1$
	——	ʔas-x̣ə-báx̣	anaptyxis: $\#C_2C_1 \rightarrow \#C_2əC_1$
	——	ʔəs-x̣ə-báx̣	MR[7]

For this explanation to be convincing, examples such as (5) have to be considered, as the triconsonantal clusters formed by loss of the unstressed vowel in the reduplicant remain unreduced, seemingly denying the reduction rule itself:

[5] The data for Twana augmentative reduplication in this paper are entirely from Drachman (1969), which I have reorganized as befits the reduplicative stem types and their phonological behavior.

[6] Asterisks are used to indicate an underlying or etymological form.

[7] The prefix *ʔas-* appears as *ʔəs-* in reduplicated forms.

(5)	Unaugmented	Augmented	Gloss
	s-tə́čəd	s-**tč**-tə́čəd	‘slave’
	s-p̓ə́čo	s-**p̓č**-p̓ə́čo	‘berry-basket’
	šóλ̓	**šλ̓**-šóλ̓	‘grind’
	š-čótax̣	š-**čt**-čótax̣	‘halibut’

In examples such as (6), on the other hand, the C_1VC_2 of the root is faithfully repeated with the unstressed reduplicant vowel weakened to a schwa:

(6)	Unaugmented	Augmented	Gloss
	bə́də(h)	**bəd**-bə́də(h)	‘child’
	łób	**łəb**-łób	‘scar’
	bále(h)	**bəl**-bále(h)	‘roe, bait’
	yəlʔə́x̣	**yəlʔ**-yə́lʔəx̣	‘gather’
	q̓ʷələ́de(h)	**q̓ʷəlʔ**-q̓ʷə́lde(h)	‘ear’
	sélə(h)	**səlʔ**-sélə(h)	‘grandfather’
	wədáwʔ	**wədʔ**-wə́dawʔ	‘horn’
	yədes	**yədʔ**-yə́das	‘tooth’

Note that unlike those in the last three examples of (3), the schwa in the reduplicant of these examples cannot have been inserted by anaptyxis. For, if that were the case, the cluster $C_1C_2C_1$ formed by prior loss of the reduplicant vowel should also have been reduced, and the schwa must have appeared between C_2 and C_1, as in ¢***də-bə́də(h)***, ¢***bə-łób***, etc.,[8] rather than between C_1 and C_2 as in *bəd-bə́də(h)*, *łəb-łób*, etc. This indicates that the unstressed reduplicant vowel, copied from the base by the mechanism of reduplication, has only weakened to a schwa rather than eliding. Since $C_1C_2C_1$ clusters do not reduce in the augmentatives of (5), the same schwa must have been present, except that it has subsequently dropped between voiceless consonants.[9] Consider the following derivation:

[8] The symbol ‘¢’ indicates an incorrect form; the asterisk is reserved to indicate an underlying or etymological form (see footnote 6).

[9] I presume that the schwa, surrounded by two voiceless consonants, first devoices and then drops. This assumption is plausible because such devoicing will leave only an /h/-like sound, a weak consonant that often drops in an unstressed syllable, e.g. ‘a’ history teacher but ‘an’ historical novel. This must be the [h] that has sometimes been reported to occur in initial voiceless clusters in some Salish languages such as Puget Sound Salish, e.g. [tʰsósəd] ‘punch someone in the face’ beside [tə́səd] ‘Punch someone!’ (Urbanczyk 1996: 122; Snyder 1968); and Moses-Columbian (Nxaʔamxcín), e.g. [pʰtíx̣ʷ] ~ [pʾtíx̣ʷ] ‘spit’ and [xλ̓út] ~ [xʾλ̓út] (Czaykowska-Higgins and Willett 1997: 394). The preconsonantal fricative absorbs the aspiration in the latter example; note the same deaspiration in English abstract noun suffixes, e.g. *depth*, *health*, *length*, but *gift*, *frost*, *height*, etc. (cf. Foley 1990). An extended version of the same schwa elision occurs in English, e.g. *suppose* [səpóʊ̯z] ~ [spóʊ̯z], *potato* [pətʰéɪ̯ɾo] ~ [ptʰéɪ̯ɾo], *correct* [kərɛ́kt] ~ [krɛ́kt], *police* [pəlís] ~ [plís], etc (Kaisse & Shaw 1985: 6) For evidence of the close

(7)	šoɬ̓-šóɬ̓	sel-sélə(h)	
	šəɬ̓-šóɬ̓	səl-sélə(h)	weakening of unstressed reduplicant vowel
	——	——	synergistic weakening: $C_1C_2C_1 \rightarrow C_2C_1$
	šɬ̓-šóɬ̓	səl-sélə(h)	schwa deletion (between voiceless consonants)
	——	səlˀ- sélə(h)	resonant glottalization[10,11]

Why does the reduplicant vowel drop in the augmentatives of (3), but remain as a schwa in those of (5) and (6), even though the reduplicant is generally unstressed in both? What distinguishes the examples of (3) that undergo cluster reduction from those of (5) and (6) that do not? These questions are important because, as one can see by comparing the derivations in (4) and (7), the synergistic weakening of $C_1C_2C_1 \rightarrow C_2C_1$ crucially depends on prior loss or retention of the reduplicant vowel: Its loss feeds the reduction as in (4), but its retention bleeds it as in (7).

According to van Eijk (1998:460), CVC reduplications in Salish generally fall into two patterns of stress assignment: (a) the stress falls on the CVC prefix; (b) the stress remains on a later syllable, i.e., on the root or on a suffix. Some roots choose the first pattern, others the second. While roots choosing the second pattern (weak roots, abbr. WR) uniformly have the stress on the syllable after the second consonant of the base, roots choosing the first pattern (strong roots, abbr. SR) vary their stress position, with stress falling on the reduplicative CVC prefix in some languages (*Type 1*) but on the base itself in others (*Type 2*). There are also languages that vary between the two patterns (*Type 3*).

relationship between aspiration and voiceless vowel, consider that in spectrograms of aspirated stops in English, vowel formants without voicing are sometimes visible for the duration of aspiration between the stop burst and the onset of voicing in the following vowel, e.g. Eng. pa[pʰa] ~ [pḁa] (cf. Kim 2016: 107).

[10] This rule generally occurs in CVC reduplications of the roots with a resonant. It however has a number of exceptions, as in *bəl-bále(h)*, not ¢*bəlˀ-bále(h)* ‘roe, bait (PL)’.

[11] Throughout the paper, two symbols have been used to indicate a glottal stop: ‘ʔ’ when it is phonemic but ‘ˀ’ when it is derived by a phonological rule such as resonant glottalization, as in this case.

Table 1 Types of stress patterns in Salish CVC reduplication (cf. van Eijk 1998: 460)

stress assignment / type of reduplication	CV́C (..)[SR]	C(V)CV́ [WR]
1)	CV́C-CVC(..)	CVC-C(V)CV́ (CVC-CV́CV-Tw)
2)	CVC-CV́C(..)	
3)	CV́C-CVC(..) ~ CVC-CV́C(..)	

Van Eijk lists Lushootseed, Upper Chehalis, and Coeur d'Alene under *Type 1* languages; Shuswap and a host of other Interior and Coast Salish languages under *Type 3*;[12] and Twana as the only language under *Type 2*. As a pure *Type 2* language, Twana has the main stress on the base in the CVC reduplications of both strong and weak roots, moving the stress to the first vowel of the base if it is not there.[13]

The foregoing discussion suggests that *Type 1* was perhaps the original stress pattern for CVC reduplication in Salish languages in general, and *Type 2* developed from this original pattern by moving the stress to the base for the strong root reduplication, while in the weak roots the original stress on the base was maintained with the pretonic unstressed vowel often elided, except in Twana where the stress moves to the first syllable of the base in the CVC reduplications of both strong and weak roots.

Since no reduction of $C_1C_2C_1 \rightarrow C_2C_1$ occurs in strong root reduplication, we can hypothesize that the above movement of stress in Twana occurs quite late, after the synergistic weakening by dissimilation and cluster simplification has reduced the triconsonantal cluster in the reduplication of weak roots. Consider the comparative derivation of canonical forms:

[12] These include: Thompson, Okanagan, Kalispel-Spokane-Flathead, Halkomelem, Lillooet, Squamish, Sechelt, Saanich (Straits), and Columbian (Nxaʔamzcín). Bella Coola and Comox, which fall outside of these patterns, remain unclassified.

[13] Van Eijk attributes this movement of the stress to the strong tendency in Twana to stress the second syllable (cf. van Eijk 1998: 475, fn. 9).

(8)	$C_1\acute{V}C_2$-C_1VC_2X [SR]	C_1VC_2-$C_1\acute{V}C_2X$[14] [WR]	
	——	C_1C_2-$C_1\acute{V}C_2X$	reduplicant vowel loss
	——	C_2-$C_1\acute{V}C_2X$	$C_1C_2C_1 \rightarrow C_2C_1$
	C_1VC_2-$C_1\acute{V}C_2X$	——	stress movement
	$C_1əC_2$-$C_1\acute{V}C_2X$	——	reduplicant vowel weakening
	——	$C_2ə$-$C_1\acute{V}C_2X$	anaptyxis (C_1&C_2 ≠ voiceless)
	C_1C_2-$\dot{C}_1\acute{V}C_2X$	——	schwa deletion (C_1&C_2 = voiceless)
	(šɬ̓-šóɬ̓ < *šóɬ̓-šoɬ̓)	(qə̓-wə́q̓ab < *wəq̓-wə́q̓ab)	

A drawback of this explanation is that the stress movement, which occurs as part of reduplicative stem formation, applies after the phonological rules such as reduplicant vowel loss and cluster reduction of $C_1C_2C_1 \rightarrow C_2C_1$. This is undesirable as such ordering goes against the general principle that morphology precedes phonology in derivation. The root of the problem is that we know very little about how the stress pattern developed in the reduplicative stems of Salish languages. Nevertheless, there seems to be no doubt that it plays an important role in yielding the different outcome of consonant cluster reduction in reduplications of strong vs. weak roots.

As an alternative, we may reason that the schwa in the reduplicant generally maintains in strong roots because when the stress moves to the base in type 2) languages, it leaves a trace, in the form of a secondary stress, so that the reduplicant vowel in strong roots does not drop but only weakens to a schwa:

(9)	$C_1\acute{V}C_2$-C_1VC_2X [SR]	C_1VC_2-$C_1\acute{V}C_2X$ [WR]	
	$C_1\grave{V}C_2$-$C_1\acute{V}C_2X$	——	stress movement with sec. stress
	$C_1əC_2$-$C_1\acute{V}C_2X$	C_1C_2-$C_1\acute{V}C_2X$	reduplicant vowel weakening
	——	C_2-$C_1\acute{V}C_2X$	$C_1C_2C_1 \rightarrow C_2C_1$
	——	$C_2ə$-$C_1\acute{V}C_2X$	anaptyxis (C_1&C_2 ≠voiceless)
	C_1C_2-$\dot{C}_1\acute{V}C_2X$	——	schwa deletion (C_1&C_2 = voiceless)
	(šɬ̓-šóɬ̓ < *šóɬ̓-šoɬ̓)	(qə̓-wə́q̓ab < *wəq̓-wə́q̓ab)	

In this explanation, morphology does precede phonology, but there seems to be little evidence supporting such secondary stress in Twana.[15]

With no other alternative currently available, we leave the problems as they are for the future, and turn now to the cases that still remain puzzling in spite of the explanations in (8) and (9). These occur mostly at the interface of morphology and phonology, between reduplicative stem formation and the ensuing phonological rules that shape the reduplicant.

[14] 'X' refers to whatever follows after the C_1VC_2.

[15] Note that Drachman (1969: 49 and passim) also frequently refers to 'secondary stress' to explain certain vowel changes, even though there is no overt evidence for it.

3 Rule interactions

3.1 $C_1C_2VC_3X$ roots

These roots begin with two voiceless consonants in the unaugmented form and they regularly reduplicate as if the underlying root is *$C_1əC_2VC_3X$, with an etymological schwa between the two voiceless consonants. As predicted, strong roots keep the triconsonantal cluster, reduplicated as *C_1C_2-$C_1ə́C_2VC_3X$, while weak roots reduce it, as *C_2- $C_1ə́C_2VC_3X$:

(10)	Unaugmented	Augmented	Gloss
	ʔəs-qʷtáxʷ	ʔəs-**q̓ʷt**-q̓ʷətaxʷ	‘thin’ (SR)
	s-xp̓áb	s-**xp̓**-xəp̓ab	‘cockle’ (SR)
	ʔəs-pqʷéqʷad	ʔəs-**pq̓ʷ**-pəq̓ʷqʷəd	‘feather in hair’ (SR)
	š-c̓táy	š-**c̓t**-c̓ətay	‘pan’ (SR)
	s-pqálšəd	s-**pq**-pəqalšəd	‘foot’ (SR)
	kʷtábac	**kʷt**-kʷətəbəc	‘husband’ (SR)
	s-sq̓áče(h)	s-**q̓**-səq̓če(h)	‘finger’ (WR)
	s-łq̓áxad	s-**q̓**-łəq̓xəd	‘arm’ (WR)
	s-łqʷə́qs	s-**q̓ʷ**-łəq̓ʷqs	‘nostril’ (WR)
	ʔəs-cxʷálas	ʔəs-**xʷ**-cəxʷəlʔəs	‘steamed’ (WR)
	ʔəs-tqócad	ʔəs-**q**-təqcədəxʷ	‘closed’ (WR)
	s-ckábšəd	s-**k**-cə́kabšəd	‘shin’ (WR)
	tkʷápšəd	**kʷ**-təkʷapšəd	‘shoe’ (WR)

In the reduplication of the following weak root, on the other hand, regressive assimilation and subsequent degemination between C_2 of the reduplicant and C_1 of the base further reduces the cluster with the stressed schwa left as the only mark for the augmentative as illustrated in (12):

(11)	Unaugmented	Augmented	Gloss
	š-c̓éc̓aʔesəd	š-**c̓**éc̓aʔesəd	‘eyebrow’ (WR)

(12)	s-c̓əc̓-c̓éc̓aʔesəd	
	s-c̓c̓-c̓éc̓aʔesəd	loss of reduplicant schwa
	s-c̓-c̓éc̓aʔesəd	synergistic weakening: $C_1C_2C_1 \rightarrow C_2C_1$
	s-c̓-c̓éc̓aʔesəd	assimilation: c̓-c̓ → c̓-c̓
	s-c̓éc̓aʔesəd	degemination: c̓-c̓ → c̓
	š-c̓éc̓aʔesəd	palatal assimilation of s-c̓ → š-c̓

For evidence supporting the underlying etymological schwa between the voiceless consonants in the roots, note first that some of the bases in (10) appear

with a schwa between the first and the second consonant in Kuipers' (2002) reconstruction:[16]

(13)	Unaugmented	Gloss	Kuipers (2002)	
	ʔəs-pq̓ʷéqʷad	'feather in hair' (SR)	*pəq̓ʷ/kʷ	'to scatter; powder'
	ʔəs-tqócad	'closed' (WR)	*təq	'to obstruct'

Secondly, Kuipers (2002) also cites some of the Twana forms above with a schwa between the two voiceless consonants:

(14)	Unaugmented	Gloss	Kuipers (2002)	
	ʔəs-tqócad	'closed' (WR)	təqə́d	'close it'
	kʷtábac	'husband' (SR)	kʷətábac	'husband'

Finally, the assumption that an underlying schwa is present between the two voiceless consonants in the unaugmented forms of (10) is also consistent with our earlier postulation on the stress pattern in Twana: stress generally falls on the second syllable of reduplicative stems in CVC reduplications of both strong and weak roots. With the underlying schwa present between C_1 and C_2 of the root, moving the stress from its original position after C_2 to the interconsonantal schwa in the root automatically puts the stress on the second syllable of the reduplicative stem, even though the reduplicated schwa eventually drops in both strong and weak forms; in the strong forms, between voiceless consonants; in the weak forms, by the early rule dropping unstressed reduplicant vowel. It is thus reasonable to assume an unstressed etymological schwa between the two voiceless consonants that begin these $C_1C_2VC_3X$ roots.

3.2 C_1VC_2X roots with /w/ or /y/ as C_2

Most of the roots in (15) are strong; they thus exhibit no triconsonantal cluster reduction, except the last one, which, as a weak root, reduces the cluster with subsequent schwa insertion. Since the root in this class ends with a resonant, most of the reduplicants show glottalization at its end, though there are exceptions:

[16] However, these two were the only ones that I could find in his etymological dictionary.

(15)	Unaugmented	Augmented	Gloss
	łáwalbəš	**ło^{ʔ}**-łáwalbəš	‘person, Indian’ (SR)
	q̓əwəʔáče(h)	**q̓o^{ʔ}**-q̓áʔwače(h)	‘cane, walking-stick’ (SR)
	də́^{ʔ}wat	**do**-də́^{ʔ}wat	‘wave, surf’ (SR)
	t̓áwʔ	**t̓o^{ʔ}**-táw	‘mussel’ (SR)
	šáwʔ	**šo^{ʔ}**-šáwʔ	‘bone’ (SR)
	kə́yə(h)	**ke^{ʔ}**-kə́yə(h)	‘grand-mother’ (SR)
	k^{w}óy	**k^{w}e^{ʔ}**-k̓^{w}óy	‘bend’ (SR)
	k̓^{w}óy	**k̓^{w}e^{ʔ}**-k̓^{w}óy	‘mother’ (SR)
	s-c̓áʔyat	s-**c̓e^{ʔ}**-c̓áʔyat	‘salmon-gill’ (SR)
	ʔas-ʔə́yʔ	ʔəs-**yə**-ʔə́yʔ	‘paid’ (WR)

These forms are peculiar as /e/ and /o/ appear in the reduplicants of the strong roots, instead of the usual schwa expected from weakening of the unstressed reduplicant vowel. Note that this vowel change is not observed in the last form, *ʔəs-yə-ʔə́yʔ* ‘paid’, which, as a weak root, exhibits the triconsonantal reduction and schwa insertion. Drachman (1969: 57) explains this appearance of the reduplicant vowel by vocalization of /w/ and /y/ between consonants, to /o/ and /e/ respectively. But such a rule necessitates loss of the reduplicant vowel not only in weak roots but also in strong roots:

(16)	ław-łáwalbəš	k̓^{w}oy-k̓^{w}óy	
	łw-łáwalbəš	k̓^{w}y-k̓^{w}óy	loss of the reduplicant vowel
	ło-łáwalbəš	k̓^{w}e-k̓^{w}óy	vocalization of /w/ and /y/
	ło^{ʔ}-łáwalbəš	k̓^{w}e^{ʔ}-k̓^{w}óy	glottalization

As we have shown repeatedly, however, the reduplicant vowel does not drop in strong roots, unless it is between voiceless consonants. The correct rule then is not vocalization of /w/ and /y/ in interconsonantal position but rather contraction of /əw/ to /o/ and /əy/ to /e/:

(17)	łàw-łáwalbəš	k̓^{w}òy-k̓^{w}óy	
	łəw-łáwalbəš	k̓^{w}əy-k̓^{w}óy	vowel weakening to /ə/
	łəw^{ʔ}-łáwalbəš	k̓^{w}əy^{ʔ}-k̓^{w}óy	resonant glottalization
	ło^{ʔ}-łáwalbəš	k̓^{w}o^{ʔ}-k̓^{w}óy	contraction: əw → o, əy → e

There are a number of reasons to prefer the analysis in (17) over the analysis in (16). First, what Drachman says in essence is that the unstressed reduplicant vowel drops in all CVC reduplications and a schwa is inserted between two consonants unless both of these consonants are voiceless, or the C_2 of the reduplicant is /w/ or /y/: In the former case the inserted schwa drops via devoicing, while in the latter case the interconsonantal /w/ and /y/ vocalize to /o/ and /e/. But this assumption runs into problems because according to his rule, schwa should be inserted in reduplications of /w/- and /y/-final roots as well.

Second, in the following form, the supposed vocalization of /y/ to /e/ seems to occur even though it is not in interconsonantal position:

(18)	Unaugmented	Augmented	Gloss
	t̓káyas	*k-t̓ə́kʷəs*	‘basket’ (WR)

As the augmented form shows, the root here is **t̓ək*, which occurs with a lexical suffix *-áyas* ‘round object’; but the underlying /y/ of this suffix surfaces only in the unaugmented form *t̓káyas*. It seems to have converted into /e/ in the augmented form *k-t̓ə́kʷəs*, even though it is not between consonants at all. This suggests that a contraction of /əy/ to /e/ has occurred from the underlying form **t̓ək-t̓ək-áyas*. The reduplicant of this weak root is shaped by loss of the reduplicant vowel with subsequent reduction of the triconsonantal cluster. With the interconsonantal schwa present in this typical $C_1C_2VC_3X$ root, the stress moves to the second syllable of the reduplicative stem, weakening the once stressed /a/ to a schwa, which contracts with the following /y/ to give /e/. A glottal stop is then inserted between two vowels, as it often does in many languages to break up a hiatus. This example strongly suggests that the /o/ and /e/ in the reduplicants of strong roots in (15) occur not because /w/ and /y/ vocalized between consonants but because the schwa that appeared by weakening of the copied root vowel has undergone contraction with them.

A similar contraction rule can be inferred by comparative analysis of the following forms:[17]

(19)	Thompson	Lillooet	Gloss
	ciy-kst	cil-kst	‘five’
	cíy-cikst	n-**cíl**-cl-əkst	‘five people’
	ɬ’áq’-m-ekst	ɬ’áq’-əm-kst	‘six’
	ɬ’áq’-ɬ’əq-m-ekst	n-**ɬ’áq’**-ɬ’q’-əm-kst	‘six people’

The data shows that with stress falling on the reduplicant, Thompson and Lillooet both weaken the unstressed base vowel to a schwa; this weakened schwa drops in Lillooet though not in Thompson, as the examples for ‘six people’ in the last line testify. But neither this schwa nor the following /y/ show up in the base of Thompson *cíy-cikst* ‘five people’. This is because the two have undergone contraction to become /i/. Consider the following derivation:

(20)	ɬ’áq’-ɬ’aq-m-ekst	cíy-ciy-kst	
	ɬ’áq’-ɬ’əq-m-ekst	cíy-cəy-kst	unstressed base vowel weakening
	——	cíy-ci-kst	contraction: /əy/ → /i/

3.3 C_1VC_2X roots with /w/ or /y/ as C_1

Both types of reduplication occur with C_1VC_2X roots with /w/ or /y/ as C_1. Strong roots reduplicate without triconsonantal reduction, weak roots with it:

[17] Data cited from van Eijk (1998: 457); Thompson & Thompson (1992: 189). Note /y/ in Thompson corresponds to /l/ in Lillooet, as in the examples for ‘five’ in the first line.

(21)	Unaugmented	Augmented	Gloss
	wədáwʔ	**wədʔ**-wədaw	‘horn’ (SR)
	wələp	**wəlʔ**-wəlap	‘you’ (SR)
	yədés	**yədʔ**-yədas	‘tooth’ (SR)
	s-yələb	s-**yəlʔ**-yəlab	‘year’ (SR)
	wəq̓əb	**q̓ʔə**-wəq̓ab	‘box’ (WR)
	wəq̓ʷətəb	**q̓ʔʷə**-wəq̓ʷətəb	‘drifted’ (WR)
	yášqšče	**šeʔ**-yášqšče	‘long finger’ (WR)
	ʔas-yəxʷ	ʔəs-**xʷeʔ**-yəxʷ	‘disappeared’ (WR)
	ʔas-yəx̣	ʔəs-**x̣eʔ**-yəx̣	‘sorted’ (WR)
	ʔas-yəq̓	ʔəs-**q̓ʔe**-yəq̓	‘filed’ (WR)
	ʔəs-yəq̓ʷáče(h)	ʔəs-**q̓ʔʷe**-yəq̓ʷče(h)	‘washed hand’ (WR)

The main issue with these forms is in the last six examples, in which /e/ occurs where we expect an inserted schwa. Interestingly, Drachman (1969: 228) also gives the following examples, which, unlike those in (21), occur with a schwa inserted instead of /e/ between C_2 and C_1:

(22)	Unaugmented	Augmented	Gloss
	yəq̓ósadəxʷ	**q̓ʔə**-yəq̓səd əxʷ	‘file’ (WR)
	yəq̓ʷáče	**q̓ʔʷə**-yəq̓ʷče	‘wash hand’ (WR)
	yóq̓ʷayʔdəxʷ	**q̓ʔʷə**-yóq̓ʷəyəb	‘rotten’ (WR)

As the glosses indicate, the first two of these obviously share the same roots with the last two examples of (21), which suggest that the schwa inserted by anaptyxis is in variation with /e/ before /y/. Perhaps this fluctuation of anaptyctic schwa is most evident in the augmentative of the following weak root, for which Drachman (1969: 37) gives three variants:

(23)	Unaugmented	Augmented	Gloss
	yəšəd	**šeʔ**-əšad ~ **šəʔ**-yəšad ~ **še**ʔ-yəšad	‘foot’ (WR)

Of these, the last two examples show the variation between the inserted schwa and /e/, while the first shows the contraction of the inserted schwa with the root initial /y/ into /e/, something we have not seen in the preceding examples but that which also occurs in the following example (Drachman 1969: 229):

(24)	Unaugmented	Augmented	Gloss
	ʔasə-ʔyášədəb	ʔəš-**šəʔ**-yášədəb ~ ʔəš-**še**ʔ-ášədəb	‘carry on back’ (WR)

There are also examples in which /yə/ is in free variation with /e/, e.g. (Drachman (1969: 74 & 114):

(25)	Unaugmented	Augmented	Gloss
	s-yoʔés ~ s-yəʔwés ~ s-eʔwés	s-**yoʔ**-yə́was	‘wood’ (SR)
	yəqʲwólʔwəltxʷ ~ eqʲwólʔwəltxʷ	(**qʲʷə**-yə́qʲʷče)[18]	‘washing the house’ (WR)

Unaugmented s-yoʔés and augmented *s-yoʔ-yə́was* in the first line of examples show contraction of /əw/ to /o/,[19] while the rest show the free variation /yə/ ~ /e/.

3.4 C_1VC_2X roots with /ʔ/ or /h/ as C_1

The most salient feature in reduplication of C_1VC_2X roots with /ʔ/ or /h/ as C_1 is that they show identical vowels across the laryngeal. Consider:

(26)	Unaugmented	Augmented	Gloss
	ʔáx̣cəd	**x̣a**-ʔáx̣əd	‘bed’ (WR)
	ʔélal	**le**-ʔélal ~ **lə**-ʔélal	‘sing’ (WR)
	ʔaléš	**la**-ʔálaš ~ **lə**-ʔálaš	‘sister’ (m. speaker) (WR)
	ʔébac	**be**-ʔébac	‘grandchild’ (WR)
	ʔas-hóbšəd	ʔəsə-**bo**-hóbšəd	‘red-foot’ (WR)
	ʔas-ʔə́yʔ	ʔəs-**yə**-ʔə́yʔ	‘paid’ (WR)
	həlɛ́	ʔəs-**lə**-hə́le-ɬ	‘alive, we’re alive’ (WR)

Since these are all weak roots, the schwa that appears as the reduplicant vowel in the alternate forms of *lə-ʔélal* and *lə-ʔálaš* must have been inserted and later assimilated to the following root vowel across the laryngeal. To maintain this hypothesis, however, the schwa insertion rule should be allowed to occur between a voiceless consonant and a glottal stop, which is voiceless. With no better alternative at hand, it is perhaps a solution that one can gladly entertain until a better one is available in the future.

3.5 C_1VC_2X roots with /ʔ/ as C_2

These roots are all strong. Thus, they occur with no triconsonantal cluster reduction in the augmented form. The root vowel /ə/ changes to /o/ and the glottal stop disappears in the reduplicant, perhaps to avoid its repetition.

[18] No augmented form was given by Drachman for this example, but this form from (23) has been filled in to show that the root is *yə́qʲʷ* ‘wash’ and begins with /yə/.

[19] This must have occurred after metathesis of *ʔw* to *wʔ*, the glottal stop having been attracted by the stress in the following vowel.

(27)	Unaugmented	Augmented	Gloss
	qʷɔ́ʔ	**qʷo**-qʷɔ́ʔ	‘water; river’ (SR)
	dɔ́ʔ	**do**-dɔ́ʔ	‘rotten’ (SR)
	čáʔləš	**ča**-čáʔləš	‘branch’ (SR)
	dáʔšəd	**da**-dáʔšəd	‘foot-print’ (SR)
	q̓áʔbe	**q̓a**-q̓áʔbe	‘girl’ (SR)

Interestingly, Drachman (1969: 111) gives another form without the glottal stop for ‘foot-print’, which reduplicates as a weak root:

(28)	Unaugmented	Augmented	Gloss
	dášəd	**šə**-dášəd	‘foot-print’ (WR)

The same vowel change and loss of glottal stop are observed in *sqʷoqʷɔ́ʔbəš* ‘Skokomish’, analyzed as *s-qʷo-qʷɔ́ʔ-bəš* ‘river people’ (Drachman 1969: 111).

There are two questions that have to be answered with regard to the reduplication in (27): 1) why does the glottal stop disappear? 2) why does the reduplicant vowel remain rather than weaken to a schwa, despite being based on strong roots? Perhaps the first question can be answered by referring to dissimilation between laryngeals, that the glottal stop elides to avoid repetition. But then we have also seen many cases where such a rule does not apply. For the second question, Drachman (1969: 110) attributes the retention of the vowel to the loss of the glottal stop, but there seems to be no phonological reason for it. Further investigation of the matter is called for.

Finally, note that in the following forms, not glottal stops but /w/ and /y/ occur as C_2 of the roots, which contract with the weakened reduplicant schwa to give /o/ and /e/ respectively. The underlying forms are thus as in (30):

(29)	Unaugmented	Augmented	Gloss
	dəʔwat	do-dəʔwat	‘wave’ (SR)
	c̓áʔyat	c̓eʔ-c̓áʔyat	‘fish gill’ (SR)

(30)	Unaugmented	Augmented	Gloss
	*dəwʔat	*dəw-dəwʔat	‘wave’
	*c̓áyʔat	*c̓əy-c̓áyʔat	‘fish gill’

A metathesis of /w/ and /y/ with the following glottal stop must have occurred, due to the glottal attraction by the stressed vowel (Drachman 1969: 108ff). In the following unaugmented forms, the same metathesis rule, occurring optionally, puts the schwa and /w/ in direct contact, allowing them to contract to /o/. In the augmented forms, on the other hand the weakened reduplicant schwa

undergoes obligatory contraction with /w/, while the glottal stop in the base drops rather than occurring adjacent to the glottal stop in the reduplicant:[20]

(31)	Unaugmented	Augmented	Gloss
	čəʔwás ~ čoʔás	čoʾ-čə́waš	‘wife’ (SR)
	šəʔwáł ~ šoʔáł	šoʾ-šə́wał	‘road’ (SR)

4 Conclusion

It is confirmed that Twana has the same synergistic weakening by dissimilation and cluster simplification that have been claimed to occur in Tillamook by Kim and Gardiner (2016): it shares the same cluster reduction of $C_1C_2C_1 \rightarrow C_2C_1$ with Tillamook, but differs from it in having surface $C_1C_2C_1$ clusters that appear to deny the existence of the reduction rule itself. It is argued that these clusters arise due to late elision of schwa between two voiceless consonants in reduplication of strong roots, which unlike in reduplication of weak roots generally maintain the vowel in the reduplicant. Other eccentricities in reduplicant shapes are explained by analyzing rules that interact at the interface of morphology and phonology, rules such as the stress placement in reduplicative stems, schwa insertion and deletion, assimilation of consonants between members of a cluster, and contraction of the reduplicant schwa and following /w/ or /y/.

One of the difficulties in drawing up the above analysis has been the problem of identifying the origins of various schwas that appear the same in the surface phonetic description. This, of course, is an old problem in Salish linguistics that has been noted a number of times by previous scholarship (Kuipers 1974; Urbanczyk 1996; Kinkade 1997; Czaykowska-Higgins and Willett 1997; Blake 2000). In Twana CVC reduplication, I have detected three kinds of schwas directly related to analyzing the shape of the CVC reduplicant: the etymological, the lenited, and the anaptyctic.

Even though these schwas appear the same on the surface, their different behavior in phonological analysis is obvious on many fronts. The etymological schwa does not show up in the $C_1C_2\acute{V}C_3X$ roots because the underlying schwa elides between two voiceless consonants; it emerges only when it occurs as the stressed radical vowel in reduplication of this root class, for both strong and weak roots. The lenited schwa occurs as an unstressed reduplicant vowel, which drops in weak roots but never does in strong roots, except when it occurs between two voiceless consonants. The anaptyctic schwa, on the other hand, is inserted between two consonants to meet syllabification conditions. This inserted schwa occurs still later, after phonological rules have acted on the

[20] The disappearance of the underlying glottal stop, however, is problematic and left for future research.

preceding two kinds. This schwa also drops when it occurs between voiceless consonants, yielding new triconsonantal clusters that do not reduce. [21]

Identifying when the schwa drops in the reduplicant is therefore crucial in unearthing the causes of consonant cluster reduction: if it drops early, as in the case of the etymological schwa and the lenited schwa in the weak roots, reduction of $C_1C_2C_3 \rightarrow C_2C_3$ ensues; but if it drops late, as in the case of the lenited schwa between the voiceless consonants in strong roots, the same rule does not materialize.

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[21] Another schwa has also played an indirect yet important role in untangling the complex processes shaping the various allomorphs of CVC reduplicant in Twana: This is the schwa that becomes devoiced between two voiceless consonants in unstressed syllables and then elides, leaving a residual aspiration [ʰ] in some Salish languages (cf. footnote 9). When any of the three schwas happen to occur between two voiceless consonants in an unstressed syllable, they too can undergo the same devoicing and elision. Moreover, another schwa may be inserted between the two voiceless consonants to break up the cluster immediately after such elision has occurred, which then elides again as it becomes devoiced. This cycle of insertion and deletion results in what has previously been referred to as 'excrescent' schwa in Salish phonology (cf. Parker 2011 and the references therein).

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