ONE CASE OF CONTRAST EVOLUTION IN THE YUROK VOWEL SYSTEM[1]

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This paper examines a case of contrast evolution in Yurok, an Algic language. Former **e* has split into two vowels, *e* and *a*, due to phonetically conditioned vowel lowering which was rendered opaque by conditioned loss of /h/. Analyzing all instances of Yurok *a* and *a:* as reflexes of **e* and **e:* provides new insights into verbal paradigms and morphologically related forms. This analysis also has potential implications for the reconstruction of Proto-Ritwan. The pre-Yurok basic four-vowel system may directly reflect an earlier four-vowel system in Proto-Ritwan.

[KEYWORDS: Yurok, Ritwan, vowel lowering, sound change]

1. Introduction. Yurok is a highly endangered language of northwest California, once spoken from the mouth of the Klamath River south to Trinidad, and inland along the Klamath to its confluence with the Trinity River. In this paper I make a suggestion regarding the history of the Yurok vowel system which complements the general proposals of Berman (1982*b*). I provide evidence that the Yurok vowels *a* and *a:* reflect short **e* and long **e:*, and that the split between *e* and *a* in Yurok is relatively recent. This finding informs our understanding of Yurok historical phonology and potentially alters our conceptions of the Proto-Ritwan vowel system.

While the primary implications of this research relate to the prehistory of Yurok vowels, and their potential consequences for comparative Algic, this study is also meant to highlight the importance of synthetic research in the context of language extinction. The Yurok data in this paper are drawn from a variety of sources, including my own fieldwork with the remaining speakers mentioned in n. 1, earlier published work (see below), and some of the unpublished fieldnotes and recordings of A. L. Kroeber, M. Haas, E. Sapir, and W. Bright. Insights gained from this study speak for the value of combining fieldwork on highly endangered languages with a comprehensive use

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of available sources, and a systematic re-evaluation of earlier hypotheses as new data are encountered.

The primary published data sources for this study are Kroeber (1911), Waterman (1920), Spott and Kroeber (1942), Robins (1958), Berman (1982*a*), Sapir (2001), and Exline (n.d.). The primary unpublished data for this work comes from my 2001–2002 fieldwork with the six speakers mentioned in n. 1, which consists primarily of elicitations but also includes spontaneous speech and short narratives. Unmarked data are from my own fieldwork; in many cases, the same forms were confirmed by two or three different speakers and also occur in published sources.

Four distinct dialects of Yurok are mentioned in Kroeber (1911): three coastal dialects and one river dialect. However, very little is known about coastal dialects, and all data discussed in this study are from speakers of "river" Yurok. In this study, where relevant cross-speaker differences are evident, they are noted in the text.

The Yurok segment inventory is shown in (1).

(1) Yurok segment inventory

(1*a*) Consonants and glides

p	*t*	*c* [tʃ]	*k*	*k*^{w}	*ʔ*
p'	*t'*	*c'* [tʃ']	*k'*	*k'*^{w}	
m	*n*				
'm	*'n*				
		s [ʂ], *ɬ*, *ʃ*	*x*, *g* [γ]		*h*
w	*l*, *r* [ɻ]	*y* [j]			
'w	*'l*, *'r*	*'y* ['j]			

(1*b*) Vowels

i, *i:*		*u*, *u:*
e	*r* [ɚ], *r:*	*o*, *o:*
	a, *a:*	

Symbols have their approximate IPA values, with the following exceptions: *c* = [tʃ], *c'* = [tʃ'], *g* = [γ], *y* = [j], and *r* = [ɻ] (nonsyllabic in the margin, syllabic in the nucleus).[2] The consonants are: voiceless stops /p, t, k, k^{w}/; glottalized or ejective stops /p', t', k', k'^{w}/; palato-alveolar affricates /c, c'/;

[2] Deviations from standard IPA symbols are made to facilitate comparison with the transcriptions of Robins (1958) and Berman (1982*a*). Symbols here are the same as Robins (1958), with the following exceptions: Robins's *i*˙, *u*˙, *o*˙, *a*˙, are written as *i:*, *u:*, *o:*, *a:*; Robins's *ɹ*, *ɹ*˙ are written as *r*, *r:*; and Robins's *š*, *ł* are written as *ʃ*, *ɬ*.

Phonetic values associated with vowels are highly variable, especially for short unstressed vowels. Where direct reference is made to stress, stress is marked by an acute accent over the stressed vowel. For a preliminary account of nominal stress, see Blevins (2003).

voiceless fricatives /s, ʃ, ɬ, x/; plain voiced sonorants /m, n, l, r, w, y/; preglottalized sonorants /'m, 'n, 'l, 'r, 'w, 'y/, laryngeals /ʔ, h/, and the voiced velar fricative /g/. The vowels are short /i, u, e, o, a, r/ and long /i:, u:, o:, a:, r:/. When Yurok words are cited in running text, they are written using the symbols in (1), representing surface phonological forms. Underlying forms are written in virgules, while phonetic transcriptions using IPA symbols are enclosed in brackets. When relevant, syllable boundaries are indicated with periods.

Section **2** describes the general distribution of Yurok *e*, *a*, *a:*. Section **3** presents data supporting a context-free sound change of **e: > a:*, **4** presents data supporting conditioned changes of **e > a*, and **5** illustrates how the *e/a* contrast appears to have evolved in Yurok verbs. Section **6** summarizes the main claims of the paper and their potential implications for comparative studies.

Before we turn to the distribution of /e/, /a/, and /a:/, a brief summary of the phonetic properties of these segments will serve to inform the phonological discussion which follows. Robins (1958:6–7) provides the following notes on pronunciation:

> *e* has considerable latitude in pronunciation, varying between rather close [e] and rather open [ɛ]; these qualities often occur interchangeably, but the more open quality is more frequent before pause. . . . *e* is often pronounced with a slight *y*-offglide giving the phonetic effect of a diphthong, but with the duration of a short vowel. . . . *a* and *a·* are generally pronounced as low front vowels; *a* is often a little lower than the British English *a* in "cat." After the bilabial consonants, *kw*, *k'w*, *m*, *p*, *p'*, *w*, a more retracted vowel is used. *a·* is always slightly more fronted than *a* in a similar environment.

To this, I add a few of my own observations.[3] The allophonic variation for /e/ is noticeable in long and short forms of the same word (Blevins 2003). Compare the first vowel of *pekcic* 'string, rope' [pe^{y}ktʃitʃ] with its realization in the short form *pek* [pɛ·k]. In addition to the backing effect of bilabials on /a/, I have also noticed a fronting effect of following coronals, and backing effects of both *h* and *ʔ*. Compare *paʔah* 'water' [paʔah] with *taʔanoy'ɬ* 'it's hot (of weather)' [tæ̲ʔænoj'ɬ] (IPA underline indicates a backed vowel). Long *a:* has a more stable central quality than short *a* but is slightly fronted before [ɬ]. Compare the initial vowel of *ca:nu:ks* 'newborn baby' [tʃa:nu:ks] with the final vowel of *paʔa:ɬ* 'water-LOCATIVE' [paʔæ̲æɬ]. Unstressed short

The rhotic vowels *r*, *r:* are variants of /a, e, o/, /a:, o:/ under rhotic harmony, and are clearly of recent origin. High vowels /i, i:, u, u:/ do not undergo rhotic harmony but are transparent to it.

Extra-long vowels /o::/ and /u::/ are also attested but are not relevant to the discussion. These appear to be sequences of long plus short identical vowels and may be disyllabic.

[3] Acoustic studies of vowel quality are in progress.

vowels are heavily reduced, and allophonic variation for *e* in reduced syllables is extreme, with optional assimilation to neighboring vowels and consonants. Compare the optional realization of unstressed *e* in *nikwec* 'grizzly bear' [nikwɪtʃ] with that in *ci:sep* 'flower' [tʃi:ʃʊp]. In slow or careful speech, both of these words are pronounced with [ɛ] in the final syllable. Vowel qualities before tautosyllabic coda-*r* involve a continuum of front nonhigh allophones, discussed further in **3** below.

2. The distribution of *e, a,* and *a:*. The occurrence of *a:*, *aʔa* and absence of *e:*, *eʔe* combined with near-complementary distribution of short *e* and *a* suggest context-free sound changes **e: > a:* and **eʔe > aʔa*, and conditioned changes of **e > a* before certain consonants. This general complementary distribution is illustrated in (2) (where a period marks a syllable boundary).[4]

(2) Complementary distribution of *e* and *a* vowel quality

	Attested	Unattested/rare
Long	*i:*, *u:*, *o:*, *r:*, *a:*	*e:*
	iʔi, *uʔu*, *oʔo*, *rʔr*, *aʔa*	*eʔe*
Short	*ih.*, *uh.*, *oh.*, *rh.*, *ah.*	*eh.*
	iʔ., *uʔ.*, *oʔ.*, *rʔ.*, *aʔ.*	*eʔ.*[5]
	ir., *ur.*, *or.*, *ar.*	*er.*[6]
	i'r., *u'r.*, *o'r.*, *a'r.*	*er.*
Short	elsewhere:	
	i, *u*, *o*, *r*, *e*	*a*

The few exceptions to this complementary distribution are discussed in subsequent sections.

As mentioned earlier, short vowel sequences across glottal stop are identical in Yurok and attract stress in the same way long vowels do (Blevins

[4] Berman (1982*b*:413) makes a similar observation: "The factors which condition the appearance of *a* are the same as the ones which determine when a vowel is lengthened or when a laryngeal increment is inserted, since *a* is almost always long or followed by a laryngeal increment whereas *e* is always short and is never followed by a laryngeal increment." However, the contrast between *Vʔ* and *Vh* word-finally means that at least one of the two increments is underlying and not inserted. Compare, for example, *'wr-nrh* 'her berries', *'wr-nrʔ* 'her web' or *skewip'a:h* 'we put in order', *skewip'a:ʔ* 'he/she puts in order'. See Berman (1981:257–59) on the predictable distribution of laryngeal increments in stem-initial syllables.

[5] Syllable-final glottal stop must be distinguished from the preglottalization of sonorants. Lowering of *e* occurs before syllable-final glottal stop, and before coda *r* and *'r*, but not before other preglottalized sonorants. See Blevins (2002*b*) on the phonology of Yurok preglottalized sonorants.

[6] There appears to be a general ban on syllables with rhotic vowels in the nucleus and /r/ in the coda or onset.

2003). While this might suggest treating [VʔV] as the surface realization of a long glottalized vowel /V:ʔ/, there are near-minimal pairs: *paʔah* 'water', *paːʔ* 'no'; *toʔonoh* 'four (round things)', *toːʔ* 'to be enough', *toːʔmar* 'friend'.

Forms illustrating the long and short vowel contrasts in (2) are given in (3) and (4), respectively. For general syllabification algorithms in Yurok, see Blevins (2003).

(3) Vowel length contrasts

	Short	Long	VʔV
i	***pi****.nos* 'elder sister'	*ci**ː**.ʃep* 'flower'	*pi.ʔ**ih*** 'mussel'
u	*h**u**.ne'm* 'boil.3sg'	*h**uː**k.soh* 'child'	*h**u**.ʔ**uh*** 'nut'
o	*k**o**.lin* 'one (of many)'	*n**oː**.rew* 'pretty'	*n**o**.ʔoh* 'two (round things)'
r	*n**r**.yrt* 'duck'	*n**rː**.mry* 'sing songs'	*p**r**.ʔ**r**k* 'dried mussel'
a	—	*n**aː**.mul* 'carry'	*p**a**.ʔ**a**h* 'water'
e	*l**e**wet* 'net'	—	—

(4) Short vowel contrasts

	/__h.	***/__ʔ.***	***/__r.***
i	*pi.ʔ**ih*** 'mussel'	*ʔo'.ro.w**iʔ*** 'dove'	*mo.ʔoh.p**ir*** 'fog'
u	*nu.ʔ**uh*** 'pair'	*k^{w}e.ge.r**uʔ*** 'hog'	*hi.p**ur*** 'northward'
o	*moh.k**oh*** 'louse'	*ʔek.s**oʔ*** 'door'	*he.g**or*** 'month'
r	*pr.k^{w}**rh*** 'beak'	*kr.t**rʔ*** 'lid'	—
a	*kah.k**ah*** 'sturgeon'	*hek^{W}.s**aʔ*** 'whale'	*ci.k'w**ar*** 'chair'

	Elsewhere	
i	***ki****.pun* 'Winter'	*ke'.w**in*** 'eel'
u	***ku****.cos* 'grandma'	*ki.p**un*** 'winter
o	***ko****.wiʃ* 'stick'	*lu.m**on*** 'eel trap'
r	***kr****.trʔ* 'lid'	*pr.g**rn*** 'small willow'
e	***ke****.coyn* 'day'	*ki.ʃ**en*** 'Summer'

3. A context-free sound change. The presence of *aː* and absence of *eː* in Yurok, combined with the wider distribution of *e*, suggest an earlier sound system in which each of the basic vowels *i u o e* occurred long and short.[7] At some point, the context-free sound change shown in (5) lowered all **eː* to *aː*. The sound change in (5) expresses the not uncommon phenomenon of long vowel lowering.

[7] A referee notes the absence of a "low" vowel in this system. However, /e/ is a cover symbol for a phoneme that may have ranged phonetically from mid to low and from front to central within the acoustic–perceptual vowel space. The central point is that there was only a single category of nonround, nonhigh vowels in pre-Yurok.

(5) Long vowel lowering
**e: > a:*

Context-free sound changes are typically difficult to motivate on the basis of internal evidence alone. In this case, however, two domains of Yurok grammar provide evidence for the sound change in (5). Though there are no regular phonological or morphological alternations between long and short vowels of the same quality in Yurok, the derivationally related forms in (6) provide some support for the sound change in (5), where vowels being compared are in boldface.

(6) Derivationally related long and short vowels

(6*a*) From Robins (1958)

Short *e*	Long *a:*
*kohc**e**w* 'six'	*kohc**a:**wec* 'six month of Yurok calendar'
*m**e**ruh* 'five'	*m**a:**ro* 'fifth month of Yurok calendar'
*se'r**e**c-* 'to whittle'	*se'r**a:**t-* 'to shave (wood)'[8]
*tl**e**woluł* 'to fall (of water)'	*tl**a:**moks-* 'to leak'
*t'l**a**ʔt'l**a**ʔ* 'to drip'	*tl**a:**moks-* 'to leak'[9]

(6*b*) From Proulx (1985)
***-e**łk* 'foot/body motion' ***-a:**łk* 'foot'

Within vowel sequences, V2 assimilates to V1, as shown by the regular locative *paʔa:ł* 'water-LOC', from /paʔa-oł/. Given this, the long vowels in (6) are either from long **e:*, with shortening to *e*, or from **e-e* or **e-V* sequences, where *V* is not *e*. In all cases, the expected outcome is *e:*, but we find *a:*, consistent with (5).[10] The last example involves the medial biforms *-ełk/-a:łk* (Proulx 1985:113) which take part in stem formation. Compare *mya:łkepek'* 'I jump' and *łʔełkepek'* 'I stub my toe'.

A second argument for the sound change in (5) comes from verbal inflectional morphology. Verbs in Yurok occur in one of four major inflectional classes: *e*-class, *a:*-class, *o*-class, and *o:*-class. As shown in (7), where *C* stands for the stem-final consonant, a primary distinguishing factor in these conjugation classes is the quality and length of the vowel in the inflectional suffix, e.g., in first- and second-person singular suffixes.

[8] In diminutives, *c* is sometimes found in place of *t* (Berman 1986).

[9] The presence vs. absence of glottalization in the stem may be associated with diminutive morphology (Blevins 2002*a*).

[10] For other historical sources of Yurok long vowels, see Berman (1982*b*:416–17) and Garrett (2001).

(7) Inflectional endings for indicative unipersonal verbs[11]

	e-class	*a:*-class (< **e:*-)	*o*-class	**o:*-class	*o:*-class
1sg	*C-ek'*	*C-a:k'*, *C-ak'*	*C-ok'*	*C-o:k'*	*C-ok'*
2sg	*C-e'm*	*C-a:'m*	*C-o'm*	*C-o:'m*	*C-o'm*
3sg	*C'*, *'C*	*C-aʔ*	*C'*, *'C*	{*C-o'm*, *C-ok'*^{w}, *C-o'l*, *C-oʔ*}	
1pl	*C-oh*	*C-a:*, *C-ah*	*C-oh*	*C-o:*	*C-oh*
2pl	*C-uʔ*	*C-a:'w*, *C-a'w*	*C-o'w*	*C-o:'w*	*C-o'w*
3pl	*C-eɬ*	*C-a:ɬ*	*C-oɬ*	*C-o:ɬ*	*C-oɬ*

Two aspects of (7) must be noted. First, in this chart, what I designate as the **o:*-class is the historical predecessor of the modern *o:*-class, based, again, on internal reconstruction. In all but one verb, the verb *new-* 'to see' (Robins 1958:34), *o:*-class verbs have undergone leveling, via shortening of the inflectional vowel. For *new-*, both long- and short-vowel variants are found for non-third-person singular inflected forms. Presumably, the maintenance of archaic vowel length in *new-* inflections is due to its high frequency. A second important point is that the long-vowel inflections for *a*-class verbs in the first singular and first and second plural are found (for four speakers) in my fieldwork but are not reported in Robins (1958). Robins did record length for the second singular and third plural forms, however. This discrepancy may reflect the beginning of leveling, similar to that for *o:*-class verbs, for the speakers Robins worked with.[12] The general point here, however, is that, if we assume the sound change in (5), the relationship between the two sets of verb classes (in all but third singular forms) was once identical: *e*-class was to **e:*-class as *o*-class was to **o:*-class. Subsequent developments include the lowering of **e:* to *a:* and vowel shortening associated with cross-paradigmatic analogy.

4. Conditioned changes of *e > a. The complementary distribution of short *e* and *a* in Yurok is attributed to the sound changes in (8) and (9).

[11] The third singular inflectional suffixes in curly brackets for **o:*- and *o:*-class verbs define subclasses of this verb class. One subclass takes only *-o'm*, another only *-oʔ*, and a third (as described by Robins 1958:32–35) takes either *-ok'*^{w} or *-o'l* in third singular forms. In my fieldwork, I have only recorded the *-ok'*^{w} variant for this subclass of *o:*-stem verbs.

[12] If Robins's recorded forms reflect shortening, one must ask why shortening did not take place in the third plural *a*-class ending, since all *e*- and *o*-class verbs have short vowels in this paradigm slot. In contrast to singular forms, where shortening of the first singular creates matching first, second, and third singular forms across verb classes, no single plural form can be changed with the same effect.

Pre-laryngeal lowering in (8) is a completed sound change, while evidence, presented below, suggests that the changes in (9) are still in progress.[13]

(8) Pre-laryngeal lowering *e > a/ __{h, ʔ}.[14]

(9) Conditioned vowel lowering of *e > a (gradient, variable)
(9a) Pre-rhotic lowering *e > a/ __{r, 'r}.[15]
(9b) Pre-w lowering *e > a/ __{w, 'w}.
(9c) Pre-fricative lowering *e > a/ __{s, c, ɬ}.

4.1. Pre-laryngeal lowering: a completed sound change. Evidence for Pre-laryngeal Lowering is found in the inflectional endings presented in (7), where a hyphen marks a derivational morpheme boundary. In third-person singular indicative forms, short-vowel verb classes have lost an earlier final short vowel, while long vowel verb classes show a short vowel. However, the third singular suffix is *-aʔ* for the historical **e:*-class verbs, not the expected ***-eʔ*.

The same sound change is evident in the bipersonal verb paradigm. Within the singular bipersonal indicative paradigm, all final suffixes appear to be from the *e*-class, with the exception of the 2-on-1 forms.[16] Compare *-ek'*, *-e'm*, and *-e'n* in (10), where *V* marks a thematic vowel, with *-aʔ* in the 2-on-1 forms. If we postulate the sound change in (8), then the 2-on-1 singular ending is *-aʔ* < **-eʔ* and the singular subparadigm is regular in its vocalism.

[13] Lowering of vowels before "gutteral" segments, including laryngeals as in (8), is attested cross-linguistically (see, e.g., Hayward and Hayward 1989). Lowering before rhotics and /w/ can also be understood in phonetically natural terms. Lindau (1978) demonstrates that pharyngeal constriction in rhoticized vowels results in auditory lowering and backing of vowels due to slight raising of F_1, while Ladefoged and Maddieson (1996:27–28) note that retroflexion generally brings F_2, F_3, and F_4 closer together. Lowering before /w/ is likely due to the lowering of the third and second formants (Ohala 1985).

[14] Rule (8), Pre-Laryngeal Lowering, might be collapsed with rule (5), Long Vowel Lowering. It is possible that **e:*, **eʔe*, **eh*, and **eʔ* are the natural class of bimoraic *e* sequences which contain no other supralaryngeal features. Evidence for the bimoraic status of *V'*, *Vh*, *VʔV* in modern Yurok can be found in Blevins (2003). If we assume that the vowel features of **e* define the supralaryngeal features for both moras, the lowering of long vowels and pre-laryngeal vowels can be collapsed as shown below:

Bimoraic **e* lowering **e > a*
/ \
μ μ

Sapir (2001) writes *oh* and *ah* consistently as long *o·h* and *a·h*.

[15] Berman (1982*b*:413) proposes a similar sound change to pre-rhotic lowering, but he does not recognize the role of syllable structure in his rule and he limits it only to final *-er* and *-e'r*.

[16] The 1-on-1 and 2-on-2 forms in (10) are not part of the bipersonal paradigm and show the reflexive suffix *-ep-* followed by a unipersonal indicative suffix. 2-on-1 and 3-on-1 are inverse forms.

(10) Singular on singular endings (Robins 1958:70, 78)

1-on-1	1-on-2	1-on-3	2-on-1	2-on-2	2-on-3	3-on-1
(refl)	*-Vc-**e**k'*	*-Vs-**e**k'*	*-**a**ʔ*	(refl)	*-Vs-**e**'m*	*-**e**'n*
			*-Vp-**a**ʔ*			*-Vp-**e**'n*

Finally, there is limited evidence for Pre-laryngeal Lowering (8) in the morphologically related forms shown in (11).

(11) Derivationally related *e* and *ah*

(11*a*)	*k**e**seł-* 'to feel lonely'	*k**ah**selop-* 'to feel strange'
(11*b*)	*srek'^{w}**e**p:t* 'diaper'	*srek'^{w}**ah**pi:t* 'breechcloth'
(11*c*)	*-**e**tew* 'finger/hand'	*-**ah**tew* 'hand'
(11*d*)	*-**e**p* 'REFLEXIVE'	*-**a**hp* 'REFLEXIVE'
(11*e*)	*sl**e**k^{w}-oh* 'shirt'	*sr**ah**k^{w}-oh* 'loincloth'
	*sr**e**k'^{w}-epi:t* 'diaper'	*c**ah**k^{w}-oh* 'trousers'
	*sr**e**k'^{w}-ahpi:t* 'breechcloth'	*sr**ah**k^{w}-oh* 'loincloth'

Berman (1982*b*:413) notes the existence of doublets (11*a*) and (11*b*), where *e* in one form corresponds with *ah* in another. To these, we can add the doublets in (11*c*) and (11*d*) from Proulx (1985:113, 128) and the related stems in (11*e*) from Robins (1958). Berman's (1982*b*:413) suggestion is that Yurok once had distinctive stress (as in Wiyot), and that *e/a* alternations like those in (11) were conditioned by alternations in stress. Note that in (11*e*), the *l/r* alternation is a regular morphological one associated with distinct grades (Berman 1986). An *l* in grade 1 is mapped to *r* in grade 2 (the diminutive). It is possible that *srahkwoh* and *cahkwoh* themselves are doublets; [sr] is often realized with initial affrication, and /cr/ is unattested in Yurok. Also, since /h/ is regularly lost before glottalized/ejective consonants (Robins 1958:37), the *ek'w/ahkw* alternation is also regular, and consistent with rule (7). Another word pair with corresponding *e/ah* vowels is *s**e**ksah* 'small shell used on dresses' and *s**ah**ksah* 'hail, hailstones'. A plausible semantic relationship between these two words could stem both from the comparable size of the shell and hailstones, and from the noise made by each. If, as suggested by Berman (1981), the /h/ in the stem-initial syllable of forms like those in (11) is a predictable laryngeal increment occurring in stressed syllables, we can understand vowel alternations between these pairs as follows: under stress, a laryngeal increment *h* is inserted, conditioning Pre-Laryngeal Lowering of **e* to *a*.[17]

4.2. Lowering in progress. The sound changes in (9) are of a different status from those in (8) and (5). Vowel quality in pre-rhotic, pre-*w*, and

[17] See Berman (1981:257–59) for a detailed treatment of predictable laryngeal increments after nonhigh vowels in Yurok.

pre-(coronal)-fricative/affricate contexts is variable both within the speech of single individuals and across speakers. In general, the phonologization of a short /e/ vs. /a/ contrast, described in **5** below, appears to have set in motion all of these changes. Purely allophonic variation is now subject to categorical classification by Yurok speakers, and this is the source of what appears to be the gradual stabilization of former variation in the direction of /a/.

Consider, for example, data supporting the rule of Pre-rhotic Lowering in (9*a*). Pronominal prefixes in Yurok are /'ne-/ 'first person', /k'e-/ 'second person', and /'we-/ 'third person'. In (12), nonlowered and lowered alternants of the prefixes can be compared in inalienably possessed nouns.

(12) Pre-rhotic lowering in pronominal prefixes

Stem	/-lin/ 'eye'	/-romec/ 'niece'	
1p	*'nelin*	*'neromec*	
2p	*k'elin*	*k'eromec*	
3p	*'welin*	*'weromec*	
Stem	/-rkow/ 'armpit'	/-rpeł/ 'tooth'	/-r/ 'girlfriend'
1p	*'narkow*	*'narpeł*	*'nar*
2p	*k'arkow*	*k'arpeł*	*k'ar*
3p	*'warkow*	*'warpeł*	*'war*

There is some evidence from these prefixed forms that Pre-rhotic Lowering in (9*a*) should be viewed as a sound change in progress. First, the transcriptions with *a* are somewhat misleading: sometimes [æ] or [a] was heard, but other times the percept was [ɛ].[18] This intra-speaker variation was found for each of the six speakers I worked with in at least some words. Second, if speech was slowed down enough, a diphthong could be heard, starting with [ɛ] and gradually lowering to [æ], [a]. The syllable-based sensitivity of this rule is evident in (12), where a postvocalic *r* only triggers lowering if it is tautosyllabic with the preceding *e* (cf. *'ne.ro.mec* and *'nar*). The same tautosyllabic conditioning explains Pre-rhotic Lowering in *cpe.ga'r* 'ear' in contrast to *cpe'.roy-* 'to listen' (Berman 1982*b*:413 and Blevins 2002*b*).

However, in *cpe.ga'r*, as with other cases of lowering subsumed under (9), variation is in evidence. Words with variant forms are listed in (13), where JB indicates data from my own fieldwork.[19] Words are split into two classes: forms in (13*a*) and (13*c*) are accounted for by conditioned lowering in (9), while those in (13*b*) and (13*d*) are not. As noted by Berman, Sapir writes *a* sometimes and *e* sometimes in the same words for the same speaker

[18] A referee asked on what basis forms were transcribed as *a* vs. *e*. I write *e* unless I hear an [a] or [æ] variant of the same vowel in the same word token, in which case I write *a*.

[19] This list is not exhaustive.

(Sapir 2001, note 5.15). Robins (1958) chooses one variant for most lexemes but does list two variants for some particles, e.g., *ma* or *me* for a preverbal particle marking past time. While the majority of variation appears to be across speakers, I have also found variation across utterances for the same speaker. As noted with relation to the data in (12), the transcriptions with *e* or *a* are somewhat misleading: sometimes [æ] or [a] is heard, but other times the percept is [ɛ]. Furthermore, in slow or careful speech a diphthong is heard, starting with a mid or lower-mid front vowel and gradually lowering to [æ] or [a]. The gradient nature of this lowering suggests that the changes in (9) are not yet complete for some speakers in at least some words.

(13) Variation in conditioned *e*-lowering

	Robins, Berman (1982*a*)	Sapir	
(13*a*)	*hełku*(*s*)	*hełkus*, *hałkwu*	'ashore'
	hes	*hes*, *has*	'interrogative particle'
	hes-, *has-*		'to think, to intend'
	kes	*kes*, *kas*	'down'
	(')*nemes*	(')*nemas*	'my medicine'
	lek^{w}si	*lek^{w}s*, *lak^{w}s*	'outside'
	(')*yek^{w}*	*yek^{w}ł*, *yak^{w}ł*	'worm'
(13*b*)	*he'm*, *ha'm*	*ha'm*	'he/she/it says'
	Robins, Berman (1982*a*)	JB	
(13*c*)	*per*	*per*, *par*	'playing card'
	k^{w}er	*k^{w}er*, *k^{w}ar*	'nail, peg'
	kerkeł	*kerkeł*, *karkeł*	'ringtail cat'
	cpega'r	*cpege'r*, *cpega'r*	'ear'
	cik'^{w}ar	*cik'^{w}er*, *cik'^{w}ar*	'chair'
	nekac	*nekec*, *nekac*	'me-OBJECTIVE'
	kelac	*kelec*, *kelac*	'you-OBJECTIVE'
	negec	*negec*, *negac*	'kiss (noun)'
	'we-sec	*'we-sec*, '*we-sac*	'her dried strip of salmon'
	mec	*mec*, *mac*	'fire'
(13*d*)	*pecan*	*pecen*, *pecan*	'for a little while (adv.)'

One salient aspect of this sound-change-in-progress is its apparent spread to new contexts. Pre-laryngeal, pre-rhotic, and pre-/w/ lowering show the same sound patterns for the entire lexicon, while pre-fricative lowering is only found in a small number of words, and in even fewer, like *lak^{w}s* 'outside', *yak^{w}ł* 'worm', with an optional consonant intervening between the

target vowel and the coronal fricative. Lowering in stressed syllables with /h/ or /c/ onsets (13*b* and 13*d*) is found in even fewer words and appears to be the most recent innovation in conditioned **e > a* shifts.

The general pattern observed is reminiscent of the "spread" of tense versus lax allophones of American English short /æ/ first described by Trager (1930; 1934; 1940) for New York City and New Jersey, and later by Ferguson (1975) for Philadelphia. Though these studies and subsequent ones refer to the "raising" or "tensing" of /æ/, the tense and lax vowels often have distinct dynamic properties, with the "tense" vowel characterized by a glide into the middle of the vowel space, as opposed to its lax counterpart which is more steady-state. It is possible that the same dynamic acoustic properties characterize the "lowered" variants of Yurok **e* in the contexts listed in (9); recall my remarks above that in slow speech, the gradual shift of vowel quality is audible.

A further fact suggesting continued phonetic conditioning of the changes in (9) is their apparent sensitivity to phonetic vowel duration. The longer the vowel, the more likely it is to be lowered. Compare *pegár* 'to dwell', with final stress (and accompanying duration), to *pégerk*, *pégrk* 'man', with initial stress and accompanying reduction of the final syllable. In disyllabic forms with the intensive infix *-eg-*, stress is typically word-final (not on the infix). Where stress is word-final, the lowering of /e/ appears to be moving into new contexts outside of those mentioned in (9): *kegét* [kɛgɛ·t], [kɛgæ·t] 'mountain lion'.

One other aspect of phonetic variation in the realization of /e/ deserves special mention. In tautosyllabic /ew/ and /e'w/ sequences, there is often significant lowering of /e/ to [æ] (9*b*). Robins (1958:6) comments: "before syllable final *w* or *'w* a particularly open type of *e* is used." Robins (1958) and Berman (1982*a*) transcribe these vowels consistently as *e*, with one exception: in the second plural indicative unipersonal *a*-class verb paradigm (see 7 above), the suffix is written *-a'w* instead of *-e'w*. For example, Robins (1958) writes *-cne'w* for 'son-in-law' but *skewip'a'w* 'you-pl are putting things in order'. Though a phonemic contrast is suggested by this transcription practice, I find variation in these forms and other tautosyllabic *ew*, *e'w* strings. I have already noted Robins's own remarks on an "open" allophone of /e/ in this context. Another source supporting this lowering is Waterman (1920), who uses a phonetic transcription, distinguishing [ɛ], [e], [a], and [æ].[20] Compare Waterman's *'o tlæw* 'where it drips' [H-2] with Robins's

[20] Waterman's (1920) transcriptions have been altered as follows: stress marks have been omitted, initial glottal stop has been added to vowel-initial words, Waterman's *ä* is changed to *æ*, his *L* is written as *ɬ* and his *gw* (a phonetic variant of [w]) is written as *w*. Preglottalized sonorants are only realized with preglottalization in postvocalic position; elsewhere, they are neutralized to plain sonorants.

t'lewoluł 'to drip', or Waterman's *tewolæw* 'oceanward' with Robins's *tewolew* 'Pacific Ocean'. Also note the variation in Waterman's own transcriptions of the same place-name: *wełk^wæw* [A-72] but *wełk^wew wolo'mono wroi* '*wełlkæw* its-tan-oak creek' [B-30] on map 9 and in the index.[21] In most tautosyllabic /ew/ sequences, Waterman (1920) has [æw] where Robins writes *ew*. In my own notes, there seems to be a correlation between main word stress and preference for the [æ] allophone. For example, in *tegerew* 'talk-PASSIVE', with final word stress, final [æw] is common. I conclude that Robins's writing of *-a'w* in the *a*-class paradigm, but *e'w* elsewhere, does not reflect a contrast between /e/ and /a/ before tautosyllabic /'w/. Much like the situation before tautosyllabic /r/, /'r/, there appears to be no phonemic contrast of /e/ and /a/ before /(')w/, but rather a range of allophones of the front nonhigh vowel, suggesting that Pre-*w* lowering (9*b*) is a sound change in progress.

Finally, note the lowering of /e/ in *he'm/ha'm*, the irregular third-person singular indicative form of *hegol-* 'say, tell'. Both lengthening in monosyllables and the lowering effect of syllable-initial /h/ appear to play a role in variation in this form.

5. The origin of the *a* vs. *e* contrast. Phonological contrasts typically arise when a phonetically conditioned alternation is rendered opaque by some independent process. In Yurok, a contrast between short /e/ and /a/ is found in only two places: in first-person unipersonal indicative inflections *-ek'* vs. *-ak'*, for Robins's Yurok, as shown in (7), and in third-person singular indicative forms of verb stems ending in /. . . ahC/. Since Robins's *a*-class verbs appear to involve vowel shortening induced by paradigmatic analogy, they are clearly not the source of the /e/ vs. /a/ phonemicization.

Rather, the most likely source for this arguably recent vowel split is third singular indicative forms of verbs in /. . . ahC/. In all *e*-class and *o*-class verbs, the third singular indicative unipersonal form involves laryngealization of the final consonant of the stem, as shown in (7). Compare the nonlaryngealized stem-final consonant in the first singular forms in (14) (with inflectional suffix *-ek'*) with its third singular counterpart, which shows laryngealization of the stem-final consonant.

(14) Glottalization in third singular indicatives (*e*-class verbs)

Stem	First singular	Third singular	Gloss
ciweyet-	*ci.we.ye.**t**ek'*	*ci.we.ye**t'***	'to crave'
kesomewep-	*ke.so.me.we.**p**ek'*	*ke.so.me.we**p'***	'to be lonely'

[21] On page 234 of Waterman (1920), the place-name is spelled with *æ*.

ciwey-	*ci.we.**y**ek'*	*ci.we**'y***	'to be hungry'
holim-	*ho.li.**m**ek'*	*ho.li**'m***	'to weave (baskets)'

As noted by Robins (1958:37), *h* cannot occur before glottal stop or before a glottalized consonant. In this context, *h* deletes and the earlier complementary distribution of *ah* vs. *e* is rendered opaque. The sound change giving rise to this opacity is stated in (15), with resulting minimal and near-minimal pairs shown in (16).[22] Again, in (16), first singular forms show the inflectional suffix *-ek'* or *-ok'*, while third singular forms are marked by laryngealization of the stem-final consonant or consonant cluster.

(15) Yurok *h*-loss $*h > \emptyset$ / __[constricted glottis]

(16) Glottalization and *h*-loss in third singular indicatives

Stem	First singular	Third singular	Gloss
hek^{w}s-	*hek^{w}sek'*	*he**k'**^{w}s*	'to find'
hahk^{w}s-	*hahk^{w}sek'*	*ha**k'**^{w}s*	'to laugh'
nek-	*nekek'*	*ne**k'***	'to put'
trahk-	*trahkok'*	*tr**a**k'*	'to fetch water'

The phonologization of *h*-loss is illustrated in (17) with other *h*-medial stems.

(17) Loss of /h/ before glottalization

Stem	Third plural	Third singular	Gloss
crwrhs-	*crw**rh**seł*	*c**r**wr's*	'to point'
lohp-	*l**oh**peł*	*l**o**p'*	'to come in lumps'
plohp-	*pl**oh**peł*	*pl**o**p'*	'to be in flood'

There are less than a dozen verbs in final *..ahC-*. Nevertheless, the loss of **h* before laryngealized consonants has introduced a surface contrast between verb-final *eC'* and *aC'* which has phonemicized a split between short *e* and *a*. With this phonemic split established, speakers of Yurok presented with phonetic variation of the sort characterizing the incipient changes in (9) are free to associate similar sound patterns in these contexts with those of the relatively new /a/ category.

6. Concluding remarks. The data in **5** above suggest that *h*-loss has given rise to contexts in which the once phonetically transparent relationship between surface *e* and its lowered allophones has become opaque. What is particularly interesting about this case is that the contexts in which

[22] The statement in (15) also characterizes synchronic alternations in Yurok, like those shown in (16).

/e/ and /a/ contrast in Yurok are highly limited. Nevertheless, the established contrast still appears to have the effect of allowing more and more instances of **e* to shift to *a* in the ongoing sound changes documented in **4**.

The results of this study have implications for comparative Algic. If, as suggested here, /a/ is a new Yurok vowel, Berman's (1982*b*) reconstruction of Proto-Ritwan vowels **i*, **e*, **a*, **o*, **u* needs to be reconsidered. In particular, a four-vowel Ritwan system of **i*, **e*, **o*, **u* is possible, with Proto-Ritwan **e* inherited as Yurok *e* and reflected as Wiyot *a*.[23] If Proto-Ritwan is found to have a basic four-vowel system, it will share yet another property with Proto-Algonquian.

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[23] I do not make this suggestion lightly. A close examination of the cognate sets presented in one of the most careful studies of Yurok historical phonology (Berman 1982*b*) reveals numerous problems. For example, in the sets arguing for long-vowel shortening as a Ritwan innovation, for three good sets—**kaka:nw-*, **-po:n-*, and **mi:na* 'berry'—there is evidence of short variants in Proto-Algonquian (Aubin 1975). The correspondence between PAR **i:*, PA **i:*, and Proto-Ritwan **e* is also suspect: PAR **nyi:m-* 'take' is based on comparison of PA **nyi:ma:wa* 'he takes his lunch with him' with Yurok *negem-* 'to take, to bring, to carry', an *-eg-* infixed form of ***nem-*. While this comparison looks reasonable, Yurok has a related stem *na:m-* 'to take, bring, carry' (cf. *na:muł* 'to carry a load', *na:menewk^{w}-* 'to be washed out by the waves', *na:mewet-* 'to grab in one's mouth'), suggesting that *nem-* is a shortened form of *naam-* < **neem-*. Another cognate set for PAR and PA **ki:la* 'you (singular)' includes Yurok *ke'l* and Wiyot *k^{h}il*. In this last case, where PA has **ni:la*, **ki:la*, **wi:la* for first-, second-, and third-person singular pronouns, this paradigm is absent in Yurok. It seems more likely that Yurok *ke'l* reflects leveling based on the pronominal prefix paradigm *'ne-*, *k'e-*, *'we-*, and the full form of the first singular pronoun *nek*. In addition, there is at least one good etymology where Ritwan **i* appears to be the reflex of PA **i:*. This is:

HORN. PAR **wewi:łi* (3p), **mewi:łi* (4p); PA **wewi:wi:łi* (pl) (cf. Kickapoo *-wiiin-* 'horn' [Voorhis 1988]); Yurok *mewił* 'elk'; Wiyot *dägwiwił-* 'flat horns' (Reichard 1925:128).

To my knowledge, this PAR cognate set has not been noted before.

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