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HONOLULU 96822

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THE NATURE AND UNDERLYING REPRESENTATIONS OF LONG VOWELS AND DIPHTHONGS IN FATALUKU

TYLER HESTON

Fataluku is an underdocumented Papuan language spoken by approximately 37,000 individuals in East Timor, a nation in island Southeast Asia. This paper focuses on the variety of Fataluku spoken in Lospalos, one of the main towns in the Fataluku-speaking region. After providing some background information on the phonology of Fataluku, this paper discusses the presence and phonological representations of surface long vowels and diphthongs. The evidence shows that vowel length is indeed contrastive, but both long vowels and diphthongs are represented underlyingly as sequences of vowels, rather than as true unit phonemes.

1. INTRODUCTION.¹ Fataluku ([fataluku], ISO 639-3 ddg) is a Papuan (i.e., non-Austronesian) language with approximately 37,000 speakers on the eastern end of East Timor, a country in island Southeast Asia (Lewis et al. 2013). Previous reports have indicated significant dialectal variation (van Engelenhoven 2009, Lewis et al. 2013). Fataluku is generally recognized as belonging to the Timor-Alor-Pantar family of languages, which includes approximately thirty languages spoken on Timor and nearby islands (Schapper and Huber 2012, Schapper et al. 2012, Holton et al. 2012, Robinson and Holton 2012). While some have proposed that the Timor-Alor-Pantar languages are related to languages spoken on the Bird's Head Peninsula of New Guinea (see Hull 2004, Ross 2005, and the literature review in Schapper et al. 2012), a consensus has not yet been reached. (For alternative views, see Robinson and Holton 2012, Schapper and Huber 2012, and Holton et al. 2012.)

Previous work on Fataluku includes a dissertation written in French (Campagnolo 1973), a sketch of the morphosyntax (Hull 2005), and a few articles investigating various topics in the language (van Engelenhoven 2009, 2010 on the morphosyntax, Stoel 2008 on the suprasegmental phonology). One interesting and controversial aspect of the phonology of Fataluku has been the analysis of long vowels and diphthongs. One particularly important question is, does Fataluku have contrastive vowel length? A related question is, how are surface long vowels and diphthongs represented underlyingly?

The present study seeks to clarify the status of long vowels and diphthongs in Fataluku. This paper focuses on the variety of Fataluku spoken in the town of Lospalos, one of the main towns in the Fataluku-speaking region (the “Central dialect” in the classification given in van Engelenhoven 2010:185). Unless otherwise indicated, all Fataluku data are from a male speaker in his early twenties who was born and raised in the town of Lospalos. Hereafter, the language variety spoken by this speaker will be referred to as “the Lospalos dialect of Fataluku,” although it is probable that there is variation even among speakers who are from this same area.

After the introduction, the second section gives some brief background information on the phoneme inventory and phonotactics of Fataluku. The third section gives evidence that vowel length is contrastive in the Lospalos variety of Fataluku, and thus must be represented underlyingly. The fourth section presents phonological evidence that surface long vowels and surface diphthongs are represented underlyingly as sequences of identical and non-identical vowels, respectively, rather than as true unit phonemes. The paper will conclude with a summary of the results and some directions for future research.

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2. PHONEME INVENTORY AND PHONOTACTICS.

TABLE 1. The present analysis of the consonant phonemes of Fataluku.

	Bilabial	Labiodental	Alveolar	Palatal	Velar	Glottal
VI. Stops	p		t		k	ʔ
Vd. Stops	(b)		(d)		(g)	
VI. Affricates			ts			
VI. Fricatives		f	s			h
Vd. Fricatives		v	z			
Nasals	m		n			
Taps/Trills			r			
Laterals			l			
Glides				j		

TABLE 2. The present analysis of the vowel phonemes of Fataluku.

	Front Unrounded	Central Unrounded	Back Rounded
High	i		u
Mid	e		o
Low		a	

2.1 PHONETIC REALIZATIONS. A few of the phonemes of Fataluku are worthy of additional comment. Fataluku has only one native series of stops, which are phonemically voiceless and usually realized phonetically with a small amount of aspiration. Voiced stops are only attested in loan words, and thus are included in parentheses in the phoneme chart above. While there are no native voiced stops, Fataluku does have the voiced fricatives /v/ and /z/ in its native vocabulary. The labiodental fricative /v/ is realized most often as [v], but [v̥], [β], and [w] are all in free variation.² The dental fricative /z/ is realized most often as [z], but it can also be realized as the affricate [d͡z] word-initially.

There is some interesting dialect variation in the realization of /j/ and /z/. The speech of the consultant has near-minimal pairs contrasting /j/ and /z/, for instance, [paja] ‘liquid’ and [aza] ‘rain.’ However, he reports variation in other villages, stating that in some places, they pronounce the words as [paza] ‘liquid’ and [aja] ‘rain,’ replacing [z] with [j] and [j] with [z]. It is not clear whether there are dialects that swap the realizations of these sounds or whether certain dialects have simply neutralized the contrast in different directions. What is known is that the distribution of these segments is not predictable in the consultant’s own dialect, and thus, in the variety he speaks, they must be analyzed as separate phonemes.

2.2 SYLLABLE STRUCTURE. Another characteristic of Fataluku that is important for understanding its phonology is its phonotactics. Given its history of contact with other languages, Fataluku has a substantial number of loan words from various sources, especially Portuguese and Indonesian. The summary below will focus on the phonotactics of native vocabulary, as they represent the central essence of Fataluku phonology, and understanding the native patterns gives the best foundation for understanding the phonotactics of loan words.

The general syllable structure of Fataluku is (C)V(V)(C). Surface long vowels and surface diphthongs are here treated as complex nuclei. Fataluku favors open syllables, and a substantial percentage of syllables in the language are of the shape V or CV. In general, Fataluku allows only the final syllable of a word to be closed and discourages consonant clusters in all other positions within a word. There are a few marginal examples of consonant clusters in native vocabulary, but they can be understood as resulting

² The symbol /v/ was chosen to represent this phoneme because it is most commonly realized as [v]. Labeling this phoneme as a labiovelar approximant /w/ would also be a reasonable alternative.

from recent or currently productive morphological changes. For instance, the word /naalpaal/ ‘parents’ has a medial cluster, but it is quite clearly derived from the words /naal/ ‘mother’ and /paal/ ‘father.’ Another example is the word /ant/ ‘I (emphatic),’ from the pronoun /ana/ ‘I’ and the subordinating morpheme /t/.

2.3 LIMITATIONS ON CONSONANT DISTRIBUTION. One notable characteristic of the phonotactics of Fataluku concerns the occurrence of consonants word-finally. In the present sample of 1,200 words, some consonants are widely attested in word-final position, while /ʔ/, /ts/, /z/, /j/, and the labial phonemes are unattested or exceedingly rare word-finally. Additionally, the few instances in which these phonemes occur word-finally can be attributed to more recent developments. It is possible that these gaps are an artifact of the sample size. However, it is more likely that the absence of these particular consonants in word-final position is the result of changes that have taken place over the history of the language. The precise diachronic explanation remains a question for future inquiry.

3. VOWEL LENGTH.

3.1 BACKGROUND ON VOWEL LENGTH. Several authors have mentioned vowel length in Fataluku, but they have often disagreed with one another. Van Engelenhoven (2009:334, 2010) reports that there are examples of contrastive vowel length in the variety spoken around the town of Loré (the “South dialect”), and that “long vowels ... are either absent or obsolete in the other dialects.” Different researchers have disagreed with both aspects of his claim. On the one hand, Hull (2005:1–5) mentions that the variety spoken in Lospalos (the “Central” dialect) does have “long vowels,” although he does not go into detail about his analysis. On the other hand, authors who have analyzed the South dialect have claimed that vowel length is predictable from the suprasegmental environment. Campagnolo (1973) analyzes the differences in vowel length as the result of a phonemic “long accent,” which raises the pitch and increases the duration of the vowel it is attached to. Stoel (2008:75) revises Campagnolo’s analysis, replacing the concept of “accent” with that of “tone” and making some other modifications, but he agrees that vowel length is predictable in the South dialect.

In the midst of these disagreements, the present study seeks to enhance what is known about contrastive vowel length in Fataluku, focusing on the variety spoken in the town of Lospalos. Sections 3.2 and 3.3 discuss the occurrence of surface long vowels and the evidence that vowel length is not predictable from the segmental environment. Section 3.4 attempts to predict vowel length in Lospalos Fataluku based on prosodic factors, following Stoel 2008; however, it is concluded that vowel length in Lospalos Fataluku is predictable from neither the segmental nor the suprasegmental environment, and thus, must be represented underlyingly.

3.2 SURFACE LONG VOWELS IN THE LOSPALOS DIALECT. In the variety of Fataluku spoken by the consultant for the present project, each of the five vowel qualities has a long counterpart, as shown by the following examples. In the present sample, the surface long vowels occur much less frequently than their short counterparts. The vowel [a:] is the most common of the long vowels, followed by the mid vowels [e:] and [o:], which are somewhat less common. The long high vowels [i:] and [u:] are even less frequent, and there are only a few examples of each. Long vowels are most frequent in the penultimate syllable of disyllabic words, but they can also occur in other positions.

EXAMPLE 1. Words with short and long vowels (in broad phonetic transcription).

	[i]		[i:]
<p>ʃiːla pɪpɪ ʃiːʔire</p>	<p>‘frog’ ‘goat’ ‘heavy’</p>	<p>piː³ hiːre hiːtu</p>	<p>‘palm nut’ ‘wait’ ‘sword’</p>

³ I am not aware of any content words in Fataluku that consist of a single short, open syllable. For this reason, I propose that all content words are required to contain at least two morae. It is not yet apparent whether codas count for a mora; this is a topic that requires future research.

	[e]			[e:]	
ḷsele		‘corn’		le:	‘house’
vele		‘skin’		ne:re	‘be flat’
ḷsetḷsema:laj		‘pineapple’		ke:le	‘laugh’
	[a]			[a:]	
valale		‘be fast’		ḷsa:l	‘grandparent’
ukani		‘one’		a:ḷsane	‘enough’
ale		‘rice’		va:le	‘give birth’
rata		‘old’		a:mire	‘sit on’
	[o]			[o:]	
tomoke		‘soft’		o:p	‘ashes’
oʔose		‘steal’		ḷso:ne	‘be far’
sorot		‘book, paper’		ho:ʔe	‘burn’
olo		‘bird’		lo:haj	‘cut’
	[u]			[u:]	
ula		‘about, maybe’		hu:la	‘spoon’
upu		‘back’		su:ke	‘duck’
luku		‘speak’		nu:ḷsetḷse	‘wash’

3.3 EVIDENCE THAT VOWEL LENGTH IS PHONEMIC. The strongest evidence that vowel length is contrastive comes from the presence of several minimal and near-minimal pairs. Because long vowels occur less frequently than short vowels, the number of minimal pairs is somewhat limited as well. However, examples such as the following clearly indicate the contrast in vowel length.

EXAMPLE 2. Vowel-length minimal pairs (in broad phonetic transcription).

	Short			Long	
nere		‘follow’		ne:re	‘be flat’
a		‘1.SG.ACC’		a:	‘2.SG.NOM’
aḷsane		‘mature (of plants)’		a:ḷsane	‘enough’

EXAMPLE 3. Vowel-length near-minimal pairs (in broad phonetic transcription).

	Short			Long	
ula		‘maybe, about’		hu:la	‘spoon’
ḷsele		‘corn’		ke:le	‘laugh’
sune		‘blow (as of the wind)’		su:ke	‘duck’
ale		‘rice’		va:le	‘give birth’

Another confirmation that vowel length is contrastive is that, when asked, the speaker is able to identify the words in minimal pairs for vowel length as sounding different from each other, as opposed to true homophones, such as [vari] ‘always’ and [vari] ‘nest,’ which sound the same. Additional evidence that vowel length is phonemic is that the speaker has trouble recognizing words if they are pronounced with the wrong vowel length. During elicitation, there have been several instances in which something like the following has happened. I will be checking my notes and ask, “Is [akina] a word in Fataluku?” He will

respond, “No.” I will ask him for the gloss I am trying to elicit, in this case, ‘firm.’ He will then tell me (to paraphrase), “Oh, you mean [a:kina] (emphasizing the long vowel). The word [a:kina] means ‘firm.’ If you say [akina], I will not understand what you mean.” Thus, evidence from the structural facts of the language, the speaker’s metalinguistic awareness, and the speaker’s performance in identifying words all converge on the conclusion that vowel length is not predictable in this variety of Fataluku.

3.4 AN ALTERNATIVE ANALYSIS. As noted above, it has been proposed that vowel length can be predicted in at least some dialects of Fataluku from suprasegmental features. The strongest proposal in this regard is the proposal from Stoel (2008:75), who argues that vowel length in the Loré dialect is predictable based on “tone.” In his analysis, the contrast in vowel length between pairs such as [lo:re] ‘leave’ and [lore] ‘sow’ is derived from an underlying difference in tone through the application of several rules and constraints.

The core of Stoel’s analysis is that every content word in Fataluku has a high tone associated with either the first or the second syllable (indicated by Stoel with a superscripted H following the syllable). He analyzes the word [lo:^Hre] ‘leave’ as having a high tone on the first syllable underlyingly, /lo^Hre/, while the word [lo^Hre] ‘sow’ has a high tone on the second syllable, /lore^H/. Constraints on foot shapes allow feet of the shape (σ.σ), (σ.σ^H) or (σ^H), but not *(σ^H, σ). For this reason, a word that has a high tone on the first syllable, like /lo^Hre/ ‘leave,’ will be footed as /(lo^H)re/, while a word with a high tone on the second syllable is footed as /(lore^H)/. He posits a rule that lengthens the vowel in a syllable if it is the only syllable in the word that is footed. Thus (lo^H)re ‘leave’ becomes (lo:^H)re, but (lore^H) does not change. This rule accounts for the contrast in vowel length. Additionally, there is one final rule that causes a final high tone to move to the penultimate syllable, yielding the surface forms [lo:^Hre] ‘leave’ and [lo^Hre] ‘sow.’ Thus, by Stoel’s analysis, the surface difference in vowel length between the words is completely predictable based on the underlying association of tone, but the tonal contrast itself is neutralized, as shown in table 3.

TABLE 3. A sample derivation illustrating Stoel’s (2008) analysis.

UR	/lo ^H re/ ‘leave’	/lore ^H / ‘sow’
Footing	(lo ^H)re	(lore ^H)
Lengthening	(lo: ^H)re	-
Tone move	-	(lo ^H re)
SR	[lo: ^H re]	[lo ^H re]

Stoel’s analysis is an intriguing possibility, but there are several important differences between the dialect Stoel describes and the Lospalos dialect. There appear to be lexical differences between the dialects, because the Lospalos speaker did not recognize the words [lo:re] ‘leave’ or [lore] ‘sow.’ Also, preliminary research has indicated that word-level prosody is likely predictable in Lospalos Fataluku. Nevertheless, this topic is still poorly understood, and future research will be needed to determine the details of the Lospalos Fataluku prosodic system. However, the crucial difference between the two dialects concerns the distribution of surface long vowels. In the dialect Stoel analyzes, long vowels can only occur in monosyllabic words or the first syllable of disyllabic words, and his analysis only predicts long vowels in these positions. However, in Lospalos Fataluku, long vowels can occur in various positions in words of one, two, three, or even four syllables, as illustrated by example 4. Stoel’s analysis does not account for these data.

EXAMPLE 4. Long vowels in words of 1-4 syllables (in broad phonetic transcription).

One-syllable words	
t̚ʃi:	‘thunderstorm’
le:	‘house’
lo:	‘sp. of cuscus’
t̚ʃa:l	‘grandparent’
la:n	‘friend’

Two-syllable words

huma:r	‘soul’
ḷ̥so:ne	‘to be far’
su:ke	‘to duck’
fa:te	‘four’
hu:la	‘spoon’

Three-syllable words

a:kina	‘firm’
a:heʔe	‘to be stuck’
fu:lehe	‘to return’
ḷ̥so:nana	‘the farthest one’
mautu:le	‘to be lazy’

Four-syllable words

a:tanana	‘question’
aʔana:te	‘replace’

3.5 DISCUSSION. To sum up, the variety of Fataluku under investigation here has a vowel-length contrast that is not predictable either from the segmental or the suprasegmental environment, and thus, it must be represented underlyingly. Evidence for the contrast between long and short vowels on the surface comes from speaker metalinguistic awareness, speaker phoneme perception, and a number of minimal and near-minimal pairs. The present results thus support Hull’s (2005) report, which mentions that Lospalos Fataluku has long vowels, and brings additional data and evidence to support this analysis.

The results here partially support the conclusion presented by van Engelenhoven (2009:334), who claims that vowel length is “absent or obsolete” in all dialects except Loré. While the variety of Fataluku under study here does have a vowel-length contrast, with many clear examples of contrast between long and short vowels, the vowel-length contrast has a relatively low functional load, in the sense that there are only a few lexical items that are distinguished solely by vowel length. There are also several lexical items in which there is variation between long and short vowels, or which were pronounced with a long vowel on one occasion but with a short vowel on another. This suggests that the vowel-length distinction may be in the process of being lost, as implied by van Engelenhoven (2009). This would explain why the speaker was able to clearly contrast vowel length, but was not always certain of the vowel length for an individual lexical item. An account in which it is being lost is also consistent with disagreements about vowel length present in the literature.

It is also possible that vowel length is not undergoing change, but is simply less salient for speakers than other segmental contrasts because of its low functional load. The history and distribution of vowel length is an important direction for future research. A systematic investigation of vowel length in each of the various dialects of Fataluku would be very helpful in order to clarify its distribution in the Fataluku-speaking area. It would also be helpful to look at differences between younger speakers and older speakers in this regard. If vowel length were in fact being lost, we would expect older speakers to be more consistent in their use of vowel length, especially for the particular lexical items in which younger speakers are unconfident.

4. THE UNDERLYING REPRESENTATIONS OF LONG VOWELS AND DIPHTHONGS.

4.1 POSSIBLE REPRESENTATIONS. While there are still some lingering questions about vowel length, it is clear that it must be represented underlyingly synchronically. This raises the question of how exactly it is represented underlyingly, as there are a number of possibilities. A highly related question is how diphthongs are represented underlyingly. Fataluku has six diphthongs that fall in sonority, [eɪ], [aɪ], [oɪ], [eʊ],

[a_ɨ], and [o_ɨ].⁴ As with long vowels, the best underlying representation for diphthongs is not immediately clear.

In an article analyzing the underlying representation of surface diphthongs in Hawaiian, Rehg (2007:120) writes that there are in fact four possible sources of a surface falling diphthong. These are as follows:

- (1) /V̥/, an underlying unit phoneme that involves a gliding articulation from the position of one vowel to that of another;
- (2) /VV/, an underlying sequence of two non-identical vowels, in which the second vowel is less sonorant than the first;
- (3) /VG/, an underlying sequence of a vowel followed by a glide; or
- (4) /V/ a vowel subject to one or more rules of diphthongization.

The possible analyses of diphthongs are parallel to the possible analyses of long vowels, as a long vowel can be represented as: /V:/, an underlying unit phoneme; /VV/, an underlying sequence of two identical vowels; or /V/, a vowel lengthened by phonological rule.

Rehg (2007:120) explains that only surface diphthongs of source (1), in which each is represented as a single phoneme underlyingly, are “true diphthongs,” while those from other sources are “apparent diphthongs.” In the same way, we shall consider long vowels that are underlying unit phonemes, represented as /V:/, to be true long vowels, while those from other sources are apparent long vowels.

Rehg states that the analysis of long vowels and diphthongs as underlying sequences of vowels, identical vowels in the case of long vowels and non-identical vowels in the case of diphthongs, is the simplest analysis, and that this should be the default analysis in a particular language in the absence of evidence to the contrary. This is the analysis taken by Campagnolo (1973) for Fataluku diphthongs. Hull (2005:5), on the other hand, claims that Fataluku has “true diphthongs and not simply vocalic sequences as in other Timorese languages.” The discussion below will discuss the evidence for each of the possible analyses of long vowels and diphthongs in turn, demonstrating that both surface long vowels and surface diphthongs are represented as sequences of vowels in Fataluku.⁵

4.2 EVIDENCE AGAINST THE SINGLE VOWEL ANALYSIS. Of the possibilities, the easiest to rule out is the analysis of vowels and diphthongs as single vowels that are lengthened or diphthongized. As was shown above, analyses that attempt to predict the presence of long vowels by a rule that lengthens short vowels are not able to account for their distribution in Lospalos Fataluku. This type of analysis does not adequately explain the distribution of diphthongs either. There are at least six phonetic diphthongs (i.e., [e_ɨ], [a_ɨ], [o_ɨ], [e_u], [a_u], and [o_u]), which can occur in the same environments as short and long monophthongs. There is no apparent way to predict these diphthongs as allophones of the five attested monophthongs, as shown by the following minimal and near-minimal pairs.⁶

EXAMPLE 5. Minimal and near-minimal pairs for phonetically similar diphthongs and monophthongs.

	[e(:)]		[e_ɨ]
kave	‘to marry’	lave _ɨ	‘crocodile’
le:	‘house’	fe _ɨ	‘pretty’
	[e(:)]		[e_u]
nere	‘to follow’	ne _u re	‘to chase’
ne:re	‘to be flat’	ne _u re	‘to chase’

⁴ Other surface diphthongs are attested in rapid speech, but since these six falling diphthongs are the most clear and robust examples of surface diphthongs, they will be the focus of the following discussion. The conclusions reached here apply to other surface diphthongs as well.

⁵ This is not to say that *all* surface long vowels and diphthongs are necessarily derived from the same source, but rather, that this is the primary source. As shown below, surface long vowels and diphthongs can also be derived from a sequence of a vowel, followed by a glottal stop and another vowel /V̥?V/.

⁶ It would be theoretically possible to propose six abstract vowel qualities, which are diphthongized in all environments. This “abstract vowel” analysis is essentially a more abstract version of the unit phoneme analysis, but without support for this added abstraction, it is necessarily suboptimal.

ore	[o(:)]	‘quarrel’	koire	[oĩ]	‘stir’
poki	[o(:)]	‘punch’	pouke	[ou]	‘throw at’
ho:k		‘mud’	mouk		‘cloud’
ʔso:ne		‘to be far’	koune		‘to be dark’

4.3 EVIDENCE AGAINST THE VOWEL-GLIDE ANALYSIS. There are several pieces of evidence that show that the vowel-glide analysis is not right for Fataluku either. The first piece of evidence is based on a test suggested by Rehg (2007) for Hawaiian. Since it is typically recognized that Hawaiian has only open syllables, it would be unmotivated to adopt an analysis in which glides form syllable codas. While Fataluku syllable structure is less restricted than Hawaiian, a similar argument applies.

As discussed above, two consonant sequences are severely discouraged in native Fataluku words, with only a few possible exceptions across morpheme boundaries. However, diphthongs frequently precede consonants within native morphemes, for instance [maise]/[majse] ‘to be straight,’ [kaile]/[kajle] ‘to be bent,’ and [a:seile]/[a:sejle] ‘to rub, scour.’ Even beyond this, there are monomorphemic words that have a diphthong directly before a final consonant, for instance [ait]/[ajt] ‘maybe’ and [mouk]/[mowk] ‘cloud.’ Analyzing diphthongs with the vowel-glide analysis would mean allowing consonant clusters and complex codas within a morpheme in native vocabulary. While this does not mean that the vowel-glide analysis is necessarily impossible, such an analysis is dispreferred, since it requires a revision of the phonotactics that has no other independent motivation.

Another piece of evidence comes from the dialectal variation found in the realization of the glide /j/ in Fataluku. As discussed above, in many words that have /j/ in the consultant’s dialect, this /j/ is pronounced as [z] in other dialects. For instance, the word for ‘necklace’ is pronounced [paja] by the consultant; however, he states that other people pronounce the word as [paza]. However, attempting to replace the second element of a surface diphthong with [z] resulted in completely unacceptable pronunciations. For instance, replacing the word [la:fai] ‘to be big’ with *[la:faz] or the word [pai] ‘pig’ with *[paz] resulted in completely unacceptable sequences. While the historical phonology of Fataluku dialects is not yet understood, the fact that the sound correspondence between /j/ and /z/ does not hold for the second element of surface diphthongs does provide some evidence against the vowel-glide analysis.

A final argument against the vowel-glide analysis is based on another test Rehg applies to Hawaiian. One of the arguments Rehg (2007:125) gives against analyzing Hawaiian surface diphthongs as vowel-glide sequences is that, in pre-contact Hawaiian, /w/ was not “the non-syllabic counterpart of /u/,” but likely had a significant degree of frication. He points out that a [w̥] produced with frication is much more like a consonant than like the vocalic component of a diphthong. The description of the Hawaiian /w/ as an approximant with some frication also describes the Fataluku phoneme /v/ quite well, which sometimes has labiodental frication, sometimes has bilabial frication, and sometimes is a labiovelar approximant with no frication at all. Using the same phoneme to represent a fricative and a vocalic portion of a diphthong is a rather abstract analysis, which is difficult to justify, given the presence of more natural alternatives. It is much more natural to analyze surface diphthongs as being derived from vowel sequences.

4.4 DIPHTHONGS AND LONG VOWELS AS UNDERLYING SEQUENCES. The two remaining possible sources are underlying single unit phonemes and underlying sequences of vowels. There are several pieces of evidence that Fataluku surface diphthongs are underlyingly sequences of vowels. The first argument comes from parsimony. Rehg (2007) notes that treating surface diphthongs as underlying unit phonemes greatly increases the phoneme inventory of a language. For this reason, he favors the underlying vowel sequence analysis over the true diphthong analysis in every case, unless there is evidence to the contrary. In Fataluku, analyzing long vowels as unit phonemes would add five phonemes to the inventory, and analyzing diphthongs as unit phonemes would add at least six more phonemes, yielding a total of at least sixteen vowel phonemes. Thus, such an analysis more than triples the vowel inventory.

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The second piece of evidence comes from the range of possible surface diphthongs permitted in Fataluku. Rehg (2007:126) states that “in a language like English true diagonal diphthongs have a highly skewed distribution;” however, in Hawaiian, one can predict which surface diphthongs appear based upon phonological criteria and the speech rate. Fataluku is like Hawaiian in this regard, in that the attested surface diphthongs follow regular rules, without gaps. The example 6 shows all possible combinations of a non-high vowel preceding a high vowel. In a parallel way, all possible long vowels are attested, as illustrated by example 1 in section 3.2.

EXAMPLE 6. Diphthongs follow a regular distribution.

[la:faɪ]	[aɪ]	‘to be big’	[aʊru]	[aʊ]	‘lime’
[laveɪ]	[eɪ]	‘crocodile’	[dʒeʊ]	[eʊ]	‘wife’
[tʃoɪhe]	[oɪ]	‘to mash’	[arapoʊ]	[oʊ]	‘buffalo’

The third reason that it is preferable to treat surface diphthongs as underlyingly sequences of vowels is that it simplifies the description of speech rate differences. Speech rate can have a large influence on how closely two adjacent vowel qualities are pronounced, and it is not always clear whether two vowel qualities are produced in the same syllable or different syllables. For example, in slow speech, the word /rau/ ‘to be good’ can be pronounced [ra.u], with [a] and [u] in different syllables, but in speech at more naturalistic speeds, it is realized as [raʊ], with the two vowel qualities indisputably in the same syllable. If one adopts the vowel-sequence analysis, one must propose a process that joins two vowels into the same syllable in rapid speech, a process which is phonetically motivated and attested in other languages (e.g., Hawaiian, as discussed in Rehg 2007). On the other hand, if one adopts the unit-phoneme analysis, one must propose a rule that splits a single phoneme into separate syllables in slow speech. While this is not necessarily impossible, it does seem rather contrived.

Therefore, on the basis of the entirety of the foregoing evidence, I argue that Fataluku has neither true long vowels nor true diphthongs. Rather, adjacent vowels may be realized in the same syllable as a surface long vowel or diphthong under certain phonological conditions (although, as noted above, this syllabification is not required at slower speech rates). These conditions can be stated as follows.

The syllabification of adjacent vowels in Fataluku

Two adjacent vowels may be realized in the same syllable if either of the following is true:

- The vowels are identical to each other.
- The first vowel is non-high and the second vowel is high.

There is an outstanding piece of independent evidence that this analysis of surface long vowels and diphthongs is correct. This evidence comes from the phonetic realization of words with an intervocalic glottal stop. The glottal stop is a phoneme in Fataluku, as demonstrated by pairs such as /raʔu/ ‘plate’ and /rau/ ‘good’ (the second of which can never have an intervocalic glottal stop). However, it is frequently deleted in faster speech. When an intervocalic glottal stop is deleted, two identical vowels are realized as a single long vowel, as in /maʔar/ [ma:r] ‘person,’ while two non-identical vowels are realized as a diphthong, as in /raʔu/ [raʊ] ‘plate.’ Thus, crucially, analyzing surface long vowels and diphthongs as sequences of vowels is completely parsimonious, as it does not require the addition of any phonemes or any rules that are not independently motivated by other facts about the language.

5. CONCLUSION. To sum up, the variety of Fataluku under examination here has 18 consonant phonemes /p, t, k, ʔ, (b), (d), (g), t̪s, f, s, h, v, z, m, n, r, l, j/ and 5 vowel phonemes /a, e, i, o, u/. Fataluku syllable structure is (C)V(V)(C), and consonant clusters are discouraged, especially within native morphemes. There is a contrast between surface long and short vowels that is not predictable from other segmental or suprasegmental conditions. Surface long vowels and diphthongs are represented underlyingly as sequences of identical and non-identical vowels, respectively, which are syllabified in the same syllable. Key evidence from the realization of words containing an intervocalic glottal stop demonstrates that vowel phonemes can indeed be syllabified into the same syllable in rapid speech, making the analysis here an optimally economic solution.

One generalization of the present findings beyond Fataluku concerns the representations of long vowels and diphthongs cross-linguistically. One potential research question is whether all possible underlying sources of long vowels and diphthongs are equally common, or whether some are more widely attested among the languages of the world. This study contributes to the number of languages for which the underlying representations of long vowels and diphthongs are known. This study also presents a few new phonological tests that may be useful in determining the underlying representations of complex segments in other languages. As the evidence is accumulated for more and more languages, we can begin to make firmer claims about the representations of long vowels and diphthongs cross-linguistically.

One direction that is especially relevant to the present findings would be an examination of the development of vowel length across generations, to see whether vowel length is being lost. A study of the distribution of contrastive vowel length among the various dialects of Fataluku would also be interesting. Although vowel length has been discussed in the Central and South dialects to some extent, little has been said about vowel length in the other dialects. Because of the extensive variation that has been reported (Lewis et al. 2013), broad-scale sociolinguistic investigations on the linguistic differences among the various dialects and sociolects are definitely in need.

To conclude, much has been learned about Fataluku in recent years; however, many important questions remain. In the phonology alone, there are many fruitful avenues for future research, of which the above suggestions are merely a sampling. It is hoped that future research on this language can continue to illuminate Fataluku and its neighboring languages, and thus also our understanding of Language and the human Language faculty as a whole.

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REFERENCES

- CAMPAGNOLO, HENRI. 1973. La langue des Fataluku de Lórehe (Timor Portugais). Paris: Université René Descartes PhD Thesis.
- HOLTON, GARY; MARIAN KLAMER; FRANTIŠEK KRATOCHVÍL; LAURA C. ROBINSON; and ANTOINETTE SCHAPPER. 2012. The historical relations of the Papuan languages of Alor and Pantar. *Oceanic Linguistics* 51(1):86–122.
- HULL, GEOFFREY. 2004. The Papuan languages of East Timor. *Studies in Languages and Cultures of East Timor* 6:23–99.
- HULL, GEOFFREY. 2005. *Fataluku*. East Timor language profiles 7. Dili: Instituto Nacional de Linguística, Universidade Nacional Timor Lorosa'e
- LEWIS, M. PAUL; GARY F. SIMONS; and CHARLES D. FENNIG, eds. 2013. Fataluku. *Ethnologue: Languages of the world*. 17th ed. Dallas: SIL International.
- REHG, KENNETH. 2007. Does Hawaiian have diphthongs? And how can you tell? In *Linguistic indulgence in memory of Terry Crowley*, ed. by Jeff Siegel, John Lynch, and Diana Eades, 119–31. Amsterdam: John Benjamins.
- ROBINSON, LAURA C., and GARY HOLTON. 2012. Reassessing the wider genetic affiliations of the Timor-Alor-Pantar languages. *Language and Linguistics in Melanesia* (Special issue 2012 Part 1):59–87.
- ROSS, MALCOLM. 2005. Pronouns as a preliminary diagnostic for grouping Papuan languages. In *Papuan pasts: Cultural, linguistic and biological histories of Papuan-speaking peoples*, ed. by Andrew Pawley, Robert Attenborough, Jack Golson, and Robin Hide, 15–66. Canberra: Pacific Linguistics.
- SCHAPPER, ANTOINETTE; JULIETTE HUBER; and AONE VAN ENGELENHOVEN. 2012. The historical relation of the Papuan languages of Timor and Kisar. *Language and Linguistics in Melanesia* (Special issue 2012, Part 1):192–240.
- SCHAPPER, ANTOINETTE, and JULIETTE HUBER. 2012. State-of-the-art in the documentation of the Papuan languages of Timor, Alor, Pantar and Kisar. *Wacana, Journal of the Humanities of Indonesia* 14(2):1–37.
- STOEL, RUBEN. 2008. Fataluku as a tone language. In *SEALS XVI: Papers from the 16th annual meeting of the Southeast Asian Linguistics Society 2006*, ed. by Paul Sidwell and Uri Tadmor, 75–84. Canberra: Pacific Linguistics.
- VAN ENGELENHOVEN, AONE. 2009. On derivational processes in Fataluku, a non-Austronesian language in East-Timor. In *The linguistics of endangered languages: Contributions to morphology and morphosyntax*, ed. by W. Leo Wetzels, 333–62. Utrecht: LOT.
- VAN ENGELENHOVEN, AONE. 2010. Verb serialization in Fataluku: The case of 'take.' In *Converbs, medial verbs, clause chaining and related issues*, ed. by Sascha Völlmin, Aseb Amha, Christian Rapold, and Silvia Zaugg-Coretti, 185–211. Frankfurter Afrikanistische Blätter 19. Köln: Rüdiger Köppe Verlag.

theston@hawaii.edu