

Glottalization in Cowichan¹

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1. INTRODUCTION

The phonological status of glottalization--ejection in stops and affricates and glottal stricture in sonorants--is not altogether transparent, since these phenomena could be assigned segmental status (as /ʔ/) or ascribed to a feature [+glottal] associated with the segment. The latter analysis raises the issue of whether one phonological feature of glottalization should be associated with both glottalized sonorants and the glottalized obstruents which abound in the Pacific Northwest. Data from the Cowichan dialect of Halkomelem, a Coast Salish language, shows systematic relationships between glottalized sonorants, glottal stop and, to a limited degree, glottalized obstruents, which leads to the hypothesis that these elements share a common phonological feature.

2. GLOTTALIZATION AS A FEATURE

The evidence for underlying glottalized segments in Cowichan is not compelling. That is, it is at least possible to analyze putative glottalized obstruents and sonorants as sequences with an adjacent glottal stop. We shall see in this section, however, that reduplication rules operate on these elements as single phonological units, not as clusters, and therefore glottalized segments must exist at some point in the phonology. This can be taken as indirect

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evidence for a feature or component of glottalization in Cowichan-- an analysis which is supported by phonological alternations discussed in section three. Given that glottalized segments must exist at some rather abstract level in Cowichan phonology, it is not clear that there are descriptive advantages in positing underlying sequences involving glottal stop unless such sequences are motivated in specific cases by alternations in surface forms.

Let us consider first the case for glottalized obstruents in Cowichan. For every plain stop or affricate there is a glottalized counterpart (see Table 2.1), with the exception of /k/, which is acquired through loanwords. The converse holds as well, except that there is no plain counterpart to the glottalized lateral affricate /x̥/. Excluding the latter, one might analyze the glottalized segments as sequences of obstruent plus /ʔ/. This fills a distributional gap, since apparently such sequences do not occur at the phonetic level.

A case for a segmental analysis could be made for three forms which exhibit an alternation between [t̥] and [tVʔ].

- (1) i. x̥téʔ 'do'
 ii. x̥étə 'doing'
- (2) i. x̥ʷtéʔ 'go that way'
 ii. x̥ʷétə 'going that way'
- (3) stəʔé ~ sté 'be like'

The progressive forms (1ii) and (2ii) exhibit a regular vowel infixation process which applies to CC-initial bases in progressive formation (Hukari 1978, Jones 1974). However, the alternation between CVʔ and C̣ is unique to these forms (though perhaps phonologically definable in this narrow context of fricative, /t/ plus /ʔ/).

	m	ḿ	n	ṅ	l	ḷ	y	ý	w	w̃	h	ʔ	θ	s	š	ɬ	x ^w	χ	χ ^w	p	p̃	t ^θ	t̃ ^θ	t̃	t̃̄	c̄	č̄	č̄̄	ʎ	k	k ^w	k̃ ^w	q	q̄	q ^w	q̃ ^w		
SONORANT	+	+	+	+	+	+	+	+	+	+	+	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
HIGH	-	-	-	-	-	-	+	+	+	+	-	-	-	-	+	-	+	-	-	-	-	-	-	-	-	-	+	+	-	+	+	+	-	-	-	-	-	-
BACK	-	-	-	-	-	-	-	-	+	+	-	-	-	-	-	-	+	+	+	-	-	-	-	-	-	-	-	-	-	+	+	+	+	+	+	+	+	+
CONTINUANT	-	-	-	-	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
ANTERIOR	+	+	+	+	+	+	-	-	-	-	-	-	+	+	-	-	-	-	-	+	+	+	+	+	+	+	-	-	-	-	-	-	-	-	-	-	-	-
CORONAL	-	-	+	+	+	+	-	-	-	-	-	-	+	+	+	+	-	-	-	-	+	+	+	+	+	+	+	+	+	-	-	-	-	-	-	-	-	-
DELAYED RELEASE	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	+	-	-	+	+	+	+	+	-	-	-	-	-	-	-	-
LATERAL	-	-	-	-	+	+	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-	-	-
STRIDENT																																						
VOICED	+	+	+	+	+	+	+	+	+	+	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
ROUND	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-	+	+	-	-	+	+
GLOTTAL	-	+	-	+	-	+	+	-	+	-	+	-	-	-	-	-	-	-	-	-	-	+	-	+	-	+	-	+	-	+	+	-	-	+	-	+	-	+

Table 2.1
Tentative Distinctive Feature Matrix of Cowichan Consonants²

The glottalized segment in these progressives is copied in CVC-plural reduplication.

(4) ǰə̀t̚ǰə́tə 'they are doing'

(5) ǰʷə̀t̚ǰʷə́tə 'they are going that way'

The fact that such glottalized stops, though derived from sequences, reduplicate indicates that processes such as reduplication are not compelling evidence against a sequential analysis, although they show that at some point in the derivation glottalized stops must exist. In particular, the plural reduplication pattern above never copies more than the sequence CVC (i.e., not CVCC), hence /tʔ/ must be a glottalized consonant at the point in the derivation where plural formation applies.

Elsewhere glottalized stops do not alternate with sequences and they pattern as single phonological segments, as in the reduplication of CV-initial progressive bases (CV-reduplication) and of diminutives (CVʔ- ~ Ciʔ- reduplication) (Hukari 1978).

² This chart follows Jones (1974) in many respects. However, I assigned /h/ the specification [-glottal] on the assumption that degree of stricture is significant. So far as I know, /h/ does not interact with glottalized segments in the manner of /ʔ/. Underlying /h/ does alternate with /ʔ/, however in reduplicated forms, where root-initial /h/ becomes glottal stop.

hésəm breathe

héʔsəmʔ breathing (from /hehsəmʔ/)

This feature assignment was suggested to me by my colleague Dr. G. N. O'Grady.

- (6) i. t̥iləm sing
 ii. t̥it̥ələm? singing³
- (7) i. k̥w̥içət cut it
 ii. k̥w̥ik̥w̥əçət cutting it
- (8) i. ʃ.k̥w̥içəw? in-law
 ii. ʃ.k̥w̥iç?k̥w̥içəw? little in-law
- (9) i. č̥əwi?tən dish
 ii. č̥əč̥wi?tən? little⁴ dish

Note that initial glottalized stops reduplicate as single units. Further, such forms would undergo vowel insertion instead in progressive formation if the initial glottalized segment were a sequence at the time progressive formation applies, as in (lii) above. It seems reasonable to assume that there are underlying glottalized segments in Cowichan, except in specific cases which show alternation, as in (1) and (2).

The facts are somewhat more complex for glottalized sonorants, since they clearly may arise from sequences and further, segments which must be glottalized sonorants at some point in the derivation are phonetically realized as sequences, as discussed in sections two and three. The argument for the existence of glottalized sonorants at some point in the derivation is essentially the same as for glottalized obstruents: they pattern as single segments in reduplication.

³ Hereafter, glottal stricture in the environment of sonorants is given rough phonetic form: preglottalization being represented as ?S, simultaneous glottalization as Š and postglottalization as S?. Š in forms enclosed by slashes denotes the feature [+glottal].

⁴ /?/ drops in diminutive prefixes when followed by an obstruent plus a sonorant.

In CVC plural reduplication, glottalized sonorants are copied as in (10) and (11).

- (10) i. q̣^wu·nʔ ear
 ii. q̣^wənʔq̣^wu·nʔ ears
- (11) i. ṣⁱ?lə grandparent
 ii. səlʔṣⁱ?lə grandparents

Note that the phonetic sequence [ʔl] in (11) patterns systematically as a glottalized segment, as discussed below in sections two and three. The underlying forms for (10i) and (11i) might then be /q̣^wu·ṇ/ and /ṣⁱḷə/.

Similarly, glottalized sonorants do not pattern as sequences of glottal stop plus sonorant in progressive reduplication, despite the fact that this may be their phonetic realization. CVʔ-initial bases reduplicate in the progressive as Cə- instead of CV-, as in (12) and (13), but full CV-reduplication occurs in (14) and (15).

- (12) i. ʔeʔt putting it on top
 ii. ʔəʔeʔt putting it on top
- (13) i. ṭ^θeʔt chew it
 ii. ṭ^θəṭ^θeʔt chewing it
- (14) i. c·q̣ⁱ?lə make dry food
 ii. c·q̣ⁱq̣^ʔəlʔə making dry food
- (15) i. ṭ^a?əlt learn it
 ii. ṭ^aṭ^aəlʔət learning it

Full reduplication in (14) and (15) follows if these forms contain a glottalized sonorant rather than glottal stop at the point when progressive reduplication applies. That is, their underlying

representations are /c+qiiə/ and /tai+t/.⁵

We can conclude that glottalized stops and sonorants exist at some point in the derivation of Cowichan forms. While some surface forms point to a sequential analysis, it seems plausible to posit underlying glottalized segments in a significant number of cases.

3. PHONETIC REALIZATION

The realization of glottalized obstruents seems to be straightforward, involving co-articulation of the primary articulator and the glottis, with raising of the glottis creating supraglottal pressure. The oral closure is released followed by release of the glottis, creating an ejective consonant (cf, Chomsky and Halle 1968, p. 323, Ladefoged 1964, and Dickson 1977). The auditory effect is quite distinct from a sequence of stop plus glottal stop due to the ejectiveness of the oral release, although there is a notable moment of silence before the onset of a subsequent vowel. I am not aware of significant alternations in the timing of glottal structure with respect to the oral release, but this should be confirmed by acoustic studies. There is apparently variation in the amount of supraglottal pressure, as the ejectiveness of the oral release varies, but, again, I have not noted systematic variation.

The remainder of this section is confined to glottalized sonorants, which present a more complex picture. The phonetic realization of sonorant glottalization (regardless of its phonological source) appears to involve two parameters: degree of stricture and timing with respect to the sonorant. These parameters are conditioned by the phonetic context, as discussed below, although the findings must be taken as tentative pending detailed acoustic studies.

⁵ /-t/ is a transitive suffix and /c-/ is a verbal prefix.

3.1 Preglottalization

Glottalic stricture in word-initial position appears to occur at the onset of the sonorant, although examples of this are apparently confined to the following.

- (16) ʔmi come
 (17) ʔnan very, too (also [nan])

The degree of stricture may vary from speaker to speaker, probably being complete stoppage before the sonorant in the most markedly discernible cases.

Preglottalization also occurs when preceded by a strongly stressed, tense vowel (not shwa) and followed by a vowel.

- (18) sɨʔlə grandparent
 (19) méʔməlʔq forgetting
 (20) hèmʔəšéʔnəmʔ taking shoes off
 (21) wéʔwənʔʂ throwing
 (22) yáʔyəkʷəmʔ shattering

The degree of stricture may diminish in rapid speech, with the effect of shifting stricture into the sonorant. This is particularly notable if the preceding vowel has secondary stress.

- (23) hənʔətèʔwət ~ hənʔətèwət being called, named

3.2 Glottalization concomitant with the sonorant

Glottalization of the sonorant itself, perceived as stricture during the sonorant, occurs between unstressed lax vowels (shwas), but may also occur in rapid speech in other positions. This glottal stricture may be sufficiently weak as to become imperceptible on occasion.

- (24) léʔləmət looking at it
 (25) čécəwət helping
 (26) síšələ grandparent (diminutive)

In distinct, lento speech the glottalic activity may become more pronounced and is perceived as post-sonorant stoppage.

- (27) léʔləmʔət looking at it
 (28) čécəwʔət helping
 (29) síšəlʔə grandparent (diminutive)

3.3 Postglottalization

In other positions glottalization of sonorants is perceived as occurring at the end of the sonorant, varying from stricture to complete stoppage. The environments include preconsonantal and word-final positions, after stressed shwa and preceding a stressed vowel.

- (30) təlʔnəx^w find out
 (31) sčéyʔx^w dried
 (32) spa·lʔ raven
 (33) stətínʔ woven
 (34) nəwʔəš put it in
 (35) cəmʔət Pack it on the back
 (36) sənʔíq^w dozed off
 (37) sk^wəlʔéš gun

Significant differences in the degree of stricture may exist, although a definitive analysis must await acoustic studies. Word-final glottalization is perceived as a shortening of the sonorant-- which may be stricture plus devoicing rather than complete stoppage, as lento forms are notable in a perceptible release of a glottal stop, while normal speech forms lack this. Also, glottalic activity between sonorants is perceived more as a moment of stricture (cf,

(30)), while a complete stop seems to occur if the following segment is a stressed vowel, as in (37).

The timing of glottalic stricture with respect to a sonorant appears to be predictable and, as shown below, does not correlate with the underlying status of the glottal as a feature or a segment.

4. ALTERNATIONS

Four rules involving glottalized segments are examined in this section: glottalization, deglottalization, absorption and segmentation, all of which provide additional evidence for glottalization as a phonological feature. Most notably, deglottalization may be thought of as a dissimilation rule which is triggered by either a glottalized sonorant or a glottalized obstruent, establishing a link between glottalization in sonorants and obstruents.

4.1 Glottalization

Sonorants are systematically glottalized in two aspectual categories: progressives and resultatives.⁶ As glottalization applies to all sonorants in the word (excepting base-initial position and all prefixes), it seems plausible to treat this as a feature-changing rule rather than the infixation of glottal stops. Further, the phonetic realization of glottal stricture follows the distribution noted above and hence does not correlate with a segmental analysis (distinguishing ?C from C?) or a segmental versus feature analysis (distinguishing Ć from the former).

Glottalization is linked with the aspectual categories *progressive* (ongoing or habitual) and *resultative* (a resultant state). Both

⁶ Glottalization also occurs in diminutives, but I omit them here, pending a more detailed study.

categories are variously realized by CV-reduplication or ablaut, with vowel infixation occurring in the progressives as well (cf, Hukari 1978). As glottalization is a constant despite other overt markers, it appears to be an independent phonological process triggered by these aspectual categories.

- (38) i. $liq^wəm$ get smooth
 ii. $liʔləq^wəmʔ$ getting smooth
 iii. $sliʔləq^w$ smooth
- (39) i. $qəlʔqt$ hang it
 ii. $qelʔqt$ hanging it
 iii. $sqelʔq$ hanging
- (40) i. k^wsem count
 ii. $k^wəsemʔ$ counting

As glottalization occurs throughout the word (excepting prefixes and base-initial position), object suffixes contain glottalized sonorants as well. Further, glottalization of suffix sonorants is not contingent upon the base containing a sonorant nor is it triggered by inherently glottalized base sonorants, indicating that this is not an assimilation rule, but across-the-board glottalization.

- (41) i. $səqʔqt$ seek him/her
 ii. $səwʔqəleəm$ seek me
 iii. $səwʔqəʔləmʔ$ seeking me (progressive)

The rule may be formulated as follows, where any noninitial sonorant is glottalized,

(42) Glottalization

-syllabic [+glottal]/ [Cⁿ X ___]
 †sonorant

This is a morphologically governed rule, triggered by the appropriate

morphological categories.

A glottalization rule seems far more plausible than inserting glottal stops in the environment of sonorants, since this applies throughout the word rather than in just one position as one would expect if it were an infix. Further, in a segmental analysis a choice between a preceding and a following glottal stop would be arbitrary, as the realization of the glottalic stricture will be determined by subsequent rules. Glottalization, then, provides further evidence for a feature analysis.

4.2 Deglottalization

Glottalized sonorants deglottalize when followed by a glottalized segment (with an intervening unstressed vowel). This accounts for the plain sonorants in the following progressives.

- (43) i. q^hwóləm barbecue
 ii. q^hwəq^hwóləm? barbecuing
- (44) i. wənél's throw
 ii. we^hwənəl's throwing

This is not simply the failure of glottalization to apply, since underlying glottalized sonorants are also deglottalized.

- (45) i. pén^həm plant
 ii. pəpénəm? planting
- (46) i. fén^həm weave
 ii. fəfénəm? weaving

Glottalized obstruents also trigger sonorant deglottalization, as in the following progressive.

- (47) i. qéləč spin
 ii. qéqələč spinning

Further, deglottalization is not confined to aspectually marked forms, as illustrated by the following example, where the glottalized obstruent in the lexical suffix /-(i)t^θeʔ/ 'clothing/fibre' deglottalizes /m̥/ in both progressive and nonprogressive forms.

- (48) i. t̥ámʔət pound it
 ii. t̥ámət^θeʔt pound fibre
 iii. t̥ət̥ámət^θeʔt pounding fibre

A certain amount of variation has been found in the data. This may reflect, in part, the difficulty in perceiving light glottal constriction; however, there seems to be a tendency to retain glottalization in citation forms on the part of sophisticated informants, which suggests this is a low level phonetic rule.

The fact that the rule is triggered by both glottalized sonorants and obstruents is evidence for a common feature of glottalization. Further, there is evidence that glottalization is also triggered by the segment glottal stop, as in the following progressive form with the lexical suffix /-(i)ʔq^w/ 'head'.

- (49) i. šémət smoke it
 ii. šámaʔq^wt smoke fishheads
 iii. šášəmaʔq^wt smoking fishheads

This forms an unusual context, as unstressed vowels generally reduce to shwa, but the sequence /əʔC/ does not occur in Cowichan and apparently the vowel tenses to /a/, despite its lack of stress (also triggering vowel assimilation in the root).

The deglottalization rule, then, applies in the context of any glottalized segment, including glottal stop, across an unstressed vowel, as stated in the following rule.

(50) Deglottalization

$$\left[\begin{array}{l} +\text{sonorant} \\ +\text{voice} \end{array} \right] \rightarrow [-\text{glottal}] / \quad \text{---} \left[\begin{array}{l} \text{V} \\ -\text{stress} \end{array} \right] \quad [+glottal]$$

Note that this presupposes a feature of glottalization common to /ʔ/, glottalized sonorants and glottalized obstruents.

4.3 Absorption

The processes of glottalization and deglottalization make a convincing case for a feature analysis. Nevertheless, sequences of glottal stop plus sonorant must occur in the underlying representation of certain forms, as noted in section one. For example, the following forms have roots of the shape CVʔ, as revealed in the /-t/ transitive forms (i), but the final glottal stop combines with the initial sonorant in the limited control suffix /-nəxʷ/ (ii).

- (51) i. kʷeʔt let it go
 ii. kʷenʔxʷ drop it
- (52) i. seʔt lift it
 ii. senʔxʷ manage to lift it
- (53) i. tʰaʔt pull it out
 ii. tʰanʔxʷ manage to pull it out

While this alternation could be treated as metathesis, it follows the normal distribution for glottalic stricture in glottalized sonorants (cf, section three), making it far more plausible to posit a glottal absorption rule which applies before the phonetic realization rules,

(54) Glottal Absorption

$$\begin{array}{l} ? \\ 1 \end{array} \left[\begin{array}{l} -\text{syllabic} \\ +\text{sonorant} \\ +\text{voice} \end{array} \right] \rightarrow \left[\begin{array}{l} 2 \\ +\text{glottal} \end{array} \right]$$

As in Table 2.1, / / has the feature [+glottal], which is incorporated into the sonorant by glottal absorption. With the application of this rule, the sequence glottal stop plus sonorant merges with underlying glottalized sonorants.

4.4 Segmentation

In addition to absorption, causing merger of glottal stop plus sonorant and glottalized sonorants, the reverse process occurs, whereby the glottal component precedes the sonorant as a separate segment.

Segmentation occurs sufficiently late in the derivation that it does not affect plural or progressive reduplication, as noted in section one in the forms repeated here.

- (11) i. sɪʔlə grandparent
 ii. səlʔsɪʔlə grandparents
- (14) i. cʔqɪʔlə make dry food
 ii. cʔqɪqəlʔə making dry food

That is, /ɪ/ is copied in (11) and full CV-reduplication (not Cə-) occurs in (15), indicating that both forms contain glottalized sonorants at the point where the reduplication rules apply. However segmentation precedes deglottalization, since segmented forms never undergo deglottalization.

- (55) i. léməðèləm look at me (passive)
 ii. léʔləmʔəðèʔləmʔ looking at me

As the phonetic distinction between early glottal stricture and complete segmentation is at best a fine one, further evidence that this is actually segmentation would be welcome. As it turns out, an epenthetic vowel may occur between the glottal stop and the

and the following sonorant, as in the transitive form of the roots /táɪ/ 'know' and /wíɪ/ 'appear':

- (56) i. táʔəɪt learn
 ii. tátəɪʔət learning
 (57) i. wíʔəɪt make it appear
 ii. wíʔwəɪʔt making it appear

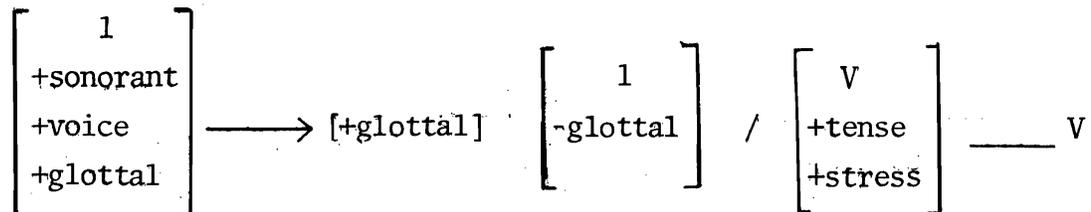
Note that the progressives (ii) indicate that the roots are /táɪ/ and /wíɪ/, respectively. The epenthetic vowel may be the result of metathesis when a glottalized sonorant preceded by a tense vowel is followed by a homorganic obstruent, as this also occurs in the following progressives.

- (58) i. náʔət rub oil in
 ii. náʔənsət rubbing oil in
 (59) i. s·net night
 ii. xʷə·néʔənt evening (becoming night)

That is, one would otherwise predict the forms */naʔəsət/ and */xʷəneʔət/, with segmentation of the glottalized sonorant.

A formal statement of segmentation brings into question the status of glottalization and its relationship to glottal stop. In sections (4.2) and (4.3), it seemed necessary to assume that /ʔ/ is [+glottal]. Let us assume further that a segment specified only as [+glottal] in an insertion operation is redundantly specified for the features of glottal stop.

(60) Segmentation



That is, a glottalized sonorant is realized as the sequence glottal stop plus plain sonorant intervocalically when preceded by a tense, stressed vowel, as discussed in section three.

5. CONCLUSIONS

The existence of glottalized segments in Cowichan at some point in the phonological derivation seems clearly indicated by processes such as reduplication and further corroborated by the glottalization and deglottalization of sonorants. Barring evidence to the contrary in specific forms, it seems reasonable to assume that glottalized segments exist at the level of underlying representation. Further, Cowichan exhibits systematic relationships between glottalization and glottal stop, as in segmentation and absorption (albeit restricted in the case of obstruents) and in sonorant deglottalization, triggered by any glottalized segment, including glottal stop. This leads to the hypothesis that there is a common feature, call it [+glottal], associated with all these segments.

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