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Interior Reduplication in the St’at’imcets Diminuitive

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The Lillooet language, or St’at’imcets, is an endangered interior Salish language of the Northern family, that is spoken by the St’at’imc people in southern BC. The language is mutually intelligible to other Northern family Salish languages, with differences arising in certain lexical items (van Eijk, 1997). The focus of this paper is on the single consonant interior reduplication process in the St’at’imcets diminutive. The comprehensive grammar by Jan van Eijk (1997) describes the patterns that arise from interior reduplication without giving an analysis on what drives this particular affixation. Examples of this affix mainly demonstrate reduplication of a single consonant, or a “C-reduplication pattern”, such as in [ʔáma] “good” + DIM = [ʔáʔma] “cute, pretty” and [qíqəl’] “weak” + DIM = [qə́qqəl’] “rather weak”. Some forms include a vowel in the reduplicant, such as in [sql ə́w’] “beaver” + DIM = [sqlə́ləw’] “little beaver”. St’ati’mcets C-reduplication copies the consonant preceding the most prominent peak, or the primary stressed vowel in the prosodic word. Using an Optimality Theory (OT) approach, a general ranking was discovered using syllabification constraints alongside shape and position constraints. The position of the infixation is generated through maintaining base-edge faithfulness (Kurisu & Sanders, 1999) and motivating the reduplicant to go as far left as possible without reduplicating left of the stressed vowel. The shape of the reduplicant is driven by the satisfaction of the morphological requirements, and the St’at’imcets syllable template. Vowel epenthesis of [ə] appears to co-occur with consonant reduplication to prevent violations of the syllable template when complex codas greater than three segments would else be formed (*CCC), or if the resulting complex coda is in violation of the sonority sequencing principle (SSP). Exceptions to the maximum limit of two segments in an onset/coda are due to the high ranking of Max-IO, causing input faithfulness. Other phonological phenomena appear to be triggered by the St’at’imcets C-reduplication, such as the alternation in base vowel quality and resonant glottalization. Base vowel quality changes so far have been unpredictable; however, the epenthesized vowel is always predictable ([ə]). The glottalization of resonants has a somewhat predictable pattern. Insight to these phenomena is currently outside of the research question but may be considered for future research.

Keywords: St’at’imcets, Optimality Theory, infixation, Salish languages, C-reduplication

Introduction to the Lillooet Language

The Lillooet language, or St’at’imcets, is an endangered interior Salish language, of the Northern family, spoken by the St’at’imc people. As of 2014 statistics from the First People’s Cultural Council, there are less that 140 native speakers remain, most of whom are over the age of 60. The language is mutably intelligible to other Northern family Salish languages, with differences arising in certain lexical items.

Special mentions to: Yurika for pointing me towards Kurisu & Sanders (1999), Mark for discussing the phonology of Lushootseed and other Salish languages with me, Dr. Lisa Matthewson for suggesting papers, and Dr. Doug Pulleyblank for the guidance and feedback throughout the process of this draft.

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The specific feature I will be looking at is how St’at’imcets uses interior reduplication as affixation to generate diminutive forms, and by what processes it is generated. Examples of this affix mainly showcase a C-reduplication pattern, such as in [ʔáma] “good” + DIM = [ʔáʔma] “cute, pretty” and [qíqəl’] “weak” + DIM = [qə́qqəl’] “rather weak”. Some forms include a vowelin the reduplicant, such as in [sql ǽw’] “beaver” + DIM = [sqlə́ləw’] “little beaver”. The comprehensive grammar by Jan van Eijk (1997) mainly focuses on describing the patterns that arise from interior reduplication, without giving an analysis on what drives this particular affixation. The method of research for this analysis utilized Optimality Theory (OT), which is a linguistic model proposed in 1991 by Alan Prince and Paul Smolensky. OT ranks universal constraints to generate and evaluate the most optimal output from an input, or underlying form. The use of OT provides a means to observe how the language prioritizes faithfulness to the input, and markedness on the output. In the case of C-reduplication, this interaction causes the exact shape and position of the reduplicant through what the grammar regards as “optimal”.

In Part 2, I will be discussing the phonemes and phonologic assumptions and representations present in St’at’imcets. Sections 2.1 & 2.2 will discuss consonant and vowel observations. Section 2.3 will contain an overview on syllable structure. Part 3 introduces data and describes the patterns found in diminutive reduplication. Part 4 defines the base for interior reduplication, and compares templatic and non-templatic hypothesises of C-reduplication. Part 5 proposes Optimality Theory (OT) constraints from various sources relating to interior reduplication with rankings and tableau. Parts 6 through 9 will demonstrate how the shape and location of this infix arises, as well as how the various patterns found in St’at’imcets diminutive reduplication can be predicted.

The Inventory

The Consonant Chart

Table 1

Consonant Inventory of St’at’imects

		Dental		Lateral-dental		Postalv/paletal		Velar		Post-velar		Larngeal	
		Labial	Central	Lateral	Retracted	Plain	Retracted	Plain	Labial	Plain	Labial		
Plosives	Plain	p	t			c	c̱	k	k	q	q^{w}		
	Glottalized	p’		ƛ’				k’	k^{w}	q	$q^{w’}$		
Fricative				ɬ		ʃ	ʃ̱	x	$x^{w’}$	χ	$χ^{w}$		
Nasal	Plain	m	n										
	Glottalized	m’	n’										
Approximant	Plain		z	l	l̲	y		ɣ	$ɣ^{w}$	ʕ	$ʕ^{w}$	h	w
	Glottalized		z’	l’	l̲	y’		ɣ’	$ɣ^{w’}$	ʕ’	$ʕ^{w’}$	ʔ	w’

Note. *See Appendix for discussion on the phonology of St’at’imcets and the transcription conventions used in the paper.

Vowels

St’at’imcets contains four contrastive vowels [a, i, u, ə], that may be un-retracted (ATR), or retracted (RTR) as [a̲, i̲, u̲, ə̲]. Retraction for vowels is not contrastive. Jan van Eijk classifies the full vowels [a, i, u/a̲, i̲, u̲] as “A” vowels, and as the schwa [ə/ə̲] as “E” vowels.

There exists a discrepancy between the vowel chart used in van Eijk (1997)’s transcriptions (Table 2) and van Eijk (1997)’s narrow phonetic description of the vowel space (Table 3). The vowel space is more centralized, and van Ejik describes “high vowels” phonetically existing within a mid-vowel space. A narrow transcription of the data would likely alter the data given in van Ejik (1997) to more accurately describe the vowels inventory of

St’at’imcets. However, vowel in Table 2 is useful in illustrating the vowels on a broad generalization. Van Eijk also only rarely marks vowels with a retracted diacritic, making adjustments risky. For this analysis, vowels will be described broadly, using vowel in Table 3.

Table 2

Vowel Chart: Jan van Eijk (1997)

	Front		Central		Back	
	ATR	RTR	ATR	RTR	ATR	RTR
High	i i̠				u u̠	
Mid			ə ə̠			
Low			a a̠			

Table 3

**Vowel Chart With Narrow Transcription*

	Front		Central		Back	
	ATR	RTR	ATR	RTR	ATR	RTR
High						
Mid	e ɛ		ə ʌ		o ɔ	
Low			ɛ a̠			

Default Vowel

Typical of Salish languages, St’at’imcets uses [ə] as a default vowel, defined as the unspecified vowel that surfaces upon the surface form requiring a vowel to surface. According to Mathewson (1994), schwa is considered phonemically shorter than the rest of the vowels, and behaves differently from the “full vowels”. As such, Schwa is also considered “lighter” than the full vowels, and is observed to be the least preferred recipient for stress (see Appendix: Stress). Schwas can be excrescent, epenthesized, and deleted to maintain well-formedness of the prosodic word. Onsets that would otherwise surface as RC (R = Resonant, C = Consonant) are attested, predictable targets for schwa epenthesis (Mathewson, 1994).

Stress Rules: (See Appendix for Examples)

St’at’imcets stress assignment is predictable. In words with at least one vowel, the stress assigns itself to the first A vowel of the root (A = full vowels: ATR: [a, i, u] and RTR: [a̠ i̠ u̠]) regardless of if it proceeded by other vowels. If there is no A vowel, the left most E vowel is assign primary stress (E = short vowels ə, ə̠). Cases of [aʔ] are treated like E vowels in terms of stress priority. When more segments are added, the stress shifts from the root. Additionally, some special suffixes (heavy suffixes) attract the stress. Dynamic stress is an exception to these rules, such as in [máqaʔ] “snow” vs. [maqáʔ] “poison onion”.

Observations in Interior Reduplication

St’at’imcets uses interior reduplication as an infix that marks the diminutive form. This change in meaning may refer to a loss of quality, or as a weaker form of the original word. The process for interior reduplication targets the onset of the stressed vowel, and repeats the consonant, after the stressed vowel, which I refer to as “C reduplication”, where C stands for consonant. Examples of reduplication of a single consonant are shown below.

second-level heading

C-reduplication on initial vowels:

1. /ʔáma + DIM/ -> [ʔáʔma] “cute, pretty”;

2. /ʃə́q-ən + DIM/ -> [ʃiʃq-ən] “to split wood”;

3. /qíqəl’/ + DIM/ -> [qə́qqəl’] “rather weak”;

4. /ʃ-jáqcaˀ + DIM/ -> [ʃ-j’áj’qcaˀ] “girl”;

5. /qʷláwaʔ + DIM/ -> [qʷlə́lwaʔ] “little onion”;

6. /sq ə́xaʔ + DIM/ -> [sqə́qxaʔ] “pup”.

There are also cases where the reduplicant copies both the stressed vowel and the consonant preceding it, which will be referred to as CV reduplication for now.

CV reduplication:

1. /mátq + DIM/ -> [mám’təq] “to walk”;

2. /twíw’t + DIM/ -> [twə́ww’ət] “little boy”;

3. /ʃəmɣáw + DIM/ -> [ʃəmɣə́ɣəw] “little Lynx”;

4. /sqláw’ + DIM/ -> [sqlə́ləw’] “little beaver”.

Reduplication is not restricted to the leftmost vowel, as in cases where the stressed vowel is not the leftmost, the consonant of the stressed vowel is still the target.

Non-leftmost stressed vowels are still targets for reduplication:

1. [q’əltwáxʷ] “to wage war” -> [qəltwáwxʷa] “to have a race”;

2. [naxʷít] “snake” -> [naxʷə́xʷt] “worm”.

Interior C-reduplication is not bound to occur only in roots, and has the potential to cross morphological boundaries (Bell, 1982). If the stress is moved to a vowel in the suffix, then that suffix’s consonant before the stressed vowel is the target, such as in [Xəxp-qíqin’kʃt] “one hundred”. This observation implies that the domain of the reduplicant is within the phonemic melody of the word (Bell, 1983).

Suffixes can be reduplicated:

1. /(*Xəxp)-qín’kʃt + DIM/ -> [Xəxp-qíqin’kʃt] “One hundred”;

2. /*χm-ílx + DIM/ -> [χʷm-íml’əx] “To hurry up”.

Interior reduplication may occur multiple times within a word, such as in [twít] “hunter”, becoming [twíw’t] “young man”, and then [twə́ww’ət] “little boy”:

Multiple DIM infixes:

1. [twít] hunter;

2. [twíw’t] young man;

3. [twə́ww’ət] little boy.

In reduplicated forms, it is very likely to observe vowel quality changes. Examples are such as when [ə́] appears in place of the stressed vowel target in words such as in [qʷláwaʔ] “onion” to [qʷlə́lwaʔ] “little onion or [qíqəl’] “weak” to [qə́qqəl’] “rather weak”. There are some cases where this observation is reversed, the stressed vowel in the non-reduplicated form is [ə́], and the reduplicated form contains a different stressed vowel, such as in [ʃə́q-ən] “to split, quarter” to [ʃísq-ən] “to split wood”. Additionally, some forms do not have any vowel quality discrepancies, such as in [ʔáma] “good” to [ʔáʔma] “cute, pretty”. According to Jan van Eijk (1997), during reduplication, there is no clear predictability on which morphemes will maintain their vowel identity over which ones are subject to change (See Part 9).

Syllable Structure (van Eijk, 1997)

Onsets appear to be mandatory, with no observed VC syllables, nor any data with a vowel occurring in word initial position. Bound suffixes may feature nuclei with no onsets pre-merge to words/roots, but are assumed to gain onsets after merging with other morphemes.

Mono-syllabic words of the following type are observed CVC, CCVC, CVCC (CCVCC is rare but attested: [ptakʷɬ] “tell a legend”). CV syllables are attested in multi-syllabic words. Syllables may be composed of consonants, resonants, and vowels (see Vowel-Consonant Combinations in the Appendix).

CV syllables types (the period marks the syllable boundary):

1. [ʃú.tik] “Winter”;
2. [zá.nuc] “Driftwood”;
3. [zú.mak] “Spring salmon”.

CVC syllable types:

1. [qʌɬ] “Bad”;
2. [q’áʔ] “To eat”;
3. [kʷín] “How much/many?”.

CCVC syllable types:

1. [ptak] “To pass by”;
2. [psil’] “Daylight”;
3. [qmut] “Hat”.

CVCC syllable types:

1. [mátq] “To be on foot”;
2. [[ɬə̰mp] “To vibrate”;
3. [χə̰lq’] “To roll”.

Syllable structure
σ / / | | | R | | | \\ | | N C | | | | | |μμ | | | | \\ (C) C V (C)(O)

Referring to Matthewson (1994), at least one coda consonant is moraic. Syllables may not exceed more than two consonants in onset position, and/or more than two consonants in coda position. Complex codas may be either a combination of higher sonority consonant and obstruent (VCO), or glide and obstruent (VGO).

The general assumption of the process of template association in St’at’imcets:

1. Projects a syllable from a well-formed vowel and makes this vowel the nucleus.
2. Takes the consonant immediately to the left of nucleus as the onset of the syllable.
3. Takes any free consonant to the right of the nucleus as the coda of the syllable.

Hypothesis for the Shape of the Reduplicant

Two hypotheses are proposed: one in which the reduplicant is templatic (Hypothesis 1), and the other where it is non-templatic (Hypothesis 2). We begin by evaluating the templatic approach first:

Compare the St'atimcets diminutive with the diminutive in the related interior Salish language of Lutshootseed in the data below (Zoll & Inkelas, 2005, re: Urbanczyk, 1996). The Lutshootseed diminutive copies both the consonant preceding the stressed vowel, and the vowel, giving the diminutive a CV shape. The Lutshootseed pattern would appear to imply that the stressed vowel is a part of the target of interior reduplication. In the article by Urbanczyk (2006), there is further argumentation for reduplicated forms to be realized as syllables through the necessity for morphemes to be realized. The reduplicated diminutive morpheme is underlined.

Lutshootseed Diminutive (From Urbanczyk, 2006)

a. [χa'-il] "argue" -> [χ á-χa-il] "squabble";

b. [talə] "dollar" -> [t áʔ-talə] "small amount of money".

In St'at'imcets, the vowel is not required for reduplication (resulting in C-reduplication over CV reduplication). However, Lutshootseed provides evidence for where we can postulate our target for reduplication: the syllable containing the stressed vowel.

Hypothesis 1:

a. Target of reduplication is the stressed syllable, driven by the constraint RED (Stress σ). The content of the syllable is stripped away by constraints that outrank Max-BR, such as No Coda.

b. Reduplication occurs by creating a CV template with unspecified content to the right edge of the stressed syllable. The nucleus is deleted though the constraint *RED (V), which would prohibit the reduplication of vowels

The templatic approach has many flaws. Approaching the formation of the diminutive as syllable reduplication will have the winner violating the constraint that forms the reduplicant, "RED (Stress σ)" by deleting the nucleus. Additionally, it would appear to be arbitrary as to what the syllable shape was, as there are only two observed forms for reduplication (C or CV) and many more syllable types, which do not appear to affect the representation of the diminutive infix.

Reduplication of the CV́ maintains Urbanczyk (2006)'s criteria of a morpheme being a defined syllable. Problems arise again when considering that reduplication of the CV́ (RED (CV́))[1] is never satisfied, and would appear to fail as a method of getting the proper shape for the reduplicant. However, if this criterion is allowed to be abandoned and the non-templatic approach is taken, these problems may be solved.

Non-templatic Approach

Hypothesis 2: Reduplication is non-templatic, and only reduplicates the consonant. A vowel may be epentheisized to prevent reduplication processes from creating a complex coda.

Urbanczyk (2006)'s morpheme criterion states that a morpheme must be (at least, underlyingly) a well formed syllable. As a single consonant is not a well-formed syllable, approaching the formation of the diminutive as C-Reduplication, will violate this criterion. However, because the reduplicant has no need to remove copied base content, there is no violation of the reduplicant shape constraint RED (C) (See Part 5). Due to the flaws of both of the templatic approach hypotheses, this analysis will use the non-templatic approach to the St'at'icmets diminutive infix.

The Base

Through observation, it is clear the reduplicated target is the consonant preceding the stressed vowel. In order to ensure that the consonant copied from the base is correct, the definition of the base must be made clear. Urbanczyk (1996) defines the base as the string of segments adjacent to the reduplicant. Because the reduplicant occurs at the right edge of the stressed vowel, I propose that the base for the diminutive is the phonological content to the left of (or including) the stressed vowel:

- [sqə́xaʔ] "dog" (Base portion in bold);
- [sqə́qxaʔ] "dog" (Reduplicant underlined).

To represent this in the lexicon portion of the tableau, the diminutive affix is represented as (DIM) as the catalyst to undergo the reduplication process, and is positioned as an infix to the right of the stressed vowel. Stress is included in the underlying form, as the base is assumed to come from the surface representation of the output of an existing word. However, the placement of the diminutive creates a dilemma. Consider the following two approaches:

(1) /sq + DIM + ə́xaʔ/ = [sqə́qxaʔ]

(2) sqə́ + DIM + xaʔ/ = [sqə́qxaʔ]

The approach in (1) would maintain the need for the phonologically copied content to be on the right edge, but would fail to recognize that the consonant occurs *after* the stressed vowel, and would predict a geminate before the vowel *[sq-q-ə́xaʔ]. Conversely, the approach in (2) recognizes that the consonant reduplicates after the stressed vowel, however the reduplicated content is not aligned with the right edge of the base. The approach in two would predict a long vowel, *[sqə́-ə-xaʔ].

For now, approach (1) is used, as to be faithful to the base edge as much as possible. We will return to the constraints that mandate the selection of the target consonant (see Part 7), after positioning of the reduplicant has been defined. For now, it will be assumed that the correct consonant is copied.

To begin analysis on St'at'imcets reduplication with OT, some basic constraints on faithfulness and markedness must first be proposed.

OT Constraints and Rankings

Faithfulness Constraints

The focus for this analysis is dependant on markedness and BR faithfulness constraints, and it will be assumed for now that faithfulness from the input to out put (IO) is always satisfied. Max-IO is included as a fatal violation, preventing alteration to the base. Referring to the faithfulness constrains by McCarthy and Prince (1995):

- Max-IO: Every segment in the input has a corresponding segment in the output.
- Max-BR: Every segment in the base has a corresponding segment in the reduplicant.
- DEP-IO: Every segment of the output has a correspondent in the input (no epenthesis).
- Ident-BR: Let α be a segment in the input and be any correspondent of β in the output. If α is [γFeature], then β is [γFeature].

Ident-BR is modified by Zoll and Inkelas (2005) to specifically refer to stress faithfulness as Ident-BR (stress), which assigns a violation to any changes in the placement of the stress from the base to reduplicant.

- Ident-BR (stress): Assign a violation if a segment in the reduplicant is carrying a stress that was not assigned stress in the base, or if a segment that was carrying stress in the base is not carrying stress in the reduplicant.

Non-templatic Approach: Constraint Rankings

- RED (C): The target for reduplication is the stressed vowel and consonant preceding it. Assign a violation to candidates that reduplicate more than a single C.

As well as their rankings:

- RED (C) >> Max-BR—target of reduplication is only to satisfy the C-template, as interior reduplication in this context is incomplete reduplication (McCarthy & Prince, 2004).

Morphological Representation

In general, morphemes in S’ta’limcets must have phonological content on the surface; else there is a violation of well-formedness to the grammatical word. To not provide content for the DIM affix is a violation of a constraint I shall define as:

- Realize Morph: Realized morphemes must be assigned phololological content.

A cross-linguistic consequence of this may be represented in languages that do use null morphemes (i.e.: invisible affixes), but OT can account for this via ranking. If we are to consider that different morphemes have different ranking, then perhaps a better definition for this constraint is “REALIZE (DIM)” where the diminutive morpheme must be provided content; however, to the best of my knowledge, St’at’imcets does not contain any “null” content morphemes. “Realize Morph” will now join the ranking system as an undominated constraint.

Markedness Constraints

Syllable constraints:

- Onset: Assign a violation to syllables that do not have an onset.
- *Complex onset: Assign a violation to any complex onsets in a syllable.
- *Complex coda: Assign a violation to any complex codas in a syllable.
- No coda: Assign a violation to a syllable that has a coda.

The syllable constraints are added to the tableau to block coda consonants, and drive unfavourability of generating CVC, CCVC or CVCC syllables. Syllable constraints primarily drive the shape, choosing the optimal form based on template satisfaction. By combining the reduplication, faithfulness, and syllable constraints, we arrive at our preliminary ranking: SPEC >> Max-IO, Dep-IO, Ident-IO (stress) >> RED (C) >> Onset >> *Comp Coda >> *Comp Onset >> No Coda >> Max-BR, Dep-BR.

Next, we evaluate if this ranking is sufficient to derive the attested form for /twít + DIM/ “young man”:

Table 4

title

/tw + DIM + ít/ “young man”	Dep/Max-IO	Ident-IO (stress)	RED (C)	Onset	*Comp coda	*Comp onset	No coda	Max-BR
a. ☹twíw’t					*	*	*	***
b. twít.twit			*!			**	**	
c. wít.wit		*!	*				**	**
d. ☹twítw’					*	*	*	***

The incorrect candidate is chosen. Crucially there is a lack of distinction between the attested candidate (a) [twíw’t], and the unattested candidate in (d) *[twí’tw]. Suffice it to say, consideration for the constraints of the position of the diminutive infix must be considered.

Position of Infixation

The diminutive infix could be considered as being applied to the right of the base, as the reduplicated consonant repeats to the right of the target (the stressed vowel). How the infixation occurs in such a way that is it not suffixation is a problem that must be addressed. Kurisu and Sanders (1999) propose that in order to obtain infixation, the base must be anchored to the edges. Else, the reduplicated form will become a prefix/suffix.

1. Anchor L IO (DIM)—Left edges of the input and output must correspond when the affix is diminutive (prevent prefixation).

2. Anchor R IO (DIM)—Right edges of the input and output must correspond when the affix is diminutive (prevent suffixation).

- Collapsing into Anchor Edge-IO (DIM): Edges of the input and output must correspond when the affix is the diminutive. If either edge is not aligned in the output, a violation is assigned. (Shorthand: EDGE)

Anchor Edge-IO is ranked high, as it is a constraint that governs infixation, and as such should never be violated in the diminutive form.

Table 5

title

	/tw + DIM + ít/ "young man"	Max-IO	Anchor edge IO (DIM)	RED (C)	No comp onset	Onset	No coda	Max-BR
a	☞twíw't				*		*	***
b	twít			*!	*		*	****
c	twít-twít		*!	*	*		**	
d	twít-wi		*!	*	*		*	**
e	wtwí't		*!		*		*	***

The attested candidate is chosen as optimal, as Anchor Edge-IO (DIM) blocks candidates that place the reduplicant at the left or right edge of the surface form, as these candidates violate the faithfulness of the input edge.

Refining Position

There is another problem regarding the position of the reduplicant. Even while maintaining edge faithfulness, there is no constraint dictatingwhere the consonant occurs as an infix. I propose that there is restriction on position in that the reduplicant must occur rightmost to the stressed vowel.

- Align R BR (V́): Thereduplicant must be to the right of the stressed vowel.

Table 6

$/nax^{w}$ə́t + DIM/ "Worm"

$/nax^{w}$ + DIM + ə́t/ "worm"	EDGE	Align R BR (V́)	RED (C)	*Comp coda	*Comp onset	No coda	Max-BR
a. $na.x^{w}$ít			*!			*	*****
b. ☞$na.x^{w}íx^{w}t$				*		*	****
c. $nax.^{w}x^{w}$ít		*!				**	****
d. $nx^{w}ax.^{w}x^{w}$ít		*!				*	***

The correct candidate is chosen as the winner. Note that *Comp Onset cannot rule out candidate (c), and if not for this new constraint, it would be evaluated as equally good as the winner in (b).

There is anadditional problem regarding the location of the diminutive infix, as once Anchor-IO Edge and Anchor R BR (V́) are satisfied, the position of the infix is still ambiguous, as shown in the table below:

Table 7

/ʔáma/ +DIM "Cute, Pretty"

/ʔ+DIM+áma/ "cute, pretty"	MAX-IO	EDGE	Align R BR (V́)	RED (C)	*Comp onset	No coda	Max-BR
a. ☹ʔáʔ.ma						*	***
b. ☹ʔám.ʔa						*	***
c. ʔá.mʔaa					*!		**
d. ʔʔá.ma			*!		*		***

Candidates a. [ʔáʔma] and b. *[ʔáʔma] are incorrectly equivalent as the evaluator has difficulty determining where the reduplication occurs. Both forms satisfy EDGE by the base corresponding its edge segments in the input with its output edge segments, as well as Anchor R (V́) by reduplicating the consonant [ʔ] to the right of the stressed vowel. Something must be motivating DIM to occur as close as possible to its source. To take another constraint from Kurisu and Sanders (1999):

- (ALRW): Align L (RED, PrWd)—The left edge of an reduplicant must be aligned to the left edge of a prosodic word. Assign a violation to every intervening segment between the left edge of the reduplicant and the left edge of the prosodic word.

Table 8

Below Demonstrates a Potential Ranking for Anchor R BR (V́) and ALRW

/ʔ + DIM + áma/ "cute, pretty"	ALRW	Align R BR (V́)
ʔá.ʔma	*!*	
ʔám.ʔa	*!**	
💣ʔʔá.ma		*
ʔʔáma	*!	*
/ʔ + DIM + áma/ "cute, pretty"	Align R (V́)	ALRW
☞ ʔáʔ.ma		**
ʔám.ʔa		***!
ʔʔá.ma	*!	*
ʔʔáma	*!	*

Note. Conclusion: Align R BR (V́) >> ALRW.

Note that the incorrect winner [ʔʔáma] in the leftmost tableau would violate EDGE, thus actually predicting *[ʔʔáma] to be the winner. However, the point of this tableau is to show that Align R (V́) must outrank ALRW to maintain the direction of the reduplication.

Below is a table ranking for ALRW and *Comp Coda. Note that the candidates assume a violation of RED (C):

Table 9

title

/tw + DIM + íw't/ "Little boy"	*Comp coda	ALRW
a. ☞twíw'.wit		****
b. twí.wiw't	*!	***
/tw + DIM + íw't/ "Little boy"	ALRW	*Comp coda
a. twíw'.wit	****!	
b. 💣twí.wiw't	***	*

Note. Conclusion: *Comp Coda >> ALRW.

Additionally, ALRW is assumed to outrank *Complex Coda and the other syllable constraints, as C-Reduplication will inevitable cause codas and complex to form.

The current ranking: Max-IO >> EDGE >> Align R BR (V́) >> RED (C) >> *Comp Coda >> ALRW >> *Comp Onset >> Onset >> No Coda >> Max-BR.

Preventing Other Consonants From reduplication

Recall that the base was assumed to be the string of segments to the right of the stressed vowel, and that maintaining this edge was considered more important, as alignment could force the consonant right of the stressed vowel (Align RBR (V́)). So far, nothing truly limits what consonant may be selected, as long as that consonant is in the base. To counter this problem, a constraint on selection has been covertly operating thus far:

- Anchor BR R: The right edge of the reduplicant must correspond with the right edge of the base. Assign a violation to any segment in the reduplicant that is not at the right edge.

Because RED (C) limits the copying of the diminutive to one segment, Anchor BR should select the correct, rightmost consonant in the base for reduplication:

Table 10

/sqə́xal + DIM/ “Pup”

/sq + DIM + ə́xal/ “pup”	EDGE	Anchor R BR	Align RBR (V́)	RED (C)	*Comp coda	ALRW	*Comp onset	No coda	Max-BR
a. sqə́.xaʔ				*!			*	*	******
b. ☞sqə́q.xaʔ						***	*	**	*****
c. sqə́s.xaʔ		*!				***	*	**	*****
d. sqə́s.qxaʔ		*!		*		***	**	**	****
e. sqqə́.xaʔ			*!			**	*	*	*****

Candidate b. [sqə́q.xaʔ] is correctly chosen as the winner, as it copies the rightmost consonant at the right edge of the base. A candidate such as c. *[sqə́s.xaʔ] is rules out by improperly being copied while not at the right edge of the base.

Accounting for Vowel Epenthesis

In Part 3, two patterns of reduplication were identified. Until now, this analysis has focused on C-reduplication where only the preceding consonant of the stressed vowel was copied. Our attention now shifts to cases where C-reduplication also has a vowel in the reduplicant:

C-Reduplication + V:

a. /mám’təq + DIM/ -> [mátq] “to be on foot”;

b. /[nax^{w}ít + DIM/ -> [nax^{w}ə́x^{w}t] “worm”;

c. /twíw’t/ + DIM/ -> [twə́ww’ət] “little boy”;

d. /ʃəmɣáw + DIM/ -> [ʃəmɣə́ɣəw] “little Lynx”.

A question to consider is whether this is CV-Red or C+ V epenthesis. The CV pattern appears to hold true in forms such as c and d, with what appears to be the consonant vowel reduplicating together. However, the CV approach fails in other examples. In Examples a and b, we see that the consonant and vowel have segments intervening, which suggests that its epenthesis, rather than CV-reduplication occurring.

*Complex Coda plays an important role in predicting what surface forms will generate an additional vowel. From Part 2.2, we observed that the St'at'imcets syllable template allows up to maximum of two coda consonants, but only as monosyllabic forms. This in turn would explain the vowel epenthesis observations in forms such as /sql ə́w' + DIM/ -> [sqlə́ləw'] "little beaver" and /ʃəmɣáw +DIM/ -> [ʃəmɣə́ɣəw] "little Lynx".

There is one apparent problem with using "No Coda" to trigger epenthesis. Some diminutives will form complex codas without triggering epenthesis. Forms such as /naxʷít + DIM/ to [naxʷə́xʷt] "worm" and /twít + DIM/ to [twíw't] "young man" surface with a complex coda as a result of reduplication, but no epenthesis occurs. If the constraint "No Coda" were the cause of epenthesis, it would over apply to these forms. An additional restriction on consonant clusters is needed.

Through observing the transcription of double diminuitives provides evidence that epenthesis is not case-by-case specific, and that there must be some predictable pattern. The single diminutive [twí-w-'t] from [twít] has a complex coda of two segments, whereas the unattested double diminuitive *[twə́-w-w't] has a complex coda of three segments. Thus, when the reduplication process would else trigger a complex coda of three consonant segments, epenthesis is triggered to prevent a violation of the syllable structure. A constraint such as *CCC would capture the restriction on the syllable for maximum codas and onsets. Additionally, *CCC properly predicts that forming a complex coda during reduplication will be permitted as long as it does not exceed three segments.

- *CCC: Prohibit sequences of three consonant segments in an onset or coda.

Some exceptions to the two-segment limit do occur, such as [sql ə́w] "beaver"; however, this can be accounted for if we consider the Max-IO outranks *CCC.

Leaving epenthesis to be explained only via *CCC does not account for why epenthesis occurs in cases where the coda formed is within the permitted limit of two segments. For example, [ʃəmɣ ə́w] "lynx" and [sql ə́w'] "beaver" should be predicted as *[ʃəmɣə́-ɣ-w] and *[sqlə́-l-w'] respectively. Referring to Matthewson's (1994) analysis on the St'at'imcets syllable structure (Part 3.2), recall that there are constraints on types of coda clusters. St'at'imcets demands that the second consonant in a coda cluster be an obstruent (Matthewson, 1994). Because obstruents have the lowest sonority, it is predicted that this process is motivated by the sonority sequencing principal, or the "SSP". This is defined as a constraint below:

- SSP: A well-formed syllable must follow SSP, such that there is a prominent peak, and an adequate decline in sonority in the coda.

Compare the unattested forms which violate the SSP: *[ʃəmɣə́-ɣ-w'] and *[sqlə́-l-w'], with the attested forms, which follow the SSP: [naxʷə́-xʷ-t] and [twí-w'-t]. Both of the unattested forms would have an increase in sonority across their coda consonants, whereas the attested forms have the appropriate decrease in sonority.

Vowel Quality Alterations

A pattern that arises in the vowels is the apparent asymmetry in whether or not an A vowel, or "full vowel" in the base undergoes change into a [ə], or "reduced vowel" after reduplication.

Base vowel maintained A <-> E vowel alternation:

a. /naxʷít + DIM/ -> [naxʷə́xʷt] "worm";

b. /mám'təq/ + DIM/ -> [mátq] "to be on foot";

c. /ʔáma/ + DIM/ -> [ʔáʔma] "cute, pretty";

d. /ʃəmɣáw/ + DIM/ -> [ʃəmɣə́ɣəw] "little Lynx";

e. /ʃə́q-ən/ + DIM/ -> [ʃi̯ʃq-ən] "to split wood";

f. /qíqəl'/ + DIM/ -> [qə́qqəl'] "rather weak".

There is no clear pattern of what environments vowels do or do not alternate in. It is apparent that if epenthesis occurs alongside C-reduplication, the vowel is predicted to surface as [ə].

The problem with accounting for the base vowel quality alternation is that there is no evident indication of what forms undergo change, and what forms do. At the time, there is no evident ranking or constraint that could account for the lack of alternation from [mátq] "to be on foot" to [mám'təq] "to walk", but cause the alternation from [twíw't] "young man" to [twə́ww'ət] "little boy". The vowel quality problem remains half solved for now.

Accounting for Resonant Glottalization

As shown in the consonant chart in Section 2.1, glottalization is a contrastive property; therefore, it is expected to occur in root forms. However, resonants rightmost of the copied consonant may become glottalized when C-reduplication occurs (van Eijk, 1997). Thus far, the patterns of glottalization have been assumed irrelevant to this analysis, as the glottalization pattern is not entirely predictable on the basis of C-reduplication, as shown below:

a. /ʃ-jáqcaˀ + DIM/ -> [ʃ-j'áj'qcaˀ] "girl" GLOTTALIZED;

b. /qʷláwaʔ/ + DIM/ -> [qʷlə́lwaʔ] "little onion" NO GLOTTALIZATION.

However, some basic patterns do emerge: First it targets resonants to the right of the reduplicated consonant. Next, in forms where a pattern of a CV́R undergoes C-reduplication (where R = Resonant), the surface form is [CV́CR'] such as in /mátq + DIM/ = [mám'təq] "to walk" (van Eijk, 1997). In forms undergoing reduplication that have a RV́K pattern (K = non-resonant consonant) the surface form yields two possible forms. The first is [R'V́R'K], glottalizing the base and the reduplicated resonant, such as in /ʃ-jáqcaˀ + DIM/ = [ʃ-j'áj'qcaˀ] "girl". Else, the output is [RV́R'K], such as in /twít + DIM/ = [twíw't] "young man" (van Eijk, 1997). How this pattern emerges through OT, and why it occurs is a problem for future analysis.

Final Tableau

Cumulating all of the constraints discussed and analyzed, we arrive at the tableau for [ʃəm.ɣə́.ɣəw] which accurately demonstrates our ranking, and the processes that derive the St'at'imcets diminutive infix.

Table 11

/qíqəl'/ + DIM/ -> [qə́qqəl'] "Rather Weak"

/ʃəmɣ + DIM + ə́w/ "little Lynx	Realize Morph	Max-IO	EDGE	SSP	Align R BR (V́)	RED (C)	*CCC	ALRW	*Comp coda	No coda	Max-BR
a. ʃəm.ɣ ə́w	*!					*				**	5
b. ☞ʃəm.ɣə́.ɣəw								5		**	5
c. ʃəm.ɣə́wɣ			*!	*				6!		**	5
d. ʃəm.ɣə́ɣw				*!				5		**	5
e. ʃəm.ɣɣə́w					*!			4		**	5

Candidate b. [ʃəm.ɣə́.ɣəw] is correctly chosen as the winner. This tableau demonstrates how the reduplicated consonant must occur after the stressed vowel. The failures of candidates c and d, show how a violation of the SSP will be triggered without vowel epenthesis.

Final Ranking

SPEC (Morph) >> Max-IO, Dep-IO, Anchor-IO EDGE, Anchor BR R, Ident-BR (stress), $*]_{Morph}$V, Align R (V́) >> RED (C) >> Onset >> ALRW >> *Comp Coda >> *Comp Onset >> No Coda >> Dep-BR >> Max-BR.

Conclusion

The base for the infixal diminutive reduplicant is the phonological content left of the stressed vowel. A general constraint ranks for the St'at'imcets diminutiveis proposed by using syllabification constraints alongside shape and position constraints. The position of the infixation is generated through maintaining base-edge faithfulness (Anchor-BR EDGE) and motivating the reduplicant to go as far left as possible ((ALRW): Align L (RED, PrWd)) (Kurisu & Sanders, 1999) without reduplicating left of the stressed vowel (Align R (V́)). The shape of the reduplicant is driven by the satisfaction of the morphological requirements (SPEC; RED C).

Vowel epenthesis of the default vowel [ə] appears to co-occur with consonant reduplication to prevent violations of the syllable template when complex codas/onsets would else be formed. The argument for two different DEP constraints comes from the observation that emergence of the unmarked appears to be taking place. Epenthesis occurs to prevent violations of the syllable template (*CCC). Violations of the sonority sequencing principle (SSP) will also trigger epenthesis. However, complex codas are permitted in the base as the higher-ranking Max-IO prevents deletion of base segments.

Other phonological phenomena appear to be triggered by the St'at'imcets C-reduplication, such as the alternation in base vowel quality and resonant glottalization. Base vowel quality changes so far have been unpredictable; however, the epenthesized vowel is always predictable ([ə]). The glottalization of resonants has a somewhat predictable pattern, but remains outside of the scope of this paper. Insight to these phenomena should be considered for future research, as collecting as much information on this unique language is critical before its eventual extinction.

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Appendix

OT Constraints

- Realize Morph: Realized morphemes must be assigned phonological content.

Faithfulness

- Ident-BR (V): Assign a violation to any vowel that undergoes any feature changes in the reduplicant that are not present in the base.
- Max-BR: Every segment in the base has a corresponding segment in the reduplicant.
- Max-IO: Every segment in the input has a corresponding segment in the output.
- Dep-IO: Every segment of the output has a correspondent in the input (no epenthesis).

Position

- (ALRW): Align L (RED, PrWd): The left edge of an reduplicant must be aligned to the left edge of a prosodic word. Assign a violation to every intervening segment between the left edge of the reduplicant and the left edge of the prosodic word (Kurisu & Sanders, 1999).
- Align R BR (V́): The reduplicant must be to the right edge of the stressed vowel.
- Align (Morpheme R, Syllable R): The right boundary of a morpheme must be aligned with the right boundary of a syllable (Matthewson, 1994).
- Anchor R BR: The potion of the reduplicant is the right edge of the base. Assign a violation to any segment in the reduplicant that is not at the right edge.
- (EDGE): Anchor Edge-IO (DIM): Edges of the input and output must correspond when the affix is the diminutive. If either edge is not aligned in the output, a violation is assigned.

Syllable Template

- SSP: A well-formed syllable must follow SSP, such that there is a prominent peak, and an adequate decline in sonority in the coda.
- *CCC: Prohibit sequences of three consonant segments in an onset or coda.
- *Complex Coda: Assign a violation to codas that are greater than one segment.
- No Coda: Assign a violation to a syllable that has a coda.
- *Comp Onset: Assign a violation to any complex onsets in a syllable.
- Onset: Assign a violation to syllables that do not have an onset.

Reduplication

- RED (C): The target for reduplication is a consonant. Assign a violation to candidates that reduplicate more or less than a single consonant.
- Ident-BR (stress): Assign a violation if a segment in the reduplicant is carrying a stress that was not assigned stress in the base, or if a segment that was carrying stress in the base is not carrying stress in the reduplicant.
- St'at'imcets contrasts between plain, glottalized, and labialized consonants.
- Stress is indicated by an acute accent [V́], where the V represents a vowel, or sonorant that can act as a recipient of stress.
- Retracted phonemes are represented by the diacritic. Retraction can occur on all vowels, and for some consonants. It is unclear at this point if St'at'imcets contrasts ATR and RTR vowels, but according to the analysis given by van Eijk (1997), it is most likely a 5-vowel system with the retracted vowels behaving in complementary distribution.

- The symbol “t” is used to represent a voiceless denti-alveolar stop, and may be glotailized, or labialized. Alveolars in St’at’imcets (such as the nasal [n], or the retroflex [l]) are more dental than typically conceived by the standard IPA convention. Instead of writing the dentalized diacritic for each of these consonants, it will be assumed within the transcriptions from here on out.
- The fricative [s] is retracted, and represented as [ʃ] for this analysis.
- The voiceless alveolar lateral affricate is represented by [ƛ], a symbol not found in IPA, but borrowed from the Americanist phonetic notation. It’s approximant IPA correspondent would be [t͡ɬ̪]. The lambda bar symbol is used by Jan van Ejik, and will be used in this analysis as to provide salience when reading transcriptions.
- The palatal glide [j] is represents as [y] for this transcription.
- The symbol [c] is used to represent a voiceless palatal stop
- Jan van Eijk has represented a voiceless uvularized fricative as [x̌], whereas I have instead chosen to represent this phoneme as the uvular fricative [χ].

Table 1

The Consonant Chart

	Dental			Lateral-dental		Postalv./palatal		Velar		Post-velar		Laryngeal	
		Labial	Central	Lateral	Retracted lateral	Plain	Retracted	Plain	Labial	Plain	Labial		
Plosives	Plain	P	t			c	c̱	k	kʷ	q	qʷ		
	Glottalized	p’		ƛ’				k’	kʷ’	q’	qʷ’		
Fricative				ɬ		ʃ	ʃ̱	x	xʷ	χ	χʷ		
Nasal	Plain	m	n										
	Glottalized	m’	n’										
Approximant	Plain		z	l	l̠	y		ɣ	ɣʷ	ʕ	ʕʷ	h	w
	Glottalized		z’	l’	l̠’	y’		ɣ’	ɣʷ’	ʕ’	ʕʷ’	ʔ	w’

Stress

1. In words with at least one vowel, the stress assigns itself to the first A vowel of the root (A = full vowels: a, i, u for +ATR and -ATR: a̱ i̱ u̱) regardless of if it proceeded by other vowels.

a. [cúɬ-xal] “to point at things”;

b. [cúɬ-un’] “to point at it”;

c. [ʃútik] “winter”;

d. [zúmak] “spring salmon”;

e. [ník’-in’] “to cut it”;

f. [ník’-Xal] “to cut things”;

g. [kí̠ɬ-uʃ-əm] “to feel bad about something”;

h. [k’áx-an] “to dry it”;

i. [k’áx-xal] “to dry things”;

j. [zánuc] “driftwood”;

k. *?[a_i]*.

2. A vowels take priority over E vowels.

a. [ʔúcəz] “straightforward”;

b. [məc-xál] “to write”;

c. [məc-ən-ɬkán] “I write it down”;

d. [ləʕʷ-átkʷaʔ] “to hide water/liquor”.

3. If there is no A vowel, the next target for stress is E vowels (E = short vowels ([ə, ə̠)].

a. [lə́ʕʷ-ən] "to hide it";

b. [Xə́ɬ-Xəɬ] "quickly".

4. Reduplication may change vowel qualities, but stress assignment remains (?).

a. [qʷlə́lwaʔ] "little onion";

b. [qʷláwaʔ] "onion";

c. [naxʷít] "snake";

d. [naxʷə́xʷt] "worm".