The Phonology of Wakashan Languages

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Abstract

This article offers an overview of the phonological typology and analysis of the Wakashan languages, namely Haisla, Heiltsukvla (Heiltsuk, Bella Bella), Oowekyala, Kwak'wala (Kwakiutl), Nuu-chah-nulth (Nootka), Ditidaht (Nitinaht), and Makah.

Like other languages of the Northwest Coast of North America, these have many consonants, including several laterals, front and back dorsals, few labials, contrastive glottalization and lip rounding, and a glottal stop with similar distribution to other consonants. Consonant-vowel sequences are characterized by large obstruent clusters, and no hiatus.

Of theoretical interest at the segmental level are consonant mutations, positional neutralizations of laryngeal features, vowel-glide alternations, glottalized vowels and glottalized voiced plosives, and historical loss of nasal consonants.

Also addressed here are aspects of these languages' rich prosodic morphology, such as patterns of reduplication and templatic stem modifications, the distribution of Northern Wakashan schwa, alternations in Southern Wakashan vowel length and presence, and the syllabification of all-obstruent words.

1. Introduction

The Wakashan language are spoken in what are now British Columbia, Canada, and Washington State, USA. The family comprises a northern branch—Haisla, Heiltsukvla, Oowekyala, and Kwak̓wala—and a southern branch—Nuu-chah-nulth, Ditidaht, and Makah—that diverge significantly from each other, but are internally very similar. They are endangered, being spoken natively by about 350 people, out of ethnic populations of about 23,000 whose main language is English. At the same time, most are undergoing active revitalization, with about 1,000 semi-speakers and learners (*First Peoples' Language Map*).

In this article, I summarize their segmental and prosodic phonology, drawing attention to phenomena that are typologically unusual, or have inspired significant theoretical interest.

The words in (1) convey an idea of Wakashan sound patterns. I abbreviate Haisla as *X*, and other languages by the first letter of their English name. Data are in orthography, alongside a meta-alphabetic transcription in italics (see appendix B).

(1)	X	ɬhàqˀa	*ƛ̓àqʷa*		ẇawès	*ẇawès*		qˀàsa	*qˀʷàsa*		ɬxls	*ɬəxàls*
	H	ƛ̓áqva	*ƛ̓áqʷa*		qvúqvs	*qʷúqʷəs*		qvása	*qʷásа*		ɬx	*ɬəx*
	O	ƛ̓aqva	*ƛ̓aqʷa*		qvuqvs	*qʷuqʷs*		qvasa	*qʷasa*		ɬx	*ɬx*
	K	ɬłak̲wa	*ƛ̓aqʷa*		na̲ge	*nəge*		k̲wasa	*qʷasa*		ɬa̲xa̲la	*ɬəxəla*
	N	ƛ̓iḥuk	*ƛ̓iħuk*		nučii	*nučiː*		ʕiḥak	*ʕiħak*		ɬašii	*ɬašiː*
	D	ƛ̓ixuk	*ƛ̓iχuk*		dučiʔ	*dučiʔ*		ʕaxak	*ʕaχak*		ɬašii	*ɬašiː*
	M	ƛ̓ixuk	*ƛ̓iχuk*		dučiʔiˑ	*dučiʔiː*		qixak	*qiχak*		ɬašiˑ	*ɬašiː*
		‘red’			‘mountain’			‘weep’			‘path’	

Many aspects of Wakashan phonologies are general to the Northwest Coast of North America, including large consonant inventories with several laterals, front and back dorsals, few labials, contrastive glottalization and lip rounding, and a glottal stop /ʔ/ with similar distribution to other consonants. Word shapes are characterized by large obstruent clusters and a lack of hiatus, and word-building by rich reduplication patterns.

Other aspects are less common. These include word-level tone, pharyngeal consonants, historical loss of nasals, words without vowels or resonants, glottalized vowels, and voiced glottalized plosives. Wakashan prosodic phonology features pervasive alternations in vowel length and presence, and modifications of stems according to prosodic templates.

The data for this article are taken variously from Vink (1977), Lincoln and Rath (1986), and Bach (1989, 1990) for Haisla, Rath (1981) for Heiltsukvla, Howe (2000) for Oowekyala, Boas (1947, 1948) and Grubb (1977) for Kwak̓wala, and Lincoln and Rath (1980) for all of Northern Wakashan. My main sources for Nuu-chah-nulth are Sapir and Swadesh (1939), Stonham (1999, 2005), Davidson (2002), and Kim (2003d), a Ditidaht Studies Program wordlist for Ditidaht, and Jacobsen (1979b) and Davidson (2002) for Makah.

Readers will find comprehensive bibliographies in Pillino (1894), Adler (1961), and Davis and Wojdak (2007), and online at the *Wakashan Linguistics Page*, Bach's *Checklist*, Stonham's *Bibliography*, and the site of the Yinka Déné Language Institute. Audio of Haisla, Kwak̓wala, Nuu-chah-nulth, and Ditidaht is available online at *First Voices*.

I begin in section 2 by laying out the consonants and vowels of Wakashan languages, with some discussion of unusual contrasts, and historical nasal loss. Then in section 3, I address intersegmental processes like vowel-glide alternations, consonant mutations, and positional neutralizations.

I turn in section 4 to prosodic phonology, including syllable structure, the distribution of Northern Wakashan schwa, and the initial disyllable in Southern Wakashan. Section 5 is concerned with reduplication and templatic morphology, and section 6 concludes.

Last, I provide appendices on names for Wakashan people and languages (appendix A), symbols and transcription (B), and consonant mutations (C).

2. Segments

2.1 Northern Wakashan consonants

As is typical on the Northwest Coast, Wakashan languages exhibit many consonants with little allophonic variation. This inventory is typical of Northern Wakashan:

(2) Northern Wakashan consonants

aspirated plosives	*p*	*t*	*tɬ*	*c*	*kʸ*	*kʷ*	*q*	*qʷ*	
glottalized plosives	*pˀ*	*tˀ*	*tɬˀ*	*cˀ*	*kˀʸ*	*kˀʷ*	*qˀ*	*qˀʷ*	*ʔ*
voiced plosives	*b*	*d*	*dɮ*	*dz*	*gʸ*	*gʷ*	*ɢ*	*ɢʷ*	
fricatives			*ɬ*	*s*	*xʸ*	*xʷ*	*χ*	*χʷ*	*h*
plain resonants	*m*	*n*	*l*		*y*	*w*			
glottalized resonants	*mˀ*	*nˀ*	*lˀ*		*yˀ*	*wˀ*			
long resonants (Haisla, Oowekyala only)	⟨*mː*⟩	⟨*nː*⟩	⟨*lː*⟩						

I indicate here the regular palatal coarticulation of the unrounded front dorsals /k^y $k̓^y$ g^y x^y/, but omit it elsewhere. Regarding long resonants, see 2.3.

Stops and affricates pattern together as plosives, and with fricatives as obstruents, while nasals, approximants, and glides pattern together as resonants (Boas 1947, Sapir and Swadesh 1939). Dorsals can be front /k g x/ or back /q $ɢ$ $χ$/, and support contrastive lip rounding.

Plosives are further augmented by aspiration, glottalization, and voicing, and resonants by glottalization. Fricatives and plain plosives are typically aspirated, while the 'voiced' plosives /b d $ɬ$ $d͡z$ g g^w $ɢ$ $ɢ^w$/ can be phonetically voiced, but are frequently voiceless unaspirated.

Glottalized plosives are ejectives, while glottalization on resonants ranges from creaky voice to full glottal closure. Resonants are generally pre-glottalized, especially in syllable onsets, but glottalization on nuclear and coda resonants is medial or final (Grubb 1977, Lincoln and Rath 1980, Howe and Pulleyblank 2001).

There is some question as to whether aspirated or voiced plosives are less marked, or 'plain'. Some call the voiced series plain on phonetic grounds, because they lack strong voicing (Vink 1977, Lincoln and Rath 1980, Bach 1989). But Howe (2000) argues on phonological grounds that the aspirated series is plain.

First, voicing and glottalization are active in the phonology, such as in consonant mutations, whereas aspiration is not (see 3.5). Second, the aspirated plosives, together with fricatives, have the freest phonotactic distribution (see 4.1, 4.3).

Third, neutralization processes spirantize aspirated plosives to fricatives, while voiced plosives only devoice (see 3.4). If neutralization involves loss of featural contrasts, this indicates that the aspirated plosives are more similar to the laryngeally neutral fricatives.

2.2 Southern Wakashan consonants

Southern Wakashan consonant systems diverge by several developments both from the northern languages, and from each other (Boas 1891, Sapir 1911, 1938, Sapir and Swadesh 1952, Swadesh 1953, Haas 1969a, Jacobsen 1969b, 1979c, 2007, Gamble 1977, Fortescue 2007). In this chart, brackets indicate phonemes that are marginal in one or more languages:

(3) Southern Wakashan consonants

aspirated plosives	p	t	$t͡ɬ$	c	$č$	k	k^w	q	q^w		
glottalized plosives	$p̓$	$t̓$	$t͡ɬ̓$	$c̓$	$č̓$	$k̓$	$k̓^w$	⟨$q̓$⟩	⟨$q̓^w$⟩	⟨$ʕ$⟩	$ʔ$
voiced plosives	⟨b⟩	⟨d⟩									
voiced glottalized plosives	⟨$b̓$⟩	⟨$d̓$⟩									
fricatives			$ɬ$	s	$š$	x	x^w	⟨$χ$⟩	⟨$χ^w$⟩	⟨$ħ$⟩	h
plain resonants	⟨m⟩	⟨n⟩	⟨l⟩		y		w				
glottalized resonants	⟨$m̓$⟩	⟨$n̓$⟩	⟨$l̓$⟩		⟨$y̓$⟩		⟨$w̓$⟩				

General across Southern Wakashan are the merger of historical voiced and aspirated plosives into a single aspirated series, and the development of palatals /$č$ $č̓$ $š$/ from unrounded front dorsals *k $k̓$ g x. Yet instances of /k $k̓$ x/ remain, some reflecting rounded *k^w $k̓^w$ g^w x^w. Unlike in the northern languages, southern /k $k̓$ x/ have no palatal coarticulation.

Other changes distinguish southern languages from each other, including the loss of /*l̓ l̓*/ in Nuu-chah-nulth, the development of pharyngeals /*ħ ʕ*/ (Jacobsen 1969b, Carlson and Esling 2003) and new voiced plosives /*b̓ b̓ d̓ d̓*/, and loss of glottalized resonants in Makah with concomitant lengthening of a preceding vowel:

(4)		*χ χʷ	*q̓ q̓ʷ	*l l̓	*m m̓ n n̓	*y y̓ w w̓
	N	ħ ħ	ʕ	n n̓	m m̓ n n̓	y y̓ w w̓
	D	χ χʷ	ʕ ~ /q̓ q̓ʷ/	l l̓	b b̓ d d̓	y y̓ w w̓
	M	χ χʷ	q̓ q̓ʷ	l :l	b :b d :d	y :y w :w

Southern glottalized resonants are always pre-glottalized. Only Ditidaht allows them in codas:

(5)	N	wiiy̓a	D	wiiy̓	M	wi·y(a)	‘never’
	N	mamałn̓i	D	babład̓	M	babałid, babałdi-	‘white person’

Although changes have made some sounds marginal in particular languages, the original sounds survive in corners of the vocabulary through borrowing, through language contact, or because a change is still in progress:

(6)	N	q̓alx̓ak	‘muddied (water)’	q̓ʷanisic, q̓ʷalisic	(name)
	D	q̓iiquuws	‘Caycuse River’	liyoom, liyoom̓aq	‘(the) devil’
	M	na·ni·	‘grizzly bear’	mačłatx̌	‘Muchalaht person’

A much discussed case is the change from nasals to voiced plosives in Ditidaht and Makah, as nasalless languages are typologically rare (Thompson and Thompson 1972, Kinkade 1985). However, Ditidaht retains /*n n̓*/ in a few words with diminutive meaning:

(7)	N	n̓iic	—	—	—	c̓imt̓uu	—	—
	D	niic̓	ʔiniiq	ʔinuux	ʔin̓ic̓	c̓inip̓uʔ	naan̓saʔ	pin̓oo
	M	di·c	ʔidi·q	—	ʔidic	c̓ibitawi·	de·di·sq̓ʷa·	—
		‘short’	‘few’	‘small’	‘short time’	‘squirrel’	‘robin’	‘kitten’

In most other core vocabulary, original nasals have become plosives, though Ditidaht generally preserves them in borrowed words, and Makah sometimes does so:

(8)	N	maʔas	nuuk	mituuni	muusmuus	saantii	naana, naani
	D	baʔas	duuk	mituulii	muusmus	saantii	naanii
	M	baʔas	duku·	bitu·li·	bu·sbu·s	sa·dti·	na·ni·
		‘house’	‘song’	‘Victoria’	‘cow’	‘Sunday’	‘grizzly bear’

Other developments are the typologically rare pharyngeals /*ħ ʕ*/ and voiced glottalized stops /*b̓ d̓*/. Of these, /*ħ*/ is least problematic for analysis, clearly patterning with fricatives under mutation, and in its free phonotactic distribution (see 3.5, 4.1).

The other pharyngeal /ʕ/ is less well understood. Phonetically, it is described as a pharyngealized glottal stop (Sapir and Swadesh 1939), a pharyngealized epiglottal stop (Carlson et al. 2001), or a glottalized pharyngeal glide (Shank and I. Wilson 2000, I. Wilson 2000). See also Rose (1979), Colarusso (1985), Werle (2007), I. Wilson (2007).

Phonologically, /ʕ/ is the synchronic realization of hardened /*q* q^w/, and has phonotactics similar to the glottal stop /ʔ/. Both of /ʕ ʔ/ are transparent to vowel umlaut and metathesis, and do not trigger pre-adducted presence in Ditidaht repetitive forms. See 3.1, 3.5, 4.3.

Some represent Ditidaht /*b̓ d̓*/ as /ʔ*b* ʔ*d*/ sequences, presumably because voiced glottalized plosives are crosslinguistically rare (Swadesh and Swadesh 1933, J. Thomas and Hess 1981, J. Powell 1991, Fortescue 2007, Jacobsen 2007). However, several points favor their representation as single segments (Gamble 1977, Werle 2007).

Phonetically, southern /*b b̓ d d̓*/ are resonant-like in being fully voiced, and /*b̓ d̓*/ are pre-glottalized like resonants, rather than post-glottalized like obstruents. Phonologically, /*b̓ d̓*/ act like unitary segments, rather than /ʔC/ sequences. First, /*b d*/ harden to /*b̓ d̓*/. Second, /*b̓ d̓*/ must be postvocalic, whereas /ʔ/ need not be. Third, true /ʔ*b* ʔ*d*/ sequences are always (9), and other /ʔC/ sequences sometimes (10) divided by a vowel, whereas /*b̓ d̓*/ are not (11).

(9)	D	hiilaksʔub	‘headdress’	hitacx̣ʔid	‘wife’
(10)	D	c̓uucqsuʔp	‘wash dishes’	c̓uucqsʔup=s	‘I’m washing dishes’
(11)	D	dačsaab̓	‘Show it!’	dačsaab̓=s	‘Show me it!’

Last, some speakers reduce /*b̓ d̓*/ to /ʔ/ in casual speech, but do not reduce /ʔC/.

2.3 Vowels

Wakashan vowel systems are not exceptionally large, and exhibit significant allophonic variation. Some analyses further reduce mid vowels, diphthongs, and some long vowels to other vowels, or take northern alternations between vowels and glides, and between schwa and zero, to show that these languages lack purely vocalic phonemes altogether (see 3.1, 4.3).

All Wakashan languages have the basic vowels /*i a u*/, plus either mid vowels /*e o*/, or diphthongs /*ai au*/. The northern languages have schwa /*ə*/. In some languages, vowels are augmented by length, and in Oowekyala by glottalization:

(12) Haisla and Kwak̓wala vowels

short vowels	*i*	*a*	*u*
long vowels (Haisla only)	⟨*iː*⟩	⟨*aː*⟩	⟨*uː*⟩
mid vowels	*e*		*o*
schwa		*ə*	

(13) Heiltsukvla and Oowekyala vowels

plain short vowels	*i*	*a*	*u*
glottalized vowels (Oowekyala only)	⟨*i̓*⟩	⟨*a̓*⟩	⟨*u̓*⟩
long vowels (Oowekyala only)	⟨*iː*⟩	⟨*aː*⟩	⟨*uː*⟩
diphthongs	*ai*	*au*	
schwa	*ə*		

(14) Southern Wakashan vowels

short vowels	*i*	*e*	*a*		*u*
short /*o*/ (Ditidaht, Makah only)				⟨*o*⟩	
long vowels	*iː*	*eː*	*aː*	*oː*	*uː*

The symbols /*i e ə a o u*/ represent a range of phonetic vowels. Figure 1 sketches all seven vowel systems by allophones, grouping noncontrastive qualities to convey roughly how each language apportions its vowel space:

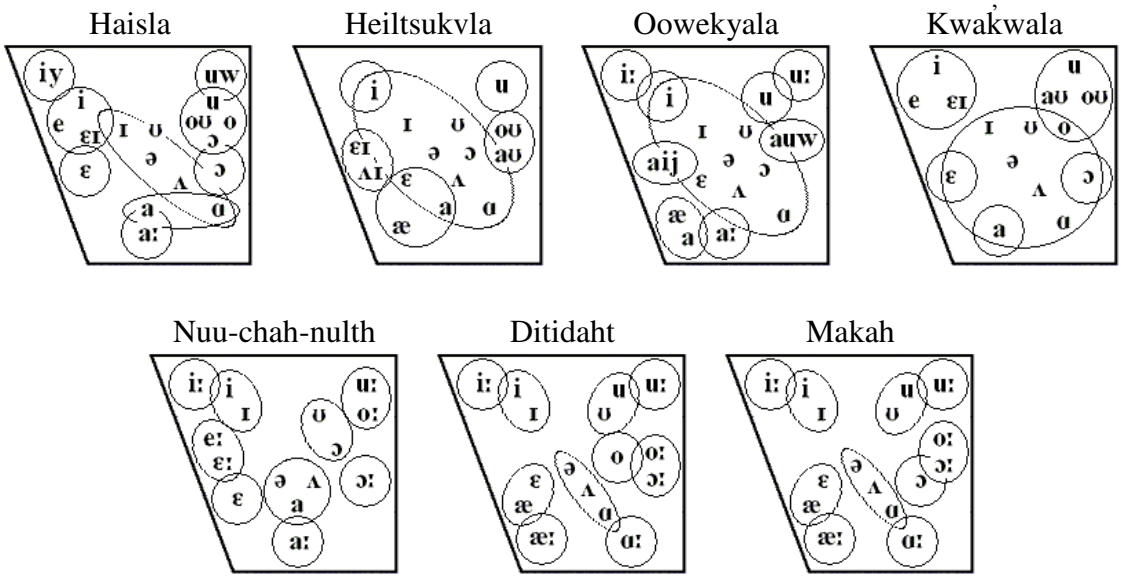

Fig. 1. Vowel allophony (adapted from Sapir 1924, Sapir and Swadesh 1939, 1955, Boas 1947, Vink 1977, Jacobsen 1979b, Lincoln and Rath 1980, 1986, Rose 1981, Stonham 1999, Howe 2000, Carlson et al. 2001, Davidson 2002, Werle 2007, I. Wilson 2007).

Haisla and Kwak̓wala are characterized by open /*i u*/, and Nuu-chah-nulth by open /*u uː*/. Ditidaht and Makah stand apart by their low canonical /*eː*/ and back /*aː*/, respectively [æː] and [ɑː], while in other languages [æ] is an allophone of /*a*/. Generally speaking, long vowels are tenser (more peripheral) and stable, and short vowels laxer and prone to allophony.

Articulatory clashes between vowels and consonants are resolved by vowel allophony, the greater integrity of consonants serving to maintain the great number of consonantal contrasts.

Back dorsals, pharyngeals, and sometimes glottals have the strongest effects, especially on high */i u/*, causing them to open, to diphthongize toward [ə a ɑ], or both.

In the southern languages, vowel quality is influenced also by stress and coda consonants. Tseshaht Nuu-chah-nulth */i a/* may have the lax allophones [ɪ ʌ] in closed, unstressed syllables (Stonham 1999). Ditidaht and Makah short vowels are canonically lax [ɪ ɛ ʌ ɔ ʊ], but are tenser [i æ ɑ o u] before glottalized resonants, and before tautosyllabic glides and */ʕ ʔ/*.

Most fluid is schwa. Phonologically featureless (see 4.3), it is typically [ə ʌ] in Haisla and Kwak̓wala, but varies widely in all northern languages, tending toward [i ɪ] next to */y/* and front unrounded dorsals, [u ʊ] by */w/* and rounded dorsals, [ɔ] by back dorsals, and [ɑ] by */h ʔ/*.

Only Heiltsukvla and Oowekyala have the true diphthongs */ai au/*—that is, two vowels to one nucleus. Other apparent diphthongs are allophones, or monophthongs plus glides. Coda glides in Ditidaht and Makah are consonants, not contributing to syllable weight, nor alternating with vowels, nor shortening preceding vowels:

(15)	D	łakaaw	ʕuuy	kiwteel, kibteel	tayeeẏ	
	M	łakoˑw	q̇uˑy	kiwtaˑl, kibtaˑl	takyaˑy	
		‘poor’	‘medicine’	‘horse’	‘senior brother, cousin’	

Some vowel contrasts are marginal, or depend on analysis. Except for */aː/*, long vowels and resonants are rarer in Haisla than in Oowekyala, and are analyzable as sequences of identical segments (Lincoln and Rath 1986, Emmon Bach, p.c.):

(16)	X	c̓àala	*c̓àːla*	O	c̓aala	*c̓aːla*	‘tide’
	X	t̓lls	*t̓əlːs*	O	t̓lls	*t̓lːs*	‘high bush cranberry’
	X	smms	*səmːs*	O	smms	*smːs*	‘mouth’

Further, it is not obvious whether Oowekyala glottalized vowels are phonemically glottalized */i̓ a̓ u̓/* (Lincoln and Rath 1980, Hilton et al. 1982, Howe 2000), or simply plain vowels followed by glottal stop */iʔ aʔ uʔ/*:

(17)	O	χ̓as	‘far out at sea, seaward’		xvita	*xʷita*	‘stick out, raise’
	O	χ̓as	‘animal fat, blubber, grease, oil’		xvisa	*xʷisa*	‘make whipping motion’

Some arguments are indicative, but ambiguous. First, while */i̓ a̓ u̓/* repel stress, similarly to the syllabic glottalized resonants */l̓ m̓ n̓/*, this is true of /Vʔ/ and /əR’/ sequences across Northern Wakashan (see 4.2). Second, */i̓ a̓ u̓/* can result from hardening, but Ditidaht hardening similarly yields postvocalic */ʔ/* (see 3.5):

(18)	O	k̓vàsla	*k̓ʷa̓səla*	*/k̓ʷa-!s-la/*	‘sitting on ground (outdoors)’
	D	ʔustaʔs		*/ʔust-!as/*	‘on ground (outdoors)’

More convincing is that /i̯ a̯ u̯/ have similar phonotactics to the unitary segments /l̩ m̩ n̩/. First, they are only short, whereas plain vowels and syllabic resonants can also be long. Second, they are possible only as the first syllabic sonorant in a word.

3. Segmental phonology

3.1 Vowel interactions

Next I will discuss some important phenomena that happen in and between segments, beginning with those involving vowels. These are of two broad kinds, consisting in resolutions of hiatus, and interactions across the non-oral consonants /ʕ ʔ/.

General across Wakashan is a complete lack of hiatus—that is, any two syllable nuclei are separated by at least one onset. Languages resolve potential hiatus by fusion, gliding, diphthongization, epenthesis, or deletion.

The various resolutions of hiatus observed in the northern languages depend on vowel height and ordering. Most consistent is gliding, whereby /i u/ become /y w/ before another high vowel or syllabic resonant, often accompanied by schwa insertion:

(19)	X	zzuis	*ʒəʒəwis*	‘smelt’ (fish)	O	buikv	*bəwikʷ*	‘pregnant’	
	H	buíkv	*bəwíkʷ*	‘pregnant’	K	ba̲wikw	*bəwikʷ*	‘pregnant’	

(20)	K	/ci-xʔid/	tsix’id	*cixʔid*	‘get water’	/ci-n/	tsa̲ya̲n	*cəyən*	(1SG)
	K	/bu-xʔid/	buxw’id	*buxʷʔid*	‘gone, flee’	/bu-n/	ba̲wa̲n	*bəwən*	(1SG)

The interpretation of orthographic *i*, *u* as /əy əw/ depends on analysis (Bach 1975). First, /əy əw/ are pronounced as such in Kwak̓wala, though they are closer to [ij uw] in other languages. Second, the putative /ə/ fails to attract stress (see 4.2).

Gliding is taken to show, further, that the pairs /i y/ and /u w/ are single phonemes. More controversial is Lincoln and Rath’s (1980, 1986) proposal to collapse /a h/, according to which Haisla, Heiltsukvla, and Oowekyala would lack purely vocalic phonemes altogether.

Resolutions of high vowels with /a/ are more variable. In Kwak̓wala these consistently fuse into one surface vowel, regardless of their order. In other northern languages, rising-sonority sequences /ia ua/ are resolved by gliding, while falling-sonority sequences /ai au/ fuse in Haisla, but diphthongize in Heiltsukvla and Oowekyala:

(21)	X	cia	*cəya*	yuàla	*yəwàla*	ne	*ne*	sk̓ok°	*sək̓okʷ*
	H	ciá	*cəyá*	yuála	*yəwála*	nái	*nái*	sk̓áukv	*sk̓áukʷ*
	O	cia	*cəya*	yuala	*yəwala*	nai	*nai*	sk̓aukv	*sk̓aukʷ*
	K	tse	*ce*	yola	*yola*	ne’	*neʔ*	sa̲k̓a	*sək̓a*
		‘get water’		‘wind, draft’		‘snow’		‘five’	

In the southern languages, gliding and diphthongization are unattested. Nuu-chah-nulth consistently deletes one or the other of vowels in sequence, favoring either the first root vowel if it is involved, or according to the scale *u* > *i* > *a*:

(22)	N	/ċa-iˑṅakʷ/	ċaaṅak	‘do river dance’	/ħayu-ayiˑ/	ḥayuyi	‘give ten’
	N	/ʔaya-ista/	ʔayista	‘many crewmen’	/ħayu-ista/	ḥayusta	‘ten crewmen’

Ahousaht Nuu-chah-nulth sometimes resolves hiatus with epenthetic /ʔ/ or /y/ (Kim 2003d).

In Ditidaht and Makah, fusion is the norm, frequently involving contraction of two vowels across a glottal stop /ʔ/ (23) or pharyngeal /ʕ/ (24):

(23)	D	/dač-(q)uːʔałˑ/	dačooʔł	M	/dač-uʔałˑ/	dačʔoł	‘see’
	D	/čaayidiː-ʔatχ/	čaayideeʔtx̣	M	/čaaydiː-ʔatχ/	čaaydeˑtx̌	‘Chinese’
	D	/ʔu-iˑduχ/	ʔuudux̣	M	/ʔu-iduχ+R/	ʔuʔudux̌	‘look for’

(24)	D	/ciq-!aqƛ/	ceʕqaƛ	‘public speaker’
	D	/du-q-!aqƛ/	doʕqaƛ	‘songmaster’

Related to fusion is umlaut, whereby /a aː/ become /e eː/ when separated from a following /i iː/ by one of /ʕ ʔ/. With other sequences, umlaut is not regular:

(25)	N	te-ʔił	ta-piƛ	waaʕit	haʔuk	ṁuʔak	ḥiʔak
	D	te-ʔił	ta-piƛ	weeʕit	haʔuk	buʔak	x̣iiʔuk
	M	te-ʔił	—	waaq̇it	haʔuk	buʔak	x̌iˑʔuk
		‘sick’	‘get sick’	‘frog’	‘eat’	‘burn’	‘crawl, slither’

Because mid vowels /e o/ often derive from /i a u/ by fusion or umlaut, there is some question as to whether mid vowels are phonemic. Haisla /e o/ may be analyzable as consistently deriving from /ai au/, based on alternations, and because they attract stress, and are long in a way similar to /aː/ (Emmon Bach, p.c.). Kwak̓wala /e o/ are also often derived, but this is not always apparent (Boas 1947, Bach 1975, Lincoln and Rath 1980).

Some southern mid vowels might be phonemic. First, they are found in a few roots:

(26)	N	kackeʔeeta, keʔeeckata	‘hop’	D	weʔek̓ƛ	‘still’
	M	k̓oloʔoˑ	‘wild currant’	D	ʔoop	‘better, more than’

Second, long /eː oː/ are meaningful rather than predictable in vocatives and emphatics, resulting from ablauted /i a u/ (Jacobsen 1978, 1994, 1997). On the other hand, short /e/ results mainly from umlaut, while short /o/ is usually clearly derived.

3.2 Consonant interactions

In contrast to vowel interactions, which are rich across Wakashan, processes resulting from contact between consonants are almost exclusive to the northern languages. Some of the more common are contraction of /ss/ to /c/ (27), dissimilation of /ɬs/ to /ɬc/ (28), and, at least in Oowekyala, contraction of consonants of similar place (29).

(27)	X	*/ʔuṁas = s gukʷ/*	’ùṁac gux°	*ʔùṁac guxʷ*	‘big house’
	H	*/k̓us = su/*	k̓úcu	*k̓úcu*	‘you do not’
(28)	H	*/ɢʷał = su/*	ğvółcú	*ɢʷółcú*	‘you stop’
	K	*/maʔł-sm/*	ma’łtsa̲m	*maʔłcəm*	‘two round ones’
(29)	O	*/gaχ-χs/*	ga-x̌s	*ga-χs*	‘come aboard’
	O	*/xʷlt-ƛyas/*	xvl-ƛ̓ias	*xʷl-ƛəyas*	‘fire on roof’

Most northern languages also contract */tɬ ts/* to */ƛ̓ c/*. Oowekyala is an exception, as shown by near-minimal pairs, and by reduplication of root-initial consonants (30). Heiltsukvla distinguishes */ts/* from */c/* only root-initially (31).

(30)	O	cla	*cəla*	‘cut through water’	tsla	*tsəla*	‘pushing’
	O	ƛ̓i-ƛ̓aa	*ƛ̓i-ƛ̓aa*	‘black bear (PL)’	ṫi-ṫła	*ṫi-ṫła*	‘soak dried fish (PL)’
	O	ẇaċ	*ẇaċ*	‘dog’	q̇vaṡ	*q̇ʷaṡ*	‘crowded on field’
(31)	H	cá-csa	*cá-csa*	‘pour liquid out (PL)’	tí-tsa	*tí-tsa*	‘push (PL)’

By contrast, the southern languages maintain such contrasts as affricates */c č ƛ/* versus plosive-fricative sequences */ts tš tɬ/* (32), round dorsals versus dorsal-*/w/* sequences (33), and single versus double obstruents (34):

(32)	N	łačuuč	‘not recognize’	tutuutš	‘thunderbird’
	D	kʷiscačƛ	‘go somewhere else’	kʷistsawaʔtx̣	‘ghost’
	D	kiiƛkiiƛ	‘breaking open sea urchins’	hiihitakʷiitł	‘shoulder’
	M	sičiƛ	‘strike match’	sitšiƛ	‘split’
(33)	M	bukʷak	‘blue’	bukwač	‘deer’
	M	č̓ix̌ʷatšiƛ	‘get scared’	hitax̌wi·łub	‘daughter’
(34)	D	ċaqabs	‘tree bark’	caqqawis	(place name)
	D	dašiiwƛ	‘become strong’	šaššii	‘name’

3.3 Rounding neutralizations

Wakashan languages neutralize rounding on dorsal consonants in several positions. Rounding is contrastive on non-final, prevocalic dorsals not in contact with */u/* (35). But following */u/*, dorsals neutralize to rounded (36).

(35)	K	g̲anutł	*ɢanuƛ*	‘night’	N	xʷakak	‘swollen’
	K	g̲wała	*ɢʷała*	‘finished’	N	ʔaƛakʷał	‘eight’
(36)	O	waka-k̓ala	*waka-k̓ala*	‘sound of barking’	D	baaqa-qapł	‘like to eat what’
	O	tu-k̓vala	*tu-k̓ʷala*	‘sound of footsteps’	D	ʔuu-qʷapł	‘like to eat’

Almost as regular is the opposite neutralization. In most languages, dorsals neutralize to unrounded preceding */u/* (37), with scattered exceptions. Only Heiltsukvla and Oowekyala maintain a strong rounding contrast in this context (38).

(37)	K	Kwaḵw-ala	‘speak Kwaḵwala’	Kwag-u’ł, Kwag-uł	‘Kwagu’ł people’
	N	mak^{w}-ink	‘bargain, trade’	mak-uł	‘shop, store’

(38)	H	kúsa	‘scrape with knife’	gvúkv	*g^{w}úk^{w}*	‘house’
	O	kusa	‘scrape with knife’	gvukv	*g^{w}uk^{w}*	‘house’

Southern Wakashan languages further exhibit rounding neutralization before consonants other than /*ħ* ʕ *ʔ*/, and at the ends of words (39). But Ditidaht and Makah maintain rounding to reflect a lost /*u*/, or where the restoration of a lost vowel would create a canonically contrastive environment (40).

(39)	N	/*mak^{w}-ʔatu*/	mak^{w}-ʔatu	‘sell’	/*ʔink^{w}-aˑs*/	ʔink^{w}-aas	‘fire on surface’
	N	/*mak^{w}-šiƛ*/	mak-šiƛ	‘buy’	/*ʔink^{w}*/	ʔink	‘fire’
(40)	D	/*hitaḵ^{w}ič*/	hitaḵ^{w}č	‘wear’	/*ʔiʔinuˑx*/	ʔiʔinx^{w}	‘small (PL)’
	M	/*ƛaχu*/	ƛax^{w}	‘ten’	/*sit*+RL-*ck^{w}iˑ*/	siˑsitck^{w}	‘wood chips’

The boundary between word and clitics is sometimes like a word edge with respect to rounding. That is, even if other conditions are met, clitic boundaries block neutralizations triggered by /*u*/, and fail to block delabialization at a word edge:

(41)	O	/*ʔamastu=ki*/	’amastu=ki	*ʔamastu=ki*	‘kindling (absent)’
	K	/*nmuk^{w}=us*/	na̲mukw=us	*nəmuk^{w}=us*	‘your friend’
	N	/*ʔink^{w}=ʔii*/	ʔink=ʔii		‘the fire’
	N	/*ḥayu=qaˑ*/	ḥayu=qa ~ ḥayu=q^{w}a		‘that there were ten’

Less well understood is the proper analysis of cases where neutralizations conflict—that is, where dorsals both follow and precede /*u*/, or, in the south, follow /*u*/ before a consonant or word edge. Rounding in such cases is variously reported in the literature, and seems to vary by degrees both within and across languages, amounting to a kind of neutralization.

3.4 Positional neutralizations

Peculiar to the northern languages are neutralizations of obstruent voicing, aspiration, and continuancy in positions defined partly in terms of syllable structure. But languages differ in triggering environments, affected consonants, and degrees of neutralization.

By *spirantization* (‘deocclusivization’), underlying plain plosives become homorganic fricatives when parsed in syllable codas. Inside words, it is regular across Northern Wakashan (42). Word-finally, it is most regular in Haisla, and variable in other languages, though more likely when another word follows (43).

(42)	X	ɬhàq̓-a	*ƛ̓àq^{w}-a*	‘copper’	ɬhàx̄̓-sdu	*ƛ̓àχ^{w}-sdu*	‘red color’
	H	wníqv-a	*wəníq^{w}-a*	‘scorch’	wniǩv-siwa	*wəniχ^{w}-siwa*	‘scorch through’
	K	ik-a̲la	*ʔik-əla*	‘kind’	ix-p̓a	*ʔix-p̓a*	‘sweet’

(43)	X	/*k̓ʷnq*/	k̓°nex̄	*k̓ʷəneχ*	‘wet’
	O	/*maċq*/	maċq ~ maċx̌	*maċq ~ maċχ*	‘two long cylindrical things’
	K	/*ṅik*/	ṅik ~ ṅix	*ṅik ~ ṅix*	‘say’

Spirantization varies also by place. It is most consistent with dorsals /*k kʷ q qʷ*/, less with /*ƛ c*/, and least with /*p t*/, which have no corresponding fricatives. Only in Heitsukvla and Oowekyala, /*t*/ becomes /*ɬ*/, and Oowekyala /*p*/ becomes /*m*/ or /*ṁ*/:

(44)	X	k°ǹc-a	*kʷə̀nc-a*	‘steam’	k°ǹs-disa	*kʷə̀ns-disa*	‘steam in pot’
	H	pnút	*pənút*	‘fill bottle’	pṅúɬ-ċuá	*pəṅúɬ-ċəwá*	‘empty bottle’
	O	kp-a	*kp-a*	‘tuck’	kṁ-stut	*kṁ-stut*	‘tuck in opening’
	K	hantł-a	*hənƛ-a*	‘shooting’	hanł-hantł-a	*hənɬ-hənƛ-a*	‘shoot repeatedly’

Similarly to rounding neutralizations, spirantization can consist in variation that amounts to the loss of a plosive-fricative contrast. Before /*s*/, back dorsals in Haisla and Kwak̓wala generally spirantize, while front dorsals may neutralize to plosives:

(45)	X	dhksàm	*ləksàm*	‘cinquefoil roots’	yχ°sm̀	*yəχʷsə̀m*	‘cedar bark basket’
	K	iksukw	*ʔiksukʷ*	‘beautiful’	haxsis	*həχsis*	‘swollen feet’

Another coda neutralization is *devoicing*, whereby underlyingly voiced plosives become similar or identical to aspirated ones. In most languages, the neutralization is absolute, but in Kwak̓wala, devoiced and aspirated plosives remain distinct:

(46)	H	yápaxd=i	*yápaxd=i*	‘the absent one sent’	yápaxt	*yápaxt*	‘sent’
	K	xwangwad	*χʷəngʷad*	‘have child’	migwat	*migʷat*	‘seal’

Initial devoicing in Oowekyala shows, moreover, that devoicing happens not only codas, but in any position not followed by a syllabic segment (*pgʷanm*):

(47)	O	/*bgʷ-*/	pgvanm	*pgʷanm*	bi-pgvanm	*bipgʷanm*	‘person (SG, PL)’
	O	/*ʒikʷ-*/	zikva	*ʒikʷa*	zi-ckva	*ʒickʷa*	‘push with feet (SG, PL)’

Deaspiration affects plain and voiced plosives in Haisla. After fricatives, these take on an intermediate quality most like their voiced versions, illustrated here with the suffix /*-gən*/:

(48)	X	ṗaṗa-kn	*ṗaṗa-kən*	‘overworked’	q̇q̇i-kn-à	*q̇əq̇i-kən-à*	‘too much’
	X	hàas-gn	*hà:s-gən*	‘out of breath’	’a’ix-gn-à	*ʔaʔix-gən-à*	‘too good’

3.5 Consonant mutations

Some suffixes and clitics induce mutations in preceding sounds. Mutations are of two types, *hardening* (‘glottalization’) and *softening* (‘weakening’, ‘lenition’, ‘mutation’, ‘voicing’). Roughly, these induce glottalization and voicing, respectively. See appendix C.

Mutations offer clues to the featural representations of segments, having significantly different effects on plosives, fricatives, and resonants. They are analyzed either as fusion of a consonant with glottal stop or /*h*/ (Rose 1976, P. Wilson 1977), or as floating features (Howe 1996, 2000, Kim 2003d, Kim and Pulleyblank 2009).

Northern hardening and softening are fairly uniform across languages, and associated only with suffixes. While plain plosives glottalize under hardening (*!*) and voice under softening (˚) (49), plain resonants only glottalize (50), and fricatives change in idiosyncratic ways (51).

(49)	X	/*bkʷ-!(k̓)ala*/	bk̓˚-àla	*bək̓ʷ-àla*	‘speak’
	K	/*wnq-˚iɬ*/	wa̲ng̲-iɬ	*wənɢ-iɬ*	‘deep on floor’
(50)	O	/*tu-!inuχʷ*/	tẇ-inuxv	*təẇ-inuχʷ*	‘good at walking’
	H	/*ẇn-˚iɬ*/	ẇṅ-íɬ	*ẇəṅ-íɬ*	‘hide indoors’
(51)	X	/*həms-˚ilas*/	hmz-ilàs	*həmʒ-ilàs*	‘restaurant’
	H	/*blxʷ-!(k̓)ala*/	Bĺẇ-álá	*bálәẇ-álá*	‘speak Nuxalk’
	O	/*məx-˚ac̓i*/	mn-ac̓i	*mən-ac̓i*	‘drum’
	K	/*c̓uɬ-!mya*/	ṫsu’l-a̲mya	*c̓uḽ-əmya*	‘black-cheeked’

Northern mutations, plus gliding, yield complex alternations among stem-final /*c c̓ ʒ s y ẏ i*/ and /*xʷ χʷ w ẇ u*/:

		stem plus neutral suffix			stem plus softening suffix		
(52)	H	ṗác̓-s	*ṗác̓ə-s*	‘bent to ground’	ṗái-kv	*ṗái-kʷ*	‘bent’
	H	púṡ-a	*púṡ-a*	‘swell’	puí-ṅakvla	*pəwí-ṅakʷəla*	‘rise gradually’
	K	k̲a̲ls-a	*q̇əls-a*	‘oily’	k̲a̲li-kw	*q̇əli-kʷ*	‘sunk in water’
	K	ya̲x̲w-a	*yəχʷ-a*	‘dance’	yu-’nakwa̲la	*yu-ṅakʷəla*	‘dance along’

Southern mutations are more varied, and more often realized as /*ʔ*/, especially after vowels, which cannot glottalize as glides as in the north. The southern languages also have several hardening clitics (53), but only Makah has developed softening clitics (54):

(53)	N	/*haɬiˑɬ=!aƛ̓*/	haɬiiɬ=ʔaƛ̓	‘invite to participate now’
	D	/*ƛ̓aʔuu=!aq*/	ƛ̓aʔoo=ʔaq	‘the other’
(54)	M	/*q̇idiˑƛ̓=˚iq*/	q̇idiˑl=iq	‘the dog’
	M	/*tiɬuˑp=˚iq*/	tiɬuˑb=iq	‘the octopus’

Recapitulating diachrony, mutations that yield glottalized resonants in other languages induce pre-resonant lengthening in Makah (55). Similarly, hardening of /*q qʷ*/ in Nuu-chah-nulth and Ditidaht yields /ʕ/, or, in Ditidaht, /*q̓ q̓ʷ*/ after consonants (56) (see 2.2).

(55)	N	/*c̓axʷ-!aqƛ̓*/	c̓aẇ-aqƛ̓	‘speared inside’
	M	/*ṗus-!atu*/	ṗuˑy-at	‘rest after work’

(56)	N	*/ʔaƛiːqʷ-ɬiːs/*	ʔaƛiiʕ-is	‘consuming forty’
	D	*/ʔayiiq = ɬa/*	ʔayeeʕ = a	‘it’s a lot’
	D	*/bucibuχʷq = ɬa/*	bucibuχ̣ʷq̇ = a	‘it’s a black bear’
	M	*/ṗuq̇ʷ-ɬaqƛ/*	ṗuq̇ʷ-aqƛ	‘feather mattress’

Following already voiced or glottalized consonants, mutations may induce no change, or be realized as glottal stop, sometimes with preceding schwa.

4 Prosodic phonology

4.1 Syllables

I now turn to phenomena that provide evidence for prosodic constituents like syllables, feet, and prosodic words. Little work has been done on intonation and other aspects of higher prosodic structure, but see Hofmann (1984), Stonham (to appear).

Wakashan syllable structure is both simple and typologically unusual. The facts that hiatus is unattested, and that in most languages every word begins with exactly one consonant, indicate that onsets are simple and obligatory. Conversely, the attestation of medial and final clusters indicates that codas can be complex (Sapir and Swadesh 1939, P. Wilson 1978):

(57)	X	hìɬk̓utk̓ani	*hìɬk̓utk̓ani*	‘right hand’	glt	*gəlt*	‘long, tall’
	K	a̱mx̱stud	*ʔəmχstud*	‘close off’	bagwa̱ns	*bagʷəns*	‘visitor’
	N	c̓uh̓smapt		‘old spruce’	tukʷaqimɬ		‘seal skin float’
	D	hiic̓qƛsʔaa		‘headlamp’	hihitacqst		‘hip’

Medial and final clusters are in principle of any length, but are more restricted in Haisla and Kwak̓wala, which limit cluster-medial consonants to fricatives. Other languages allow cluster-medial aspirated plosives, and Oowekyala allows medial glottalized plosives.

Several facts indicate that large clusters are codas, rather than appended to words or other constituents. First, clusters frequently begin with a resonant, resembling the crosslinguistically typical sonority sequencing of syllable margins. Second, most languages forbid initial clusters, whereas appended consonants are commonly found both initially and finally.

Third, northern coda spirantization applies cluster-medially, pointing to a complex coda (58). Fourth, southern repetitive aspect reduplicates entire monosyllabic roots—including cluster-final CVCC roots—but only the first CV of polysyllables (59). See 3.4, 5.2.

(58)	O	*/ʔalkʷ-/*	’alkv-a	*ʔalkʷ-a*	‘blood, bleed’
	O	*/ʔalkʷ-/*	’alxv-ċwa	*ʔalxʷ-ċəwa*	‘bleed heavily’

(59)	M	*/sitk-/*	sitk-šiƛ	siːtk-siːtk	‘wag tail (PERF, REP)’
	M	*/wasaq-/*	wasaq-šƛ	waː-waːsaq	‘cough (PERF, REP)’

Whereas the southern languages allow only vocalic nuclei, Heiltsukvla and Oowekyala also parse the resonants */l m n/* as nuclei, when they are not vowel-adjacent (60). But in Haisla and Kwak̓wala, such resonants are reliably pronounced with preceding schwa:

(60)	X	cl̀x̄a	*càlχa*	sǹqa	*sànqa*	tm̀k°a	*tàmkʷa*
	H	cĺx̌a	*cĺχa*	sńqa	*sńqa*	tḿkva	*tḿkʷa*
	O	clx̌a	*clχa*	snqa	*snqa*	tmkva	*tmkʷa*
	K	tsa̲lx̲a	*cəlχa*	sa̲nqa	*sənqa*	ta̲mkwa	*təmkʷa*
		‘hail’		‘strip cedar bark’		X/H/O ‘cure salmon eggs’, K ‘bite, chop’	

Lincoln and Rath (1980, 1986) analyze non-prevocalic resonants as syllabic across Northern Wakashan, and any preceding schwas as phonetic. Indeed, such resonants are moraic, rarely follow full vowels, and are copied in CV reduplication (Zec 1988). Non-prevocalic nasals in Nuu-chah-nulth are similarly moraic, and follow only short vowels, but are not CV reduplicated, and are analyzed as codas (Stonham 1990, Shaw 1992). See 4.2, 5.2.

Heiltsukvla and Oowekyala are exceptional also in allowing initial clusters (61), as well as words without sonorants of any kind (62).

(61)	H	łx̌vłqvác̓uá	*łχʷłqʷác̓əwá*	‘brain’	sxsba’alá	*sxsbaʔalá*	‘sharpen point’
	O	tq̓bua	*tq̓bəwa*	‘chest’	txvsx̌ƛaqa	*txʷsχƛaqa*	‘jump beyond’

(62)	H	qqs	*qqs*	‘eye’	O	c̓łc̓kv	*c̓łc̓kʷ*	‘short (PL)’
	H	tpkv	*tpkʷ*	‘flashlight’	O	t̓xt̓k̓ʷs	*t̓xt̓k̓ʷs*	‘fish hawk’
	H	x̌vtkv	*χʷtkʷ*	‘cut with knife’	O	qvsqvs	*qʷsqʷs*	‘dwarf blueberry’

Such sequences are construed as parsed by nearly canonical syllables with onsets, but lacking nuclei, e.g. *c̓ł.c̓.kʷ*. Arguments are based on native speaker judgments, on parallels with schwa-ful syllables in Haisla and Kwak̓wala, and on the attestation in such sequences of spirantization and reduplication, which are thought to target codas and syllables, respectively (P. Wilson 1978, Howe 2000, cf. Hoard 1978, Bagemihl 1991, see 3.4, 5.2).

4.2 Word prominence

Patterns in word prominence provide further clues to prosodic structures, especially to feet, and to moras through their role in syllable weight. In most languages, word prominence is largely predictable, and tends toward the beginning of the word. Moraic segments—those that contribute to syllable weight and attract stress—are full vowels in the north, long vowels in the south, and plain coda resonants. Obstruents and glottalized resonants are never moraic.

Kwak̓wala stresses the first heavy syllable, or the last syllable if all are light (Bach 1975, Lincoln and Rath 1980, S. Wilson 1986, Zec 1988):

(63)	K	bábagwa̲m	*bábagʷəm*	‘boy’	ga̲dákw	*gədə́kʷ*	‘homemade’
	K	ba̲gwána̲m	*bəgʷánəm*	‘man’	ga̲ga̲lám	*gəgələ́m*	‘ermine’
	K	g̲wá̲lxsa̲m	*ɢʷə́lxsəm*	‘rain gear’	ha̲ba̲x̲tłásxe’	*həbəχƛásxeʔ*	‘beard’

(64)	K	gá̲l̓sud	*gəlc̓ud*	‘crawl into’	ga̲’l’nákwa̲la	*gəl̓nákʷəla*	‘crawl along’

In the analysis of Lincoln and Rath (1980) and Hilton et al. (1982), Oowekyala stresses the second plain syllabic sonorant (Ṿ, Ṛ) of the word if it immediately follows the first, and otherwise the first (65). Glottalized syllabic resonants are never stressed (66).

(65)	O	cị́ą́	*cəyá*	‘get water’	wą́tą́	*wáta*	‘pull’
	O	dn̥á	*dəná*	‘pull rope’	k̓ín̥axv	*k̓ínaxʷ*	‘crab’
	O	dn̥m̥	*dənə́m*	‘buoy line’	ƛ̓úy̓ą	*ƛ̓úy̓a*	‘decorate’
(66)	O	dm̥xs	*dm̓xs*	‘sea’	ɬ̓	*ɬ̓*	‘dead’

Prominence is contrastive only in Haisla and Heiltsukvla. Haisla stress is intensity or low tone (V̀) (Vink 1977, Lincoln and Rath 1980, Bach 1989), while Heiltsukvla words have zero to three high toned syllables (Kortlandt 1973, 1975, Rath 1981, S. Wilson 1987):

(67)	X	g̃°àlas	*gʷàlas*	‘lizard’	’ìx’ika	*ʔìxʔika*	‘swing hammer’
	X	g̃°alàs	*gʷalàs*	‘quitting time’	’ix’ikà	*ʔixʔikà*	‘eat balanced diet’
(68)	H	wátásu	*wátásu*	‘you pull’	ɬl	*ɬl*	‘dead’
	H	wátasú	*wátasú*	‘be pulled’	cqḿ	*cqḿ*	‘dirty face’
	H	hádání	*hádání*	‘black cod’	lágvustíwá	*lágʷustíwá*	‘go upward’

In the southern languages, primary stress is on the first or second syllable of the word. Long vowels contribute to syllable weight, but coda nasals in Nuu-chah-ulth are the only consonants that do so (Sapir 1924, Jacobsen 1979b, S. Wilson 1986, Stonham 1994a, 1999, Davidson 2002, Waldie 2003, Werle 2007).

All southern languages stress the first syllable if it is heavy (#ḾL, #ḾH), and the second if it is heavier than the first (#LḾ). But Nuu-chah-nulth gives two initial light syllables trochaic stress (#ĹL), while Ditidaht and Makah prefer iambic stress (#LĹ):

(69)	N	#ĹL	t̓út̓uḥcaqc̓u	‘Head-at-each-end’	#ḾL	čímsm̓iit	‘Son of Bear’
	N	#LḾ	ḥayúuy̓ipšiƛ̓	‘obtained ten’	#ḾH	ʔíiḥtuup	‘humpback whale’
	D	#LĹ	hawɬíy	‘ready’	#ḾL	dúusaq	‘sort of, so-so’
	M	#LḾ	ʔusé·ʔiɬ	‘Ozette’ (place)	#ḾH	yú·qʷa·	‘also, too’

A few other patterns are reported, including consistent peninitial stress for some Makah speakers (Jacobsen 1979b), variable stress in #LL and #HH words in Ahousaht Nuu-chah-nulth (Waldie 2003), and secondary stress (Stonham 1994a, Waldie 2003, Werle 2007).

4.3 Vowel presence, absence, and length

Across Wakashan, vowels alternate in length, with schwa, and with zero. While some alternations are morphologically conditioned (see 5.2), others are phonological, either improving prosodic structures, or licensing laryngeal features on adjacent consonants.

Northern vowel-zero alternations typically involve schwa, whose distribution is largely predictable, serving to break up unsyllabifiable clusters (Grubb 1974, Vink 1977, Lincoln and Rath 1980, 1986, Bach 1990, Howe 2000):

(70)	X	q˚pla	*qʷəpəlà*	dhxx̄s	*ƛəxəχs*	ṗła	*ṗəłà*	ẇac	*ẇaċ*
	H	qvplá	*qʷpəlá*	ƛ̓xx̌s	*ƛ̓xχs*	ṗłá	*ṗəłá*	ẇac	*ẇáċə*, *ẇáċa*
	O	qvpla	*qʷpəla*	ƛ̓xx̌s	*ƛ̓xχs*	ṗła	*ṗła*	ẇac	*ẇaċ*
	K	k̲wa̲pa̲la	*qʷəpəla*	dła̲xa̲x̲s	*ƛəxəχs*	ṗa̲ła̲la	*ṗəłəla*	ẇaṫs	*ẇaċ*
		‘powdery snow’		‘canoe thwart’		‘blink, blinking’		‘dog’	

All northern languages insert schwa between an obstruent and onset resonant, to improve syllable contact (*qʷəpəla*). But whereas schwa is the default nucleus in Haisla and Kwak̓wala, Heiltsukvla and Oowekyala tolerate anuclear syllables (see 4.1).

Vowel presence also serves to license voicing and glottalization. All northern languages require voiced sounds to be prevocalic, or to devoice (*ƛəxəχs*, *ƛ̓xχs*, see 3.4). Heiltsukvla also inserts schwa to make glottalized consonants prevocalic (*ṗəłá*, *ẇáċə*).

In Howe’s (2000) analysis, schwa serves as a default nucleus, to improve syllable contact, to make onsets less sonorous than nuclei, and to license glottalization, but is otherwise absent because its featurelessness is inherently marked. By contrast, southern vowels are featureful (see 2.3, 3.1), and are absent for other reasons.

Southern Wakashan short vowels alternate with zero across forms and languages. While Nuu-chah-nulth has the greatest incidence of short vowels, there is much medial and final absence in Makah (Jacobsen 1971), Ditidaht (Swadesh and Swadesh 1933, J. Thomas and Hess 1981, Werle 2007), and Kyuquot Nuu-chah-nulth (not shown, see Rose 1981):

(71)	N	ḥaʔukʷiƛ̓	ciyapuxsim	ʔamasḥuł	ṅuẇiiqsu	tupaati
	D	x̣uʔkʷiƛ̓	ciyaapxʷs	hidasx̣ʷɬ	duẇaqs	tupaat
	M	x̣uʔukʷiƛ̓	cikya·puxs	hidasx̣uł	du·wiqs	tupa·t
		‘do in turn’	‘hat’	‘chest’	‘father’	‘privilege’

Conversely, Ditidaht and Makah exhibit vowel presence where Nuu-chah-nulth does not. In Ditidaht *augmentative presence*, vowel presence in suffixes following monosyllabic stems makes words disyllabic (72). Similarly, previously monosyllabic roots have been augmented in Makah into LH disyllables by a copy vowel, by root vowel shortening, or both (73).

(72)	D	*/ba-(k)sac/*	baksac	‘pocket’	*/ʔu-i꞉ks/*	ʔuukʷis	‘take along’
	D	*/haṫaad-(k)sac/*	haṫaadaksc	‘bathtub’	*/hid-i꞉ks/*	hidiiks	‘take along’

(73)	N	ƛ̓uł	wik	k̓ʷiis	tiič	ʔuuc	*/ʔu-i꞉c/*
	D	ƛ̓uł	wik	k̓ʷiis	tiič	ʔuuc	*/ʔu-i꞉c/*
	M	ƛ̓ułu·	wiki·	k̓ʷisi·	tiči·	ʔucu·	*/ʔu-i꞉c/*
		‘good’	‘not’	‘snow’	‘alive’	‘own’	

In Werle’s (2002, 2007) analysis, southern final absence improves prosodic words by making them consonant-final, while medial absence avoids unfooted syllables. Augmentative

presence, on the other hand, targets the initial disyllable. While in Ditidaht this merely makes words minimally disyllabic, Makah augmentation creates a canonical LH iambic foot.

The initial disyllable is relevant also to southern *variable-length vowels* /V˙/. These are long if in a first or second syllable, but short in third or later syllables, and are attested both in roots (74) and in suffixes (75). By contrast, persistently long vowels /V**ː**/ are long in all positions (76) (Sapir and Swadesh 1939, Jacobsen 1979c, Klokeid 1996).

(74)	N	*/caqi˙c/*	caqiic	‘twenty’	*/caqi˙c*+R/	ca-caqic	‘twenty each’
(75)	M	*/ʔu-da˙k/*	ʔu-da˙k	‘have’	*/baʔas-da˙k/*	baʔas-dak	‘have house’
(76)	D	*/biibida:k/*	biibidaak	‘terrible’	*/qakaċ-či:ɬ/*	qakaċ-čiiɬ	‘three days’

Pre-adducted presence also interacts with the initial disyllable, and is unique in making marked consonants postvocalic, and in grouping resonants with voiced and glottalized obstruents as a class of adducted (or ‘glottalic’) consonants. It is observed only in Ditidaht and Makah, and serves to divide an adducted consonant from a preceding consonant.

But whereas in Ditidaht such vowels are short, and are found throughout the word, in Makah they are long, and appear only in second syllables, creating an initial iamb:

(77)	D	ċis-tuup	M	ċis-tu˙p	‘rope’
	D	his-i-ẏk	M	his-i˙-yak	‘axe’
	D	ƛ̓iχ-i-ċtaqk	M	ƛ̓iǐ̆-i˙-ċitqak	‘reddish’
(78)	D	cuuc-cuuc	M	cu˙c-cu˙c	‘scratching (REP)’
	D	čaaχ-a-čaaχ	M	ƛ̓ax-a˙-ƛ̓a˙x	‘adzing (REP)’ (sic)
	D	biis-i-biis	M	bis-i˙-bi˙s	‘sniffing (REP)’

Thus, those phenomena that point to a privileged, initial, disyllabic domain in Southern Wakashan include word stress (see 4.2), variable-length vowels, augmentative presence, and Makah pre-adducted presence. To these we will add stem modifications (see 5.2).

Some propose that the initial disyllable is a foot (S. Wilson 1986, Stonham 1990, Kim 2003b, Waldie 2003, Lee 2008). But Werle (2002, 2007) argues that it is another constituent, such as a prosodic word, because the foot-based analysis must suppose marked ĹL and ĹH trochees, and because this domain can be trisyllabic, as when variable-length vowels are long in a third syllable, if the second syllable results from pre-adducted presence:

(79)	D	*/łuč-da˙k/*	łuč-i-daak	‘married (male)’
	M	*/łuč-da˙k/*	łuč-u˙-da˙k	‘married (male)’

4.4 Prosodic clisis

Wakashan languages exhibit rich systems of prosodic clitics—that is, elements with phonological properties intermediate between those of affixes and independent words. While interesting in their own right, clitics also offer clues to the structure of prosodic words.

Clitics (‘word suffixes’, ‘incremental suffixes’) include clause-level inflection, and locative and determiner elements:

(80) K Hek̓alagada xa̲salaxdga’.
hek̓ala *=gada* *xəsalaxd* *=ga?*
make that noise =this disappeared =this (invisible)
They made that noise, these who had disappeared.

(81) D waabt̓eyik ʔiʔiiči̓baakt̓aqad…
waa *=(b)t* *=!a* *=yik* *ʔiʔiiči̓b* *=a:k* *=(b)t* *=!aqad*
say =PAST =MOOD =HABITUAL Elders =POSS =PAST =the (1PL)
Our late Elders used to say…

Kwak̓wala clitics have attracted attention for their simultaneous phonological dependence on preceding words, and syntactic connection to following words (Anderson 1984, 2005, Bach 2006, Chung 2007, Nicolson and Werle 2009). But there is as yet little discussion of the properties that distinguish clitics from suffixes (Davidson 2002:252).

Most clitics are dependent on preceding words, though a few are proclitic (Rath 1981, Lincoln and Rath 1986, Lincoln et al. 1990). Clitics resemble suffixes in supporting preceding voiced plosives, and by inclusion in the domain of word prominence. But they differ with respect to mutations and rounding neutralizations, and do not induce stem modifications (see 3.3, 3.5, 5.2). Further research on such differences may shed light on prosodic structures.

5. Prosodic morphology

5.1 Syllable-based morphology

Besides their role in rhythmic organization, prosodic structures provide a foundation for prosodic morphology. Across Wakashan, roots are word-initial, and affixes overwhelmingly suffixal, but non-suffixal morphology is prosodic, consisting in syllable-based reduplication and infixation, and vowel changes that target either the root, or the initial disyllable.

The few infixes target the coda of the first syllable—typically a CV reduplicant—and often cooccur with suffixal content:

(82)	X	*/buqʷ-/*	bù-s-bq̓˚-a	*bù-s-bəq̓ʷ-a*	‘sea anemone’
	N	*/ƛ̓iħ-/*	ƛ̓i-c-ƛ̓iiḥ-suł		‘red-eyed’
	D	*/quuʔas/*	quu-t-qooʔs		‘people’
	M	*/kʷi-/*	kʷiˑ-ƛ-kʷiˑ-y(a)		‘sharpening (REP)’

Common in Northern Wakashan are vowel changes that alter the nucleus of the root:

(83)	X	*/cs-/*	càas-ksala	*caas-əksala*	‘rush off in all directions’
	X	*/k̓iχʷ-/*	k̓èx̄˚-ksala	*k̓èχʷ-əksala*	‘run in all directions’
	X	*/ɢuχʷ-/*	ḡòx̄˚-ksala	*ɢòχʷ-əksala*	‘scatter berries’
	O	*/ts-/*	taas-axsala	*taas-axsala*	‘push here and there’

Another phenomenon related to syllable structure is that of disappearing (or 'ghost') consonants. These are suffix-initial consonants that appear after vowels, and sometimes after resonants, but not after obstruents:

(84)	K	*/ʔu-(g)it-°iʔ/*	u-gwid-i'	*ʔu-gʷid-iʔ*	'body of pole, tree'
	K	*/k̓lq-(g)it-a/*	k̓alk̲-it-a	*k̓əlq-it-a*	'lick body'
	N	*/č̓a-(č)it/*	č̓a-čit		'water on body'
	N	*/č̓aquc-(č)it/*	č̓aquc-it		'Bubbly-Body' (name)

5.2 Stem modification

Stem modification consists in various templatic changes to morphological stems that are meaningful in themselves, or are associated with simultaneous affixal content. Modifications include reduplication, changes to root or reduplicant nuclei, and quantitative changes in the initial disyllable.

Wakashan reduplication copies either the first CV, or the first syllable. In Heiltsukvla and Oowekyala, this may amount to simple C and CC copying (see 4.1):

(85)	X	*/ċn-/*	ċ-ċn̓	*ċə-ċən*	'rapids'
	X	*/bik-/*	bìx-bik-a	*bìx-bik-a*	'lightning'
	O	*/ƛχʷ-/*	ƛ-ƛx̌v-ma	*ƛ-ƛχ̓ʷ-ma*	'stroke face with flat of hand'
	O	*/k̓ʷq-/*	k̓vx̌-k̓vq̣-s	*k̓ʷχ-k̓ʷq̣-s*	'early dawn'

Reduplication often cooccurs with vowel changes or affixal content:

(86)	X	*/duqʷ-/*	dù-dq°-la	*dù-dəqʷ-əla*	'see (PL)'
	K	*/bkʷ-/*	bi-bagw-anam	*bi-bəgʷ-anəm*	'people'
	D	*/buwač-/*	bu-buwač-aatx̣		'hunt deer'
	M	*/pic-/*	pi-pic-k̓uk		'orange (color)'

Southern Wakashan templates are one of several phenomena that target the initial disyllable (see 4.3). Templates are associated with particular affixes, and may reduplicate the root (+R), as well as lengthen (+L) or shorten (+S) a first or second syllable:

(87)		stem	template	derived form	
	N	*/saya-/*	+RL+S	saa-say-aapi	'too far off'
	N	*/ʔaat̓aaṅuł/*	+S+S	ʔat̓aṅuł-aqaq	'very thick along length'
	D	*/t̓udax-/*	+R	t̓u-t̓udx-ak̓kʷ	'three-corner grass'
	D	*/ƛ̓up̓eeʔčaχšƛ/*	+L+S	ƛ̓uup̓eʔčaxšƛ	'becoming summer'
	M	*/ƛuł-/*	+L	ƛuˑł-sit	'still, good, clear water'
	M	*/ƛiχ-/*	+RL+L	ƛiˑ-ƛiˑx̌-sup̓ał	'canoe race'

6. Summary

In this article, I have offered an overview of the segmental and prosodic phonology of Wakashan languages, drawing attention to several topics of typological interest, such as all-obstruent words (see 4.1), consonant mutations (3.5), word-level tone (4.2), and unusual contrasts like glottalized vowels (2.3) and voiced glottalized plosives (2.2).

I also identified several topics that would benefit from, further investigation, in particular the nature of the initial disyllable in Southern Wakashan (4.3), the representation of prosodic clisis (4.4), and whether the northern languages lack purely vocalic phonemes (3.1).

Appendix A: Names for Wakashan people and languages

In this first appendix, I offer some background on the sources of English names for Wakashan languages, both because they are of linguistic interest, and to connect this work to other literature where they are called by different names. Where several names are in use, I have tried to use those preferred by the native communities.

When abbreviating language names, I abbreviate Haisla as *X*—after its native name, see below—and all others by the first letter of their English name. When listing languages, I usually give them in order from north to south.

One point of confusion is that the native names for Wakashan languages are distinct from the ethnonyms for the people that speak them. Another is that most modern Wakashan groups are amalgamations of several older villages, so that some unified names—which may be neologisms for entities that previously had no name—are dispreferred by some groups.

The English name *Haisla*—English pronunciation [ˈhɑɪslə]—comes from the name for the X̄a'isla people of Kitamaat village (not to be confused with the nearby town of Kitimat), who have amalgamated with the X̄enaksiala or Henaksiala people of Kitlope and Kemano. The language is either X̄a'islaḵala or X̄enaksialaḵala, depending on which group is meant.

The name *Heiltsukvla* [ˈheɪltsʊkwələ] (Windsor et al. 2007)—also Háiłzaqvḷa (Windsor Wákas 2007), Haílhzaqvla (Rath 1981, First Peoples' Language Map of BC), híłzaqʷḷa (Lincoln and Rath 1986)—is in general use in the community of Bella Bella (Susan Russell, p.c.). Other language names are *Bella Bella* after the village, or *Heiltsuk*, *Heiltsuq* (S. Wilson 1986), after the ethnonym Haílhzaqv (Rath 1981), *Heiltsuk*, *Heiltsukv*.

Oowekyala [uˈwikjələ], of Rivers Inlet village, is a rendering of native ẇuiḵala (Lincoln and Rath 1980), ʔəwiḵala (Howe 2000). The people of Rivers Inlet are *Wuikinuxv*, also *Oweekeno*, *Oowekeeno*, *Oweekino*, ʔəwiḵinuxʷ, ẇəwiḵinuxʷ (Howe 2000:1, 38).

The now standard Kwaḵwala [ˈkwɑkwələ], replacing older *Kwakiutl*, refers in a narrow sense to the dialect of the Kwagu'ł people of Fort Rupert, but is also used in a general sense for all varieties. The modern ethnonym Kwakwa̱ka̱'wakw 'Kwaḵwala-speaking people' is similarly used in a general sense, though it also derives from that particular ethnonym.

Further, since the Kwakwa̱ka̱'wakw and Nuu-chah-nulth groups are relatively large, comprising villages across Vancouver Island and the nearby mainland, particular communities may prefer more specific names. The dialect of the Liǧʷiłdaʔxʷ of Campbell River, Comox, and Cape Mudge, for example, is called Liq̇ʷala (Sewid-Smith 1988). Regarding Kwakwa̱ka̱'wakw subdivisions, see Boas (1966:37-41), Webster (1990), and www.umista.ca.

Similarly, English *Nuu-chah-nulth* [nuˈʧɑnʊlθ], replacing older *Nootka* or *Westcoast*, is a neologism encompassing numerous communities and dialects (see J. Thomas 1977, Arima and Dewhirst 1990, www.nuuchahnulth.org). It is adapted from the native nuučaaʕnuł 'mountain range', which also provides the unified ethnonym nuučaaʕnułʔatḥ. The language is also called Ṫaaṫaaqsapa (A. Thomas and Arima 1970, J. Powell 1991), and Quuquuʔaca.

The modern name *Ditidaht* [ˈditidɑt], formerly *Nitinaht* or *Nitinat*, is adapted from the ethnonym diitiidʔaaʔtx̣, referring to the people of Nitinaht Lake and the nearby Pacific Ocean coast. The native name for the language is diidiitidq. In its general sense, *Ditidaht* includes the dialect of the Pacheedaht (ṗaačiidʔaaʔtx̣) people of Port Renfrew.

The name *Makah* [məˈkɑ], rendered in the language as maq̓aˑ, derives from their Klallam neighbors' name for them (Davidson 2002), and bears no resemblance to the native names for the Makah people, qʷidiččaʔaˑtx̌, and their language, qʷiˑqʷiˑdiččaq.

Last, *Wakashan*, dating from the time of Captain Cook, is generally accepted as a neutral name for the entire language family (J.W. Powell 1891, Pillino 1894, Jacobsen 1979c, Howe 2000:7). I therefore favor the subordinate designations *Northern Wakashan* and *Southern Wakashan* over the now dispreferred *Kwakiutlan* and *Nootkan*.

Appendix B: Symbols, abbreviations, and transcription

This second appendix serves as a key to the symbols used in this article, and in particular to the various transcription systems for Wakashan languages. This is warranted, first, by the variety of systems, which presents difficulties to communities, language learners, and linguists alike. Second, in the last few decades most Wakashan groups have adopted one or another system as orthography, which must be balanced against the convenience of generalists.

With these needs in mind, I provide language-particular examples using their respective orthographies, but rely also on a fairly standard meta-alphabet both for general discussion and to clarify the data, especially from the northern languages. Meta-alphabetic transcriptions are distinguished throughout by italics. Where more detailed phonetic transcriptions are warranted, these are in the International Phonetic Alphabet (IPA), and in square brackets.

The orthographies adopted here are those of Haisla Community School (Kitamaat, BC) for Haisla, of Bella Bella Community School (Bella Bella, BC) and Windsor et al. (2007) for Heiltsukvla, of U'mista Cultural Society (Alert Bay, BC) for Kwak̓wala, and of the Makah Language Program (Neah Bay, WA) for Makah. For Nuu-chah-nulth and Ditidaht, I adopt the system used widely in BC School District 70, which includes several Nuu-chah-nulth schools, and Ditidaht Community School (Nitinaht Lake, BC).

Not knowing of any approved orthography for Oowekyala, I have transcribed it like Heiltsukvla. For comparison, I also give here Rath's system for Heiltsukvla and Oowekyala, which is used in Rath (1981), Hilton et al. (1982), Stevenson (1982), and various materials by Johnson, Smith, and Stevenson (see Howe 2000:9).

In the following charts, I compare these to the meta-alphabet used here, to the IPA, and to the transcriptions of other important sources. One is that favored for Liq̓ʷala, and standard in BC School District 72 (Sewid-Smith 1988). Another is Bach's Haisla transcription, which differs only in small ways from the orthography. These are set beside the earlier systems of Swadesh and Swadesh (1933), Sapir and Swadesh (1939), and work by Boas and Hunt, and beside the practical orthographies of Bouchard, Grubb (1977), and Arima et al. (2000).

These are some consonant symbols that differ significantly across transcriptions:

(88) Consonant symbols

meta-alphabet	*y*	*ɬ*	*x̌*	*ƛ*	*c*	*ʣ*	*š*	*č*	*q*	*ɢ*	*χ*	*ħ*	*ʕ*	*ʔ*
International Phonetic alphabet	j	ɬ	tɬ	dl	ts	dz	ʃ	tʃ	q	ɢ	χ	ħ	ʕ	ʔ
Haisla	y	lh	th	dh	c	z	—	—	q	ḡ	x̄	—	—	’
• Bach	y	lh	th	dh	c	z	—	—	q	ḡ	x̄	—	—	’

Heiltsukvla, Oowekyala	y	ł	ƛ̓	ƛ	c	z	—	—	q	ǧ	x̌	—	—	’, ḥ
• Rath (1981)	y	lh	th	dh	c	z	—	—	q	ǧ	x̌	—	—	’
Liq̇^{w}ala	y	ł	ƛ̓	ƛ	c	d^{z}	—	—	q	ǧ	x̌	—	—	ʔ
Kwak̓wala	y	ł	tł	dł	ts	dz	—	—	k̲	g	x̲	—	—	’
• Grubb (1977)	y	lh	tl	dl	ts	dz	—	—	k̲	g	x̲	—	—	7
• Boas and Hunt	y	ł	L	Ļ	ts	dz	—	—	q	g	x	—	—	ɛ
Nuu-chah-nulth, Ditidaht	y	ł	ƛ̓	—	c	—	š	č	q	—	x̣	ḥ	ʕ	ʔ
• Sapir and Swadesh (1939)	y	ł	ƛ̓	—	c	—	š	č	q	—	x̣	ḥ	’̣	ʔ
• Swadesh and Swadesh (1933)	y	ł	tł	—	ts	—	c	tc	q	—	x̣	—	ˀ̣	ˀ
• Bouchard	y	lh	tl	—	ts	—	sh	ch	k̲	—	x̲	h̲	7̲	7
• Arima et al. (2000)	y	l	tl	—	ts	—	sh	ch	q	—	x̲	h̲	ʔ̲	ʔ
Makah	y	ł	ƛ̓	—	c	—	š	č	q	—	x̌	—	—	ʔ

Another difference in consonant transcriptions is that some systems omit the predictable glottal stop that precedes vowels at the beginnings of words.

These are some of the various transcriptions of vowels, dorsal rounding, glottalization on plosives (P) and resonants (R), syllabic resonants, and long vowels:

(89) Vowel symbols and diacritics

meta-alphabet	*ə*	*e*	*o*	*u*	C^{w}	Ṗ	Ṙ	Ṛ	V*ː*
International Phonetic Alphabet	ə	ɛ, e	ɔ, o	u	C^{w}	P’	R’	Ṛ	Vː
Haisla	—	e	o	u	C°	Ṗ	Ṙ	R	VV
• Bach	e	ai	au	u	C°	Ṗ	Ṙ	R	VV
Heiltsukvla, Oowekyala	—	—	—	u	Cv	Ṗ	Ṙ	Ṛ	VV
• Rath (1981)	e, ă	—	—	u	Cv	Ṗ	Ṙ	eR	—
Liq̇^{w}ala	ə	e	o	u	C^{w}	Ṗ	Ṙ	əR	—
Kwak̓wala	a̲	e	o	u	Cw	Ṗ	’R, R’	a̲R	—
• Grubb (1977)	e	eh	o	u	Cw	P’	Ṙ	eR	—
• Boas and Hunt	E	ä, ê	â, ô	o, u	Cw, C^{u}	P!	ɛR	ER	—
Nuu-chah-nulth, Ditidaht	—	e	o	u	C^{w}	Ṗ	Ṙ	—	VV
• Sapir and Swadesh (1939)	—		ɔ	o	C^{w}	Ṗ	Ṙ		V·
• Swadesh and Swadesh (1933)	—	ä	ɔ	u	C^{w}	Ṗ	ˀR		V·
• Bouchard	—	e	o	u	Cw	P’	R’		VV
• Arima et al. (2000)	—	e	o̲	o	Cw	P’	R’		Vː
Makah	—	e	o	u	C^{w}	Ṗ	—	—	V·

The schwa column for the Haisla, Heitsukvla, and Oowekyala orthographies is blank because these opt not to write schwa (see 4.3).

As described in 2.3, the meta-alphabet uses the plain vowel symbols /*i e ə a o u*/ in phonemic transcription, though these correspond to a range of phonetic vowels. In phonetic transcription, I use IPA symbols.

It is also worthwhile to lay out the plethora of vowel symbols used in Boas and Hunt’s work. These are their correspondences to the symbols of other Kwak̓wala systems:

(90) Correspondents to Boas and Hunt's vowel symbols

meta-alphabet	*i*	*e*	*ə*	*a*	*o*	*u*
Liq̇ʷala	i	e	ə	a	o	u
Kwak̓wala	i	e	a	a	o	u
• Grubb (1977)	i	eh	e	a	o	u
• Boas and Hunt	e, ē, ë, i, ī	ä, ê	E, ă, î, ŭ	a, ā	â, ô	o, ō, u, ū

I have not tried to include every transcription system devised for Wakashan languages, but the foregoing charts represent most of those that one is likely to encounter in the literature. For example, Swadesh and Swadesh's (1933) transcription serves as a guide to more phonetic versions found in earlier work on Nuu-chah-nulth, such as Sapir (1924).

As for the work of Lincoln and Rath, which accounts for much of what is known about Haisla, Heiltsukvla, and Oowekyala, one finds there a variety of transcriptions, generally approximating one of the transcriptions given above for these languages.

A potentially confusing feature of the Boas and Hunt system is that, in a fashion nearly opposite to other systems, they write /*x xʷ χ χʷ*/ as *x· ẋw x xw*—that is, the rounded front dorsal fricative with an underdot, but the back dorsal fricatives with no diacritic. Back /*ɢ*/, by contrast, is marked diacritically in their system, as *g̣*. They indicate the regular palatalization of the unrounded front dorsals /*k g x*/ with a raised dot, as *k· g· x·*.

Despite the variety of transcription systems, only a few symbols are ambiguous, so that one rarely needs to know which system is being used in order to read correctly. Potentially ambiguous consonant graphemes are *c* for /c/ and /š/, *l* for /l/ and /ɬ/, *Cw* for /*Cw*/ and /*Cʷ*/, and digraphs like *tɬ*, *ts*, *tc*. Potentially confusing vowel symbols include *e*, *o* for the high vowels /i u/, the variety of representations for mid vowels, and transcriptions of schwa (see 4.3).

The following symbols and abbreviations are also used in this article:

(91) Other symbols and abbreviations

C	consonant
(C)	disappearing consonant
D	Ditidaht
H	Heiltsukvla
H	heavy syllable
K	Kwak̓wala
L	light syllable
+L	lengthen the first or second vowel
M	Makah
N	Nuu-chah-nulth
NW	Northern Wakashan
O	Oowekyala
PERF	perfective (momentaneous) aspect
PL	plural
POSS	possessive

R	resonant (consonant)
+R	reduplicate the first syllable
REP	repetitive aspect
SG	singular
SW	Southern Wakashan
V	vowel
V·	surface long vowel (Makah)
Vː	surface long vowel (meta-alphabet)
V·	underlying variable-length vowel
Vː	underlying persistently long vowel
X	Haisla
/ /	phonemic transcription
[ ]	phonetic transcription
#	word boundary
-	affix boundary
=	clitic boundary
!	hardening mutation
˚	softening mutation

Appendix C: Consonant mutations

The following charts summarize mutation patterns across Wakashan. For discussion, see 3.5. For details on particular languages, see Swadesh and Swadesh (1933:199-200), Sapir and Swadesh (1939:238), Boas (1947:212, 226-227), Rose (1976; 1981:18-19), Vink (1977:122-129), P. Wilson (1977), Jacobsen (1979b, 1996), Rath (1981:65-67), Bach (1989:59), Howe (1996, 2000:33-53), Stonham (1999:68-73), Nakayama (2001:12-15), Davidson (2002:54-59), Kim (2000, 2001, 2003d:22-95), Werle (2007:81-82), Kim and Pulleyblank (2009).

(92) Northern Wakashan hardening and softening

target segment	hardens to	softens to
p t ƛ c k kʷ q qʷ	*ṗ ṫ ƛ̓ ċ k̓ k̓ʷ q̇ q̇ʷ*	*b d λ ʒ g gʷ ɢ ɢʷ*
m n l y w	*ṁ ṅ l̓ ẏ ẇ*	*ṁ ṅ l̓ ẏ ẇ*
ɬ x xʷ χʷ	*l̓ ṅ ẇ ẇ*	*l n w w*
s	*ẏ ~ ċ*	*y ~ ʒ*
χ	*χʔ*	*χ*

(93) Southern Wakashan hardening

target segment	before suffixes	before clitics
p t ƛ c č k kʷ	*ṗ ṫ ƛ̓ ċ č̓ k̓ k̓ʷ*	*ṗ ṫ ƛ̓ ċ č̓ k̓ k̓ʷ*
q qʷ	N/D ʕ, M *q̇ q̇ʷ*	N ʕ, D ʕ ~ /*q̇ q̇ʷ*/, M *q̇ q̇ʷ*
m n b d l y w	N *ṁ ṅ ẏ ẇ* (D/M rare)	N/D *ṁ ṅ ḃ ḋ l̇ ẏ ẇ*, M *bʔ dʔ lʔ yʔ wʔ*
ł s š	N/D *ẏ*, *M ːy*	N *łʔ sʔ šʔ*, D/M *ł s š*
ł xʷ χʷ ħ	N/D *ẇ*, *M ːw*	N *łʔ xʷʔ ħʔ*, D/M *ł xʷ χʷ*
x χ ħ	*χʔ ħʔ* (*x* rare)	N *xʔ ħʔ*, D/M *x χ*
V	V*ʔ*	V*ʔ*

(94) Southern Wakashan softening

target segment	before suffixes	before clitics (Makah only)
p t ƛ k kʷ	no change	*b d l /w ~ k̓/ w*
c č q qʷ	no change	*ċ č̓ q̇ q̇*
b d l y w	no change	*bʔ dʔ lʔ yʔ wʔ*
ł s š	*y*	*ł s š*
x χ ħ	*χ ħ* (*x* rare)	*x χ*
ł xʷ χʷ ħ	*w*	*ł x χ*
V	V*ʔ*	V*ʔ*

To represent mutating properties of suffixes and clitics, I have adapted symbols from Boas, Jacobsen, and Davidson (see 3.5):

(95) Symbols for hardening and softening mutations

	hardening		softening	
	suffixes	clitics	suffixes	clitics
meta-alphabet	-*!*	=*!*	-˚	=˚
Boas (1947)	-!		=	
Howe (2000)	-$^{+cg}$		-$^{+voi}$	
Swadesh and Swadesh (1933)	′-	˃-	,-	
Sapir and Swadesh (1939)	’-	’—	‘-	
Rose (1976)	-ʔ	-ʔ	-ʔh	
Jacobsen (1996)	-’	-’	-‘	-˚
Davidson (2002)	-’	=’	-‘	=˚

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