

## The phonetic correlates of vowel length in Makah<sup>1</sup>

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### 1 Introduction

The goal of this study is to discover whether vowel length in Makah (qviiqviiidij jaq) is more reliably distinguished by *duration* or *tenseness*. The results reported here indicate that duration is the better cue.

This study is intended to inform the transcription of Makah vowels, to the benefit of both the teaching and the linguistic investigation of the language.

Section 2 of this handout describes the Makah vowel system, and the alternations that present a difficulty to the transcription of Makah vowels. Section 3 presents a phonetic experiment designed to discover how these alternations should be interpreted in transcription. Section 5 concludes.

### 2 The problem

#### 2.1 The Makah vowels

This table lists the Makah (monophthongal) vowels. Indicated for each vowel are its principal allophone transcribed in the International Phonetic Alphabet (IPA), an example word for that vowel, and how its pronunciation is generally taught in the Makah community (Neah Bay, Washington).<sup>2,3</sup>

<sup>1</sup> I would like to thank the following people who have provided invaluable help to me in this study: Angela Carpenter, Ruth Claplanhoo, Matthew Davidson, Sharon Hargus, John Kingston, John McCarthy, Setsuko Shirai, and Helma Swan.

<sup>2</sup> The phonetic alphabet used here is one version of the alphabet that is in general use among the communities where Southern Wakashan languages are spoken, and among linguists working on these languages. It differs somewhat from the version used in the Makah community. The phonetic values of the non-IPA symbols used here are as follows: *c* = [tʰs], *j* = [tʰ], *S* = [ʃ], *z* = [tʰʃ], *l* = [tʰ], *X* = [χ], *y* = [j].

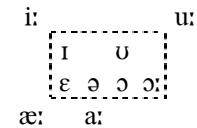
<sup>3</sup> All data used in this study were elicited in field work with my consultants Ruth Claplanhoo and Helma Swan, except where other references are cited.

#### (1) Makah vowels

Vowel	Example	How it is taught
<i>i</i>	[ɪ] bɪfɪs 'flat beach'	English <i>ih</i> , as in <i>b<u>i</u>t</i>
<i>e</i>	[ɛ] /ujj/ɛs 'together outside'	English <i>eh</i>
<i>a</i>	[ə] /aʒ 'two'	English <i>uh</i>
<i>o</i>	[ɔ] ho/ 'yes'	as in English <i>f<u>o</u>r</i>
<i>u</i>	[ʊ] Suʒ 'five'	as in English <i>l<u>oo</u>k</i>
<i>ii</i>	[i:] biɪt 'dime'	English <i>ee</i> , as in <i>be<u>e</u>t</i>
<i>ee</i>	[æ:] /eeb 'Mom!'	English <i>a</i> , as in <i>b<u>a</u>ck</i>
<i>aa</i>	[a:] /apaas 'nice'	English <i>ah</i>
<i>oo</i>	[ɔ:] ho <u>o</u> / 'yes'	English <i>oh</i>
<i>uu</i>	[u:] du <u>u</u> b 'all'	as in English <i>mo<u>o</u>n</i>

At least in terms of these vowels' principal allophones, vowel length roughly corresponds to *tenseness* — i.e. peripherality in the vowel space. Except for long *oo*, long vowels tend to sound tense (or peripheral), and short vowels tend to sound lax (or non-peripheral).

#### (2) The vowel space



Since English speakers can easily perceive the presence or absence of tenseness on vowels, it is tempting to identify the length of Makah vowels by their tenseness. However, tenseness may not be a reliable guide to the transcription of Makah vowels, because short vowels are sometimes tense.

#### 2.2 Short vowel tensing

Davidson 2002 observes that short *i*, *u*, and sometimes *a* are pronounced tense before sonorants (the only sonorant consonants in Makah are *f*, *y*, and *w*) and short *u* is pronounced tense before labial stops.

(3) *Short vowel tensing*

- a. [i]: hlyuu ‘stop, finish’  
 b. [a]: /ayisaquk ‘tricky, mischievous’  
 c. [u]: Tiquwil ‘sitting room’  
 d. [u]: tupksaap ‘blacken something’

(Davidson 2002:77)

I have observed that all short vowels are regularly pronounced tense before the glides *y* and *w*, and that short *i*, *a*, *u* are tensed before a *NV* sequence.<sup>4,5</sup>

(4) *Short vowel tensing environments*a. before glides

[i]	[u]
/iyaX ‘be at’	l aX/uy ‘today’
hacsee/ly ‘come’	/uy/oz ‘later’
hu/lyaj iz ‘go back’	kuwil ‘hole in floor’
te/idlw ‘sea cucumber’	
[a]	[e]
Xayaa ‘far’	duubey ‘always’
zawaa ‘near’	/aabey ‘yesterday, tomorrow’
qa/awic ‘burden basket’	hu/ey/oy ‘long ago’
Ja/awiq ‘the water’	Caweyuus ‘rainbow’
[o]	
/uy/oyksiicuXv daj/ol ‘I’ll see you later’	

<sup>4</sup> Short vowel tensing before *f* is not exceptionless, and it is not yet clear why this is so. One frequently encountered case of short *a* tensing before *f* occurs when the final *Z* of the clitic =’az ‘now’ is mutated to *f* by a softening clitic, e.g. *bizaa/af* ‘it’s raining now’, pronounced [bɪfʰa:ʔa].

<sup>5</sup> Short *e* is an exception to environment (b): it is *not* pronounced tense before a *NV* sequence, as in e.g. *Je/iiks* ‘drink water’, pronounced [tʰeʔi:ks]. Here, as elsewhere, examples are not always available for the mid vowels *e*, *ee*, *o*, and *oo*, because of their scarceness in the language.

b. before a /VV sequence

[i]	[a]	[u]
/l/iiXv ‘big’	da/aa ‘hear, listen’	/u/uutaX ‘hunt’
qafi/ii ‘eye’	/a/aat ‘ask’	/u/uuks ‘consume’
ji/ii ‘teeth’	za/uu ‘again’	KaaSJuu ‘hair seal’
	da/uuk ‘take along’	

In addition to the environments that Davidson observes for short *u* tensing, I have also observed short *u* tensing before *kV*. I do not yet have sufficient examples to say whether short *u* also tenses before the other rounded dorsal consonants — i.e. *qV*, *XV*, and *ʃV*.

(5) *Short u tensing*a. [u] before labial stops

KupSiZ ‘point!’	/atubidS ‘but we ...’
yuyub/iy ‘unusual’	ZuZubuQad ‘motorboat’

b. [u] before kV

sukviz ‘take’	yukviiqs ‘younger brother’
/ukviiduk ‘with’	daa/ukvaaj ix ‘help’

The tensing of short vowels in some environments indicates that tenseness is not a good indicator of vowel length. On the other hand, the process of final long vowel shortening, discussed in the next section, may indicate that duration is not a good indicator of vowel length either.

## 2.3 Final long vowel shortening

Jacobsen (Jacobsen 1971, 1973, 1979, 1995) claims that long vowels shorten when they are word-final (except in monosyllables), as part of a chain shift in which underlying word-final short vowels delete, while underlying word-final long vowels shorten.

However, if a suffix or clitic is added to the end of a vowel-final word, then there is no vowel deletion or shortening.

(6) *Final deletion and shortening*<sup>6</sup>

a. word-final short vowels delete

/kawad / → kawad ‘orca’	kawad qaa? ‘Is it an orca?’
/l akoow / → l akoow ‘poor’	l akoow pal ‘time of famine’
//aadiidaX / → /aadiidaX ‘just’	/aadiidaX s ‘I just ...’
//aza/ → /az ‘two’	/azacX ‘have two wives’
/duuba/ → duub ‘all’	duuba bitid ‘we all (PAST) ...’
/qvafafa/ → qvafaf ‘seagull’	qvafafa b/u ‘it was a seagull’
/yuuyu/ → yuuy ‘morning’	yuuyupadaj ‘walk at morning’
/duubeyu/ → duubey ‘always’	duubeyus ‘I always ...’
/duuwiqsu/ → duuwiqs ‘father’	duuwiqsu bitdis ‘our late father’

(some examples from Jacobsen 1971, Davidson 2002)

b. word-final long vowels shorten

/bizaa/ → biza ‘raining’	bizaa af ‘it’s raining’
/kviSuu/ → kviSu ‘pig’	kviSuu dis ‘our pig’
/fuufapli/ → fuufap  ‘hand’	fuufapli s ‘my hand’
/baadawli/ → baadaw  ‘smelt’	baadawli Pal ‘smell like smelt’

(Jacobsen 1971:14-17)

**2.4 Vowel length is contrastive word-finally**

The chain shift discussed in the last section implies that vowel length is neutralized word-finally. If final short vowels delete, and final long vowels shorten, then only one category of length is attested word-finally.

However, there is one environment in which final short vowels do not delete. This is when deleting a final short vowel would yield a word final consonant cluster ending in a glottal stop. In this case, final short vowels are preserved (Jacobsen 1971).

<sup>6</sup> Word-final deletion of short vowels and shortening of long vowels is also reported for Kyuquot (Rose 1981:25, 27), another Southern Wakashan dialect. However, no such deletion or shortening is found in the Tseshaht (Sapir & Swadesh 1939), Ahousaht (Eun-Sook Kim, Rachel Wojdak, Florence Woo, personal communication), or Ditidaht dialects, to my knowledge.

(7) *Preserved final short vowels*

Cuy / (man’s name)	faQ / (man’s name)
kawad / ‘it’s an orca’	/i/iiXvas / ‘is too big (3SG)’
/iSizXj / ‘Scram!’	bizaacKid / ‘it’s raining a little’
qaXSiz u ‘died (3SG)’	bi id a ‘Bahaada’ (place name)

Significantly, such preserved final short vowels contrast in tenseness with final long vowels (to my ear). While preserved final short vowels sound lax, final long vowels sound tense.

(8) *Final long vowels sound tense*<sup>7</sup>

tij  ‘tea’	waa ‘say’	buu ‘four’
tij l ‘alive, healthy’	bizaa ‘raining’	dukuu ‘song’
/ikil ‘son’	da aa ‘hear, listen’	za uu ‘again’
wikil ‘not’	dakaa ‘sun, moon’	qul uu ‘slave’
Kvisil ‘snow’	tiika aa ‘this’	zul uu ‘good, clean’
qafi il ‘eye’	qabqvaa ‘maybe’	/azpuu ‘seven’
fuufapil ‘hand’	/uXca aa ‘that’	yuuyuu ‘a while’
tuktukvadil ‘owl’	kvij iiyaa ‘world’	KaaSJuu ‘hair seal’
qadeede ‘whatchamacallit’		

If my impression of final tenseness is accurate, then vowel length is contrastive even word-finally. In other words, final long vowels remain phonemically long, and final short vowels remain short.

However, even if tenseness remains contrastive word-finally, it is possible that final shortening does happen, but at a phonetic level. That is, it may be the case that all word-final vowels are phonetically shortened.

In the next section, I report the results of a phonetic experiment designed to clarify this and other questions about vowel length.

<sup>7</sup> Davidson 2002 lists some words with final long oo, e.g. Kofoo ‘wild currant’, jaayboo ‘clam chowder’. However, I do not list them here because I have not heard these words pronounced, and because long oo has approximately the same quality as short o (to my ear).

### 3 A phonetic experiment

#### 3.1 Goals

I have conducted a small phonetic experiment as an empirical test of the observations reported in Section 2.

##### (9) Goals of the experiment

- Discover whether short vowels are tensed before glides.
- Discover whether final long vowels are phonetically shortened.
- Find the best phonetic correlate of vowel length.
- Yield a baseline of vowel durations and formant values for use in future work.

##### (10) Expected results

- Short vowels are tensed before glides.
- Final shortening is phonetic.
- The best phonetic correlate of vowel length is duration.

#### 3.2 Design

One native speaker was recorded pronouncing test words in a carrier phrase: *waa/aZ \_\_\_ za/uu* ‘say \_\_\_ again’. The test words were selected based on the following criteria, (which could not always be satisfied).

##### (11) Criteria for test words

- Two syllables long, with a short vowel in the first syllable and the target vowel in a stressed second syllable.
- To the left of the target vowel, a voiceless, unglottalized obstruent.
- To the right of the target vowel, one of the following: a voiceless obstruent coda (VC), the end of word (V#), the palatal glide (Vy), or the labiovelar glide (Vw), yielding four different environments.
- One to four test words for each combination of ten target vowels and four environments.

A search of an unpublished wordlist compiled by Matthew Davidson yielded about 80 words. Some of these words were excluded because the consultant did not know them. Others, the consultant pronounced with a

different vowel from the one in the wordlist — these were still used, but for the new vowel. This yielded 67 test words.

No test words were selected that had word-final short vowels. Also, few test words were found for the mid vowels, or for the Vy and Vw environments. See the appendix for a list of the test words used in the experiment.

##### (12) Example test words

###### VC

bazis ‘tied on beach’  
 bazils ‘towing’  
 huSeek ‘rascal!’  
 buquS ‘mute’

###### Vy

hacsee/ly ‘come’  
 hisliyyu ‘shredded cedar bark’  
 qakwey ‘salmonberry’  
 Quuy ‘medicine’

###### V#

Jitil ‘soft’  
 bisaa ‘sniffing’  
 Zekoo ‘thank you’  
 kviSuu ‘pig’

###### Vw

QaTaw ‘beaver’  
 I akvooow ‘poor’<sup>8</sup>  
 kukuwii ‘holes in floor’  
 kuXsuuwii ‘hole through’

The VC environment was intended to serve as a baseline environment for vowel behavior, since vowel length is relatively easy to perceive here, and it is not an environment for tensing or shortening.

Three trials were recorded, each trial consisting of the consultant pronouncing every word, embedded in the carrier phrase. The consultant read the test words from note cards that were shuffled into random order. Three trials of 67 test words each yielded 201 tokens.

The 201 tokens were digitized and labeled with *Praat* software.<sup>9</sup> The duration, first formant (F1), and second formant (F2) of each target vowel

<sup>8</sup> The wordlist in Davidson 2002 lists this word as *Iakoow*, but my consultant clearly pronounced it as *Iakvoow*, with a rounded *kv*.

<sup>9</sup> The following criteria were used to label the beginning and end of each target vowel. (i) Stop and affricate bursts were excluded from following vowels. (ii) Glottalization visible on the spectrogram was excluded from vowels following glottalized consonants. (iii) The labial transitions from rounded consonants were included in following vowels. (v) When vowels were found next to sonorants, the boundary between them was chosen at significant changes in frequency, or intensity if no significant change in frequency could be found. (vi) When vowels were word-

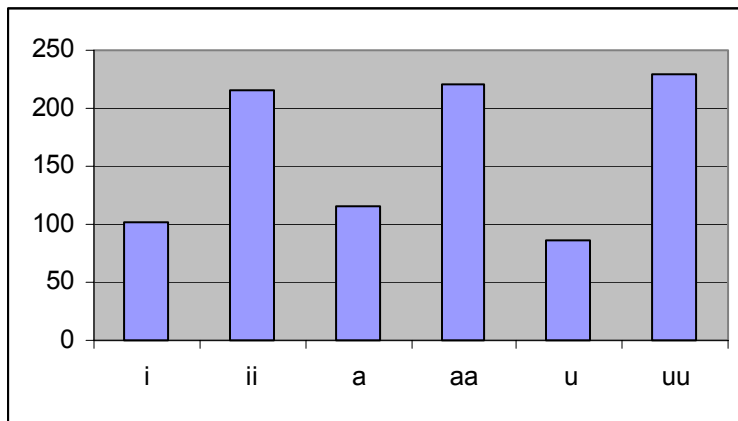
were then measured with a Praat script written by Setsuko Shirai. F1 and F2 were calculated by linear interpolation at the center of the labeled vowel.

### 3.3 Results

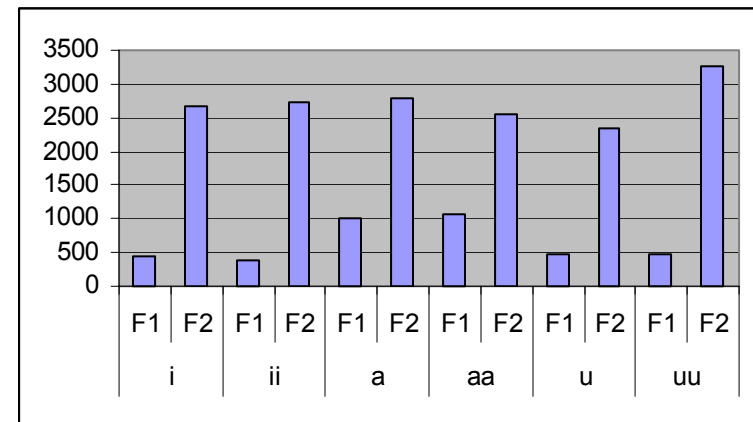
Three comparisons were conducted on the measurements obtained in the experiment. These comparisons focused on the non-mid vowels *i*, *ii*, *a*, *aa*, *u*, and *uu*, as these were the most robustly attested in the data

The first comparison compared the duration, F1, and F2 values of target vowels in the baseline VC test words (e.g. *buł łs* ‘half tide’, *hal łll* ‘invite’). A one-tailed t-Test found that the differences both in the duration and in the formants of short and long vowels were highly significant, with  $p < .001$ .

(13) Duration of vowels in VC words



(14) F1 and F2 of vowels in VC words



From this, I conclude that both duration and tenseness are effective phonetic cues to the length of vowels in the VC environment.

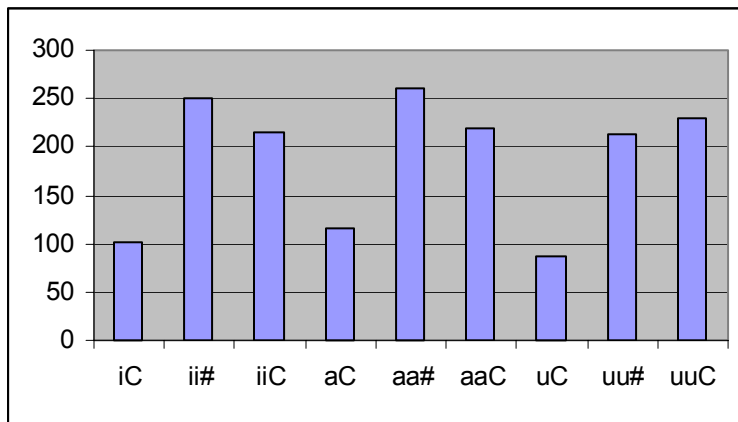
The second comparison compared the durations of short and long vowels in word-internal position with the durations of long vowels in word-final position (e.g. *hiłll* ‘remember’), to check for final shortening.

A one-tailed t-Test found the difference in the durations of medial short vowels and final long vowels to be highly significant, with  $p < .001$ .

However, no significant difference was found in the durations of medial long vowels and final long vowels, either with one-tailed or two-tailed t-Tests, where  $p$  was .139 and .278, respectively.

final, the end of the vowel was drawn at the most significant drop in intensity visible in the waveform graph.

(15) Durations of medial and final vowels

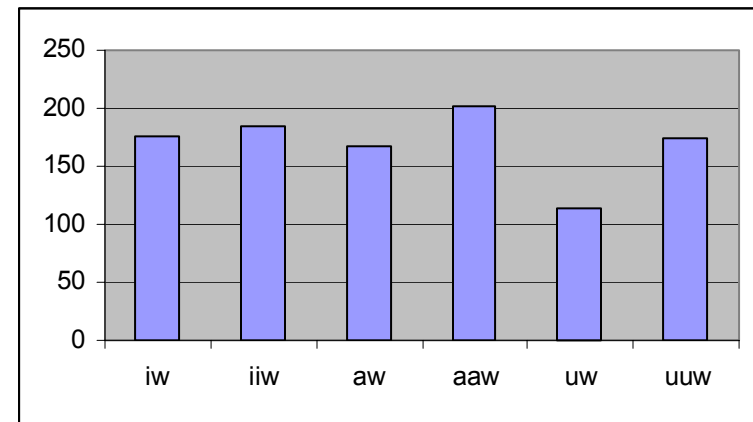


This result, together with the raw measurements shown above, was taken to indicate that word-final long vowels are neither phonologically shortened, nor phonetically shortened, at least in the pronunciation of this subject.

In the third comparison, the duration and formants of short and long vowels before the glide *w* were compared. (No comparison was made of vowels before *y*, because several vowels were poorly represented in these data.)

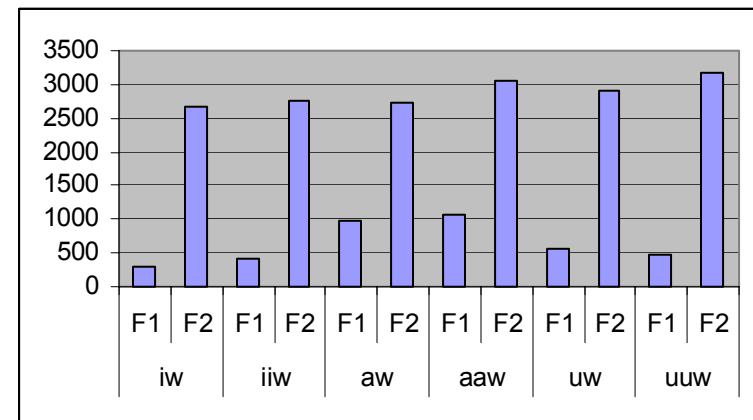
A one-tailed t-Test found that the difference in duration between short and long vowels before *w* was significant, with  $p = .012$ .

(16) Duration of vowels before w



However, a one-tailed t-Test found that the difference in F1 and F2 of short and long vowels in the same environment was *not* significant, with  $p = .418$ .

(17) F1 and F2 of vowels before w



The behavior of long and short vowels before *w* seems to show that in this environment at least, duration is a better cue to vowel length than tenseness.

#### 4 Conclusion

In this study, I looked at some alternations in vowel length and quality that have presented difficulty to the transcription of Makah vowels.

Drawing on evidence from a phonetic experiment, I offered empirical evidence against the existence of final long vowel shortening.

In addition, while both duration and tenseness were found to vary with vowel length in non-tensing environments, a comparison of vowel formants before *w* indicates that duration is a better guide to vowel length than tenseness.

#### References

- Davidson, Matthew. 2002. *Studies in Southern Wakashan (Nootkan) Grammar*. PhD dissertation: Linguistics, State University of New York, Buffalo.
- Jacobsen, William H., Jr. 1971. *Makah Vowel Insertion and Loss*. 6th International Conference on Salish Languages. Victoria, BC.
- Jacobsen, William H., Jr. 1973. *The Pattern of Makah Pronouns*. 8th International Conference on Salish Languages. University of Oregon.
- Jacobsen, William H., Jr. 1979. *First Lessons in Makah*. Neah Bay, WA: Makah Cultural & Research Center.
- Jacobsen, William H., Jr. 1995. *First Lessons in Makah, 2nd ed.* Neah Bay, WA: Makah Cultural & Research Center.
- Rose, Suzanne Maria. 1981. *Kyuquot Grammar*. PhD dissertation: Linguistics, University of Victoria.
- Sapir, Edward & Morris Swadesh. 1939. *Nootka Texts: Tales and Ethnological Narratives: With Grammatical Notes and Lexical Materials*. Philadelphia: Linguistic Society of America.

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## Appendix

These are the test words that were used in the experiment reported in Section 3. See Section 3.2 for an explanation of VC, V#, Vy, and Vw.

### VC test words

baz <u>is</u> ‘tied on beach’	Jap <u>a</u> c ‘canoe’
bul <u>is</u> ‘half tide’	bil <u>aa</u> l ‘cold’
buj <u>iz</u> ‘burn’	/ap <u>aa</u> s ‘nice’
hal <u>il</u> ‘invite’	but <u>aa</u> s ‘bobbed hair’
baz <u>is</u> ‘towing’	daj / <u>ol</u> ‘see’
hap <u>it</u> ‘have hair on body’	fi <u>so</u> of ‘shawl’
/ujj / <u>es</u> ‘together outside’	da <u>s</u> uk ‘strong’
hu <u>see</u> k ‘rascal!’	buqu <u>s</u> ‘mute’
tet/ <u>etq</u> Kuk ‘cucumber’	/as <u>u</u> k ‘ocean-feeding flock’
/e <u>ep</u> ifis ‘apples’	kvaa/ <u>u</u> uc ‘grandchild’
l <u>ee</u> /iSuk ‘red cedar’	hus <u>uu</u> l ‘wrinkled face’
/uS <u>see</u> /iy ‘borrow from neighbor’	kiz <u>uu</u> k ‘dishes’
ba/ <u>a</u> s ‘house’	hiku <u>uu</u> l ‘hair covering face’

### V# test words

hit <u>il</u> ‘remember’	biz <u>aa</u> ‘raining’
Jit <u>il</u> ‘soft’	bis <u>aa</u> ‘sniffing’
Kucq <u>il</u> ‘sperm whale’	Zap <u>aa</u> ‘two prongs clamped on’
buxv <u>il</u> ‘clam basket’	Zek <u>oo</u> ‘thank you’
/ee/ <u>ee</u> ‘Wow!’	kvi <u>suu</u> ‘pig’
pifeepif <u>ee</u> ‘fern game’	zul <u>uu</u> ‘good’

### Vy test words

yuyub/ <u>iy</u> ‘unusual’	Xv <u>aa</u> yXv <u>aa</u> y ‘Salish mask dance’ <sup>10</sup>
hacsee/ <u>iy</u> ‘come’	fapuuta <u>ay</u> ‘bottle’
his <u>iyuu</u> ‘shredded cedar bark’	/uy/ <u>oy</u> ksiicuXv daj / <u>ol</u> ‘see you later’
qakw <u>ey</u> ‘salmonberry’	hu <u>y</u> (shout at mask dance)
Z <u>ee</u> yuu ‘Let me see!’	Qu <u>y</u> ‘medicine’
j <u>aa</u> ydeetX ‘Chinese’	yu <u>y</u> ‘morning’

### Vw test words

te/id <u>iw</u> ‘sea cucumber’	do <u>ow</u> ‘Dad!’
qiiwaX ‘steelhead trout’	l akv <u>oo</u> w ‘poor’ <sup>11</sup>
Jit <u>iwiz</u> ‘soften’	Ziixv <u>oo</u> w ‘funny’
Ti <u>iwad</u> ‘ride alone in canoe’	bak <u>oo</u> was ‘store’
QaT <u>aw</u> ‘beaver’	kuku <u>wil</u> ‘holes in floor’
taj <u>aa</u> w ‘ghost’	ku <u>uwil</u> ‘steal’
ha <u>awaaq</u> ‘large group eating’	hu <u>u</u> was ‘fallen tree’
zata <u>awa</u> Jak ‘paddle’	kuXsu <u>uwii</u> ‘hole through’
kus <u>owit</u> ‘mussel shell blade’	

<sup>10</sup> Davidson 2002 has *XvayXvaay*.

<sup>11</sup> Davidson 2002 has *Iakoow*.