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A Laryngoscopic Phonetic Study of Nootka and Salish Glottal Stop, Glottalized Resonants, and Pharyngeals

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Abstract
Sounds that have a component made deep in the throat are not easily observed. Therefore, phonetic research using direct visual evidence of the larynx and supraglottal area is rare in the literature. The goal of this paper is to describe as accurately as possible, using laryngoscopic evidence, the articulatory mechanisms involved in the production of glottal stop, glottalized resonants, and pharyngeals in the Wakashan language Nootka (Nuuchahnulth) and the Salish language Nlaka'pamux. A hierarchy of phonetic incrementation is proposed to isolate and show the interrelationships that occur among the individual articulatory gestures that are involved in the production of these complex sounds. Of particular interest is the link shown between glottal phenomena and the mechanism of the laryngeal sphincter. This is a double, perhaps sliding relationship which creates a range of pharyngeal phoneme variants in both languages.

• Setting: The Pacific Northwest is a region of different language families with outwardly similar phonological inventories. • Goal: To study the articulations of these sounds in detail using audio recordings and digital laryngoscopic images of the lower vocal tract.

1.

bilabial	p	p'		m	**ʔm**
denti-alveolar	t	t'			
	ts	ts'	s		
apico-alveolar	tɬ	tɬ'	ɬ	n	**ʔn**
postalveolar	tʃ	tʃ'	ʃ		
palatal				j	**ʔj**
velar	k	k'	x	w	**ʔw**
	k^w	k^w'	x^w		
uvular	q		(χ)		
	q^w		($χ^w$)		
pharyngeal			**ħ**	**ʕ**	
glottal	**ʔ**		**h**		

Nuuchahnulth (Wakashan)

2.

bilabial	p	p'		m	**mʔ**
alveolar	t	(t')		n	**nʔ**
	ts	ts'	s	z	**zʔ**
		tɬ'	ɬ	l	**lʔ**
postalveolar	tʃ		ʃ		
palatal				j	**jʔ**
velar	k	k'	x	(ɣ)	(**ɣʔ**)
	k^w	k^w'	x^w	w	**$w^ʔ$**
uvular	q	q'	χ		
	q^w	q^w'	$χ^w$		
pharyngeal				**ʕ**	**ʕ'**
				$ʕ^w$	**$ʕ^w$'**
glottal	**ʔ**		**h**		

Nlaka'pamux (Salish)

3. Diagram of pharynx/larynx: articulation of [h] (Nuuchahnulth)

3a. We will show that
- /ʔ/ is a brief sequence where the ventricular folds momentarily arrest the vibration of the vocal folds.
- /h/ is an abduction of the vocal folds to permit glottally unimpeded airflow through the rest of the vocal tract.
- Glottalized resonants in Nuuchahnulth are preceded by [ʔ].
- Glottalized resonants in Nlaka'pamux are followed by [ʔ] with attendant laryngealization and typically voiceless release.

Ahousaht Nuuchahnulth (speaker: Katie Fraser).

4. [m] as in /muː/ 'four'
5. [ʔm] as in /ʔmutʃ'itʃtup/ 'clothes'
6. [w] as in /wiːʔuː/ 'nephew'
7. [ʔw] as in /ʔwiχʔitap/ 'to clearcut'
8. [ʔ] as in /wiːʔuː/ 'nephew'
9. [ʡʕˤ] as in /ʕumaː / 'water from spout'
10. [hħˤ] as in /ʕiħuː/ 'to cry after'

11. For comparison: /ʔ/ /ʔm/ /ʕ/ (/wiːʔuː/ /ʔmuː/ /ʕiħuː/)

Nlakaʾpamux (speaker: Rhoda Spinks).

12. [mˀ̥] as in /piχmˀ/ ‘to hunt’
13. [m] and [jˀ̥] as in /mijˀt/ ‘spreading disease’
14. [nˀ̥] as in /nˀteʃ/ ‘giving it’
15. [n] and [ʔ] as in /n-ʔ-aqʾ/ ‘to rot’

16. Pharyngeals:

plain pharyngeal	/ʕ/	/ɬiʕʕ/	[ɬɛʕʕ]	‘all scattered’
glottalized pharyngeal	/ʕʷʾ/	/npaʕʷʾ/	[nːˈpaˤɬ̥ʷ]	‘ice’

16a. Logical phonological relationship:

- Laryngeal sphinctering is required for pharyngealization, usually with larynx raising.
- RTR is the laryngeal sphincter (a component of pharyngealization).
- /ʕ/ in Nuuchahnulth [ɬʕˤ]
- /ħ/ in Nuuchahnulth [ħħˤ]
- /ʕ, ʕʷ/ in Nlakaʾpamux are mostly pharyngealized uvulars, but the rest are pharyngeals proper with laryngeal sphinctering, larynx raising and tongue retraction (cf. Carlson & Esling 2001).
- /ʕʾ, ʕʷʾ/ in Nlakaʾpamux [ˤɬ̥]

• Timing: Summary of nonglottal, glottal, glottalized and pharyngeal articulatory durations

17, 18, 19. Nuuchahnulth: Łuuta Qamiina, Katie Fraser

			Łuuta	Katie 1	Katie 2
m,j,w	ˀm,ˀj,ˀw	Glottalized longer by:	1.99	1.96	1.85 (1.79 pairwise)
ʔ	ʕ	Pharyngeal longer by:	2.45	2.77	2.46
ʔ	ħ	Pharyngeal longer by:	2.65	2.91	2.54

20. Nlakaʾpamux: Rhoda Spinks

			Rhoda
m,n,j	mˀ,nˀ,jˀ,wˀ	Glottalized longer by:	1.47
ʔ (m,n,j)	ʕ,ʕʷ	Pharyngeal longer by:	4.25 (2.49 x resonant)
ʔ (m,n,j)	ʕʾ,ʕʷʾ	Pharyngeal longer by:	4.65 (2.72 x resonant)

20a. Phonetically (in terms of articulation and timing):

- Nuuchahnulth /ʕ/ parallels Nlakaʾpamux /ʕʾ, ʕʷʾ/ (full epiglottal stop).
- Nuuchahnulth /ħ/ parallels Nlakaʾpamux /ʕ, ʕʷ/ (pharyngeal constriction without stop closure).
- But Nlakaʾpamux glottalized pharyngeals /ʕʾ, ʕʷʾ/ parallel Nuuchahnulth /ħ/ in that both cover larger articulatory distances (longer event durations in terms of timing and coarticulatory effect).

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