FATALUKU WORD-LEVEL PROSODY

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ABSTRACT

This paper examines word-level prosody in Fataluku, an underdocumented Papuan language of East Timor. Although information about Fataluku remains very limited, at least three alternative analyses of word-level prosody have been suggested: predictable accent, phonemic accent and phonemic tone. This study investigates the phonetic facts of the f0 contour in Fataluku, comparing the behavior of f0 with the claims implicit in each phonological analysis. No evidence was found for any of these three accounts; rather, the evidence in this variety of Fataluku indicates an intonation-only system based on the accentual phrase (AP). Each AP contains one or more words which form a close syntactic or semantic unit and carries a high intonational tone (H) on the syllable containing the second mora.

Keywords: Fataluku, laboratory phonology, intonation, prosody, stress

1. INTRODUCTION

Fataluku is an underdocumented language spoken by approximately 37,000 individuals in island Southeast Asia, on the far eastern tip of the nation of East Timor [12]. Fataluku is a member of the Timor-Alor-Pantar family of Papuan languages, which includes about twenty-five languages spoken on Timor and nearby islands [10, 14].

Existing sources provide limited and contradictory claims about the word-level prosody of Fataluku. Based on these descriptions, it is not clear whether Fataluku has phonemic tone, phonemic accent, predictable accent or some other type of system. This study examines the phonetic behavior of f0, comparing the phonetic facts with the claims implicit in each phonological analysis, from the perspective of the Autosegmental-Metrical theory of Intonational Phonology [11, 13]. I find no evidence for either accent or tone on the lexical level, proposing instead intonational contours based on Accentual Phrases (APs) containing one or more closely related words, analogous to Korean [7].

Section 2 gives relevant background on the phonology of Fataluku, including the phoneme in-

ventory and previous work on word-level prosody. Section 3 describes the methodology of the present study, and section 4 describes the observed phonetic patterns. Section 5 compares the results to previous analyses of Fataluku and argues for a new, intonation-only analysis.

2. FATALUKU PHONOLOGY

Tables 1 and 2 show my current analysis of the phonemes of Fataluku. Voiced stops occur only in loan words.

Table 1: Consonant Phonemes

	Bil	Lab	Alv	Pal	Vel	Gtl
Stop	p (b)		t (d)		k (g)	ʔ
Affr.			t͡s			
Fric.		f v	s z			h
Nas.	m		n			
Trill			r			
Lat.			l			
Glid.					j	

Table 2: Vowel Phonemes

	Front	Central	Back
High	i		u
Mid	e		o
Low		a	

The basic syllable structure of Fataluku is (C)V(V)(C); consonant clusters are rare. Fataluku has both long vowels and diphthongs, which are represented underlyingly as sequences of vowels—identical in the case of long vowels and non-identical in the case of diphthongs [4]. Prosodically, basic declaratives are characterized by a low tone (L%) at the end of the Intonational Phrase (IP), while questions have a low-high-falling tone (L+HL%) [5].

To my knowledge, the first to discuss Fataluku word-level prosody was Campagnolo [2]. He analyzes Fataluku as having phonemic accent, which may land on either the first or second syllable. In a more recent description, Hull [6] claims Fataluku accent is predictable. He states that all syllables in a word generally have equal stress, but if a two-

Figure 1: An example declarative sentence, with pitch peaks indicated, meaning 'The monkey sees the banana.'

	H			H	L%
	lua	ia	mu:	toto	
	monkey	this	banana	sees	

Time (s)
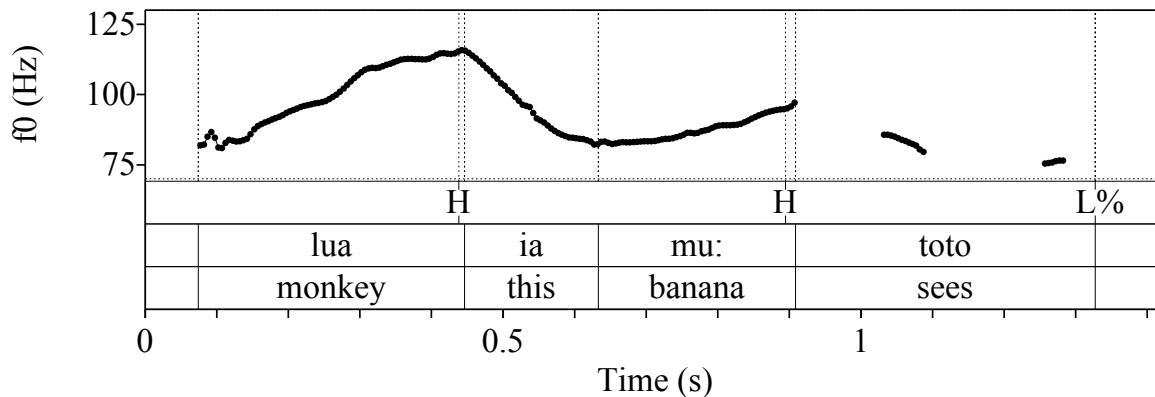
syllable word is emphasized, it is accented on the penultimate syllable, and if a longer word is emphasized, it is accented on the prepenultimate syllable. A somewhat different analysis is proposed by Stoel [15], who claims every content word has an underlying high tone on either the first or second syllable.

3. METHODS

To compare the accuracy of these competing claims, four native speakers of Fataluku (3 male, 1 female, all in their 20s or 30s) were recorded reading a mix of broad-focus declaratives and polar questions. Materials included words of varying lengths, from one to four syllables; syllable weight was also varied.

Sentences were recorded in a quiet location with a Zoom H4n or H6 solid state recorder at 44.1KHz/16bit. Speakers (who were all literate, high-proficiency speakers of English) were prompted with a list of approximately 12 declaratives and 12 interrogatives in English to translate into Fataluku. Speakers were recorded reading 2–3 repetitions, the best 1–2 of which were chosen for analysis.

The software Praat [1] was used to observe f0 tracks, with special focus on the alignment of the f0 peaks to syllable and word boundaries, as deducible from the spectrogram and waveform. Full sentences were used, rather than words in isolation, since words in isolation conflate word-level and sentence-level prosody [8]. Using full sentences also generally resulted in wider pitch ranges than wordlists, making intonational patterns clearer.

4. RESULTS

All four speakers recorded here showed the same patterns robustly. The general pattern is for f0 to rise from the beginning of a word, peaking in the syllable

containing the second mora, and falling to the end. The f0 may fall from the peak either to the end of the word, or, if the next several words form a tight syntactic or semantic unit with the first, to the end of the final word of the unit. For instance, it is very common for a verb and its object to share only a single peak.

Figure 1 shows a representative pitch track. The subject, [lua ia] 'the monkey', forms a single unit, with a peak late in the second syllable of [lua] 'monkey'. The verb phrase [mu: toto] 'sees the banana' forms another unit, with a peak late in the word [mu:] 'banana' (phonemically /muʔu/, with the loss of glottal stop typical of more rapid speech). There is some variation in peak location with speech rate, so that in more rapid speech, the peak often occurs in the syllable containing the third mora (or, rarely, even later), regardless of the particular lexical items involved. Another exception to the general pattern of second mora peaks is that IP-final disyllabic words (including disyllabic words elicited in isolation) typically have an f0 peak on their first syllable, regardless of the weight of that syllable.

Figure 2: f0 peak alignment; the dotted line represents words with a light initial syllable, the solid line words with a heavy initial syllable
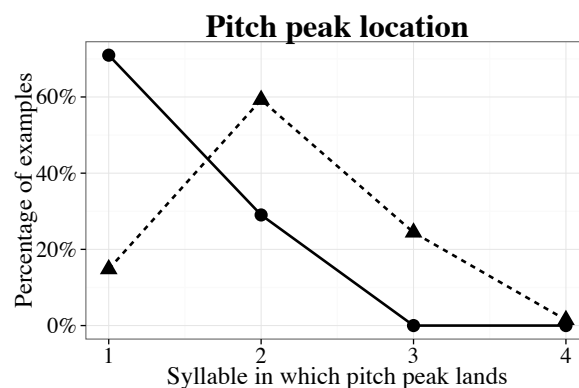

Pitch peak location

Figure 2 graphs the distribution of f0 peaks by syllable. Each group of words containing a single rise-fall pattern was treated as a unit for this analysis. These units were classified based on the syllable containing the f0 maximum (reckoned from the left). Syllable counts are based on the citation form of each word. The dotted line represents words with light initial syllables and the solid line words with heavy initial syllables.

Table 3: Contingency table comparing the weight of the first syllable and f0 peak location

	Heavy initial	Light initial	Total
Initial peak	44	40	84
Later peak	18	230	248
Total	62	270	332

There was a significant association between the weight of the first syllable and whether the f0 peak landed on the first syllable or a later syllable, $\chi^2(1) = 84.12$, $p < .001$. Based on the odds ratio, the odds of having an f0 peak on the first syllable is 13.89 (95% CI: 7.07, 28.32) times higher if the first syllable is heavy than if the first syllable is light. It is notable that both words with heavy first syllables and words with light first syllables have approximately the same percentage of third mora peaks relative to second mora peaks (41.3% for light syllables and 40.9% for heavy syllables).

5. DISCUSSION

5.1. Evaluation of previous analyses

Each of the three previous analyses of word-level prosody makes some useful observations about the data, though none are able to provide a full explanation. For instance, both Campagnolo [2] and Stoel [15] correctly identified peaks on the first or second syllable of a word, though neither recognized the conditioning effect of syllable weight, treating the differences they found as phonemic (either as accent or tone). Stoel goes a step further than Campagnolo, noting a connection between long vowels and f0 peaks, though he takes the position that vowel length is predictable from the placement of tone, rather than the reverse. However, since his derivation of vowel length only predicts long vowels in monosyllables and the first syllable of disyllabic words, it is ultimately unable to explain the occurrence of long vowels in longer words, such as [a:kina] 'firm', [ne:nukas] 'plant sp.' or [a:t͡sane] 'enough' (see further discussion in [4]). These analyses are further shaken by the absence of minimal pairs for either accent or tone.

The third analysis, that of Hull [6], does treat accent as predictable, though since his analysis is based only on the number of syllables, regardless of their weight, it is not able to capture the effect of weight either. For this reason, Hull's analysis is not able to explain the behavior of disyllabic and trisyllabic words in which all syllables are light. Hull predicts penultimate accent in light disyllabic words, when the general pattern is for an f0 peak to occur on the final syllable, as in [at͡súɾ] 'cuscus' or [vaɾí] 'always' (using an acute accent to indicate the phonetic f0 peak). Similarly, Hull predicts accent on the first syllable of light trisyllabic words, when the pitch peak occurs on the second syllable, as in [at͡sáne] 'old' or [totóle] 'look'.

5.2. Two new alternatives

Two new alternative analyses present themselves. One possibility is that f0 peaks are a manifestation of stress. In this view, stress is assigned from left to right, landing on the first syllable if it is heavy and on the second otherwise. In the terminology of metrical stress theory (see [3]), this system would be viewed as a system of left-to-right weight sensitive iambs. Peaks in f0 would be a result of a high intonational pitch accent (H*) which can be realized on (or slightly after) a stressed syllable.

The alternative is that these f0 peaks are independent of any type of stress, and instead are a manifestation of a basic rising-falling intonational contour which occurs on every word or close group of words. In this analysis, all prosodic words in Fataluku would be grouped into slightly larger prosodic units, called Accentual Phrases (APs). Each AP has an intonational high tone (H) on its second mora (similar to the realization of APs which lack a pitch accent in Tokyo Japanese, cf. [16]), which causes the basic rising-falling intonational pattern. It is this intonation-only analysis which I believe to be correct for Fataluku, and for which I argue below.

5.3. Evidence for an intonation-only analysis

One of the biggest advantages of the intonation-only analysis is its ability to properly handle disyllabic words with two short syllables, such as [vaɾi] 'always' and [aci] 'see'. These words generally have an f0 peak on the second syllable, unless they are IP-final, in which case, there is an f0 peak on the first syllable. Since the first syllable is light, stress would be predicted to land on the second syllable. However, on closer examination of the phonology, this analysis of stress is unreasonable, since the final

syllable shows several characteristics of being unstressed. For instance, phonemic long vowels can occur in the penultimate syllable, though not in the final syllable (nor in fact in the final syllable of any word longer than a single syllable). Furthermore, IP-finally, the final syllable of a two-syllable word can become shortened, reduced, and even devoiced.

It is unreasonable to analyze a syllable as being stressed when it maintains fewer phonemic contrasts than nearby syllables and undergoes such substantial reduction. Analyzing the penult as stressed in these cases would require making exception to the general pattern of stress, and would also fail to explain the location of pitch peaks on the second syllable in running speech. Creating a rule that shifts stress IP-finally finds no apparent motivation and still fails to explain why there would be a greater range of segmental contrasts in the penult than in the final syllable, even when a word is not IP-final.

On the other hand, in the intonation analysis, a motivation is readily apparent. Since the final syllable of a declarative or unmarked citation IP is associated with a L% boundary tone [5], it is natural that the H intonational tone should be realized on the first syllable, so that both can be realized fully. Such an analysis also explains the behavior of f0 peaks in running speech—which land on the second mora, following expectations—and causes no conflict with observations of final syllable reduction.

Another benefit of the intonation-only analysis is its ability to naturally predict which words in a given sentence will carry an f0 peak. As noted above, when two or three words form a tight semantic or syntactic unit it is common for only the first to carry a peak. Analyzing a group of closely knit words as an AP is a typologically natural way to explain this behavior, since it is cross-linguistically expected that an AP will bear the same contour, regardless of the number of prosodic words it contains (see [8]).

On the other hand, the best way to explain the distribution of peaks in the stress analysis is not immediately obvious. While one would not necessarily expect every stressed syllable to have an intonational pitch accent, since the distribution of peaks fits cross-linguistic expectations of APs so well, the most natural analysis would probably be to posit AP-like phrases in which the first stressed syllable receives an intonational pitch accent. A system incorporating both APs and stress is certainly possible, but if the stress system still requires positing APs, it certainly calls into question the analytic benefit of stress.

The stress account is called into further question by the fact that only one type of intonational pitch accent would need to be posited. In languages like English, stress often serves as a landing site for various types of pitch accents [8]. If only one type of f0 excursion occurs on these syllables, it is simpler to propose a single intonational tone associated directly with the relevant syllables, bypassing the additional abstraction of stress. Furthermore, as we have seen, the intonation-only account fits the data better, especially in instances in which the stress analysis falters. For this reason, I analyze the f0 peaks observed here as manifestations of a high intonational tone (H) associated loosely with the second mora of an AP, and I find no evidence for stress, accent or lexical tone in Fataluku.

6. CONCLUSION

To sum up, this paper describes the basic prosodic word-level prosody of Fataluku. In the data examined here, no evidence was found for lexical tone, stress or accent, contrary to previous assumptions. Word-level prosody can be explained solely with reference to the intonation. Words are grouped into Accentual Phrases (APs), prosodic units containing generally between one and three words which are related semantically or syntactically. The basic pattern is for an AP to start on a relatively low f0, rising to a high intonational tone (H) on the syllable containing the second mora (sometimes later), then falling to the end.

The system sketched out here follows assumptions that in languages without tone, pitch accent or stress, word-level prosody will generally revolve around APs with a default intonational pattern. It is interesting to note that several seemingly unrelated languages also have an intonational high near the second mora (or syllable) of an AP, including Korean [7], Japanese [16] and French [9]. It is possible that having an intonational peak on the second mora of an AP is a universal tendency, though if it is, its motivation is not yet clear. In order for more robust claims of prosodic typology to be made, detailed research on the prosody of a wide array of languages is paramount.

This paper is part of a larger project to document and describe Fataluku prosody. One topic of interest for future studies is the interaction between AP-phrasing and other prosodic and syntactic phenomena. For instance, what types of syntactic constituents are more resistant to being split into multiple APs? How is phrasing effected by topicalization and focus? Is there any evidence for intermediate phrases between the AP and the IP? Further research is needed to explore these questions.

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