

Tonal and durational analyses of mono-moraic nouns in the Monobe-Kochi dialect of Japanese

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1. Introduction

In this paper, we report the tonal and durational characteristics of the mono-moraic nouns in the Monobe-Kochi dialect of Japanese and we compare its tonal patterns with those in the Kochi-City dialect. The study was conducted as part of the project *Endangered dialects, folklores and folk cultures of Kochi that are on the verge of extinction*.

1.1 Why the Kochi dialect?

The Kochi dialect has been known to preserve many old features of Japanese, phonological, grammatical, and lexical, that have been lost from Standard Japanese over the centuries. It is on the verge of extinction, as the Kochi prefecture experiences the rapid loss of the younger generation in many local communities. One of the project's goal was to document and preserve, in the form of a database, some linguistic and other properties of the communities where an extreme loss of population is being experienced, i.e. where about half of the population is over 65 years and the social communal life can not be maintained any longer.

Kochi prefecture is located on the south of Shikoku Island, the fourth largest island of Japan. The north-eastern part of the Kochi prefecture borders Tokushima prefecture, and the north-western part borders Ehime prefecture, while the south is open to the Pacific Ocean. Along these borders runs the steep Shikoku Mountains which has long been an obstacle for transport and

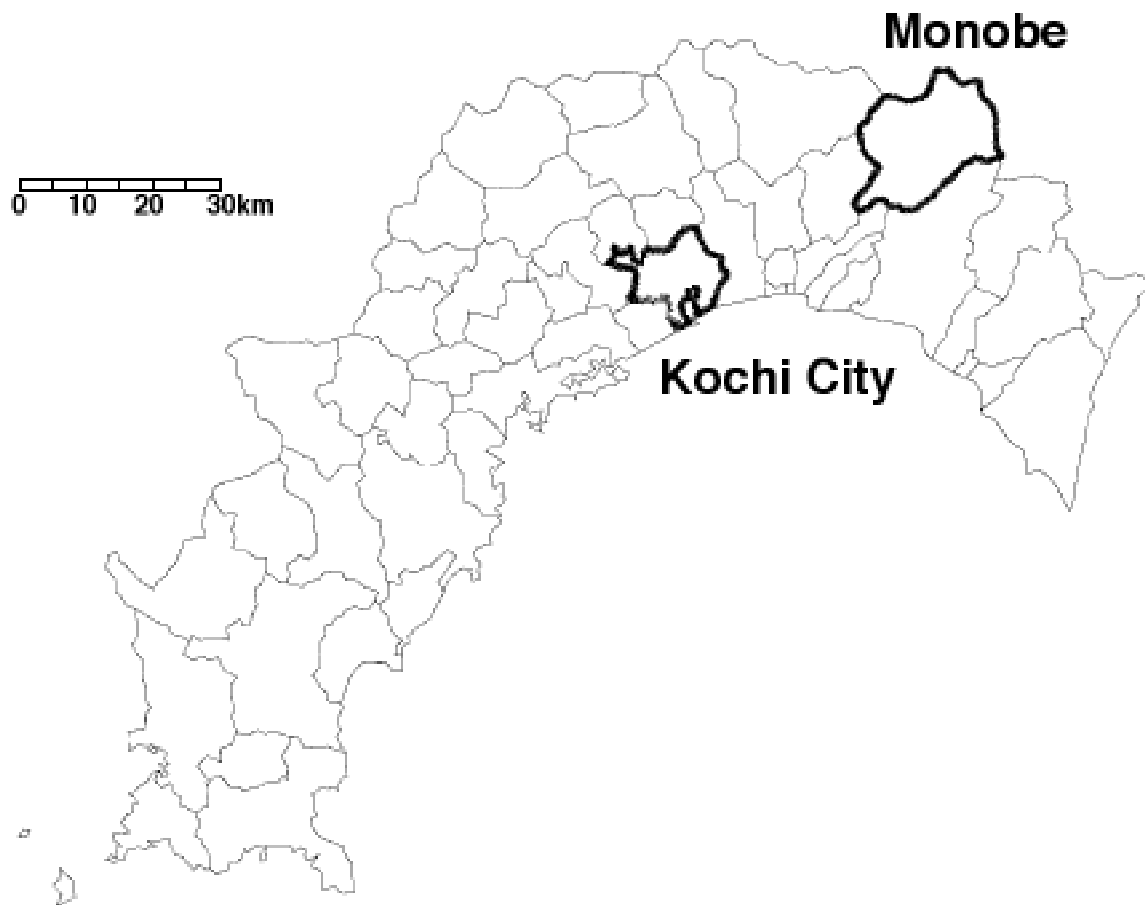


Figure 1. The map of Kochi prefecture. Monobe community (to the right) and Kochi City (to the left).

communication with the neighboring prefectures. The Monobe village is situated at the foot of the Shikoku Mountains and borders Tokushima Prefecture. It has an area of 291km² and has 1409 households with a population of 3166, of which 45.1% is over 65 years old according to the statistics for 2001. Figure 1 is the map of Kochi prefecture with its local communities. (The outlined area to the right is the Monobe area, while the left one is Kochi City.)

1.2. Previous study on the lengthening of mono-moraic nouns

It has been known that mono-moraic nouns such as *ki* 'tree' and *me* 'eyes' are pronounced as [ki:] and [me:] with a lengthened vowel in some dialects of Japanese, i.e. some of the phonemically short vowels in mono-moraic nouns tend to be lengthened. The tonal pattern of these lengthened vowels fall into one of the

three types: HH, HL, or LH. A well known example of this is the pair [e:] HH ‘a handle’, HL ‘feed’, and LH ‘a picture’. The dialects in which this vowel lengthening occurs are mostly located in the western part of Japan, including Osaka, Kyoto, and Kochi dialects among others. The exact phonetic details of this lengthening are, however, less well known except for the work on Osaka dialect (Sugito 1984).

The lengthening is commonly found in Kochi city and the tonal patterns are basically the same as those in the Osaka and Kyoto dialects. However, in some communities of Kochi this vowel lengthening has not been reported, one of them being the Otoyō village, an adjacent community to Monobe (Hashio 2000). As our pilot investigation indicated the presence of lengthening in the Monobe dialect, the present data may exhibit less consistency in the lengthening pattern as compared to the Kochi-city dialect, and as such it is of sociolinguistic interest.

2. Material and analysis

2.1 Word list and informant

The material consisted of 43 mono-moraic nouns in which different types of consonants and vowels occur. For comparison, 13 di-moraic words were included as well. The test words are presented with their gloss in Appendix A. Each word was spoken (1) twice in word isolation form, (2) twice in sentence initial position followed by the subject marker particle *_____ga aru* ‘there exists_____’, and for some tokens (3) once as answer to the question “what is this?”. For acoustic analyses, only the tokens obtained from (1) and (2) were used. The informant was a male speaker in his 60’s who was judged to be a typical Monobe speaker. The recording took place in a quiet room using a Sony Minidisc recorder and a noise-canceling close-talking microphone.

2.2 Measurement

The data recorded on the Minidisc was digitized on a PC, down-sampled to 10,000Hz. Measurements of duration and F0 were carried out using the Sugi Speech Analyser. Durations of vowels were measured on the wideband spectrogram from the mid-point of the first regular voice bar to the mid-point of the last voice bar. The durations of VOT were measured as well, but were not included in the vowel duration.

3 Results and discussion

3.1 Vowel duration

Table 1 shows the mean vowel durations for the 56 test words (43 mono-moraic

<i>word</i>	<i>mean</i>	<i>word</i>	<i>mean</i>
/ha/ 'teeth'	123.5	/roo/	184.5
/ti/	124	/o/	185.75
/su/ 'nest'	136	/ro/	191.5
/hi/ 'monument'	136	/ya/	193.5
/e/ 'handle'	136.25	/kii/	194.5
/e/ 'picture'	137	/ko/ 'child'	195.5
/si/ [ʃi] 'teacher'	140.5	/ne/ 'root'	200.75
/ki/ 'tree'	145	/ni/	201
/to/	146.75	/mi/	203.25
/se/	147	/ne/ 'sound'	204.5
/e/ 'feed'	148	/oi/	210
/ki/ 'mind'	151.75	/tii/[tʃii]	210.5
/hi/ 'fire'	156	/me/ 'sprout'	218
/ke/	157.25	/sii/ [ʃii]	218
/hi/ 'sun'	157.25	/ma/	220.25
/ho/	157.5	/too/	224
/si/ [ʃi] 'teacher'	158	/i/	229
/ta/	160.75	/me/ 'eye'	229.25
/sa/	163	/na/ 'vegetable'	230.75
/su/ 'vinegar'	163.75	/na/ 'name'	236.5
/ha/ 'leafe'	164.5	/mi/ 'body'	238
/ne/ 'price'	165.5	/ie/	248.75
/te/	166.75	/nii/	261.5
/ko/ 'powder'	174	/suu/	266
/wa/	176	/ai/ 'indigo blue'	276.75
/koo/	179	/ai/ 'love'	301.25
/yu/	183	/suu/ 'suck' (v.)	343.5
/ka/	183.25		
/ti/	184.5		

Table 1. Mean vowel duration (ms) for mono-moraic and di-moraic words (in ascending order)

and 13 di-moraic words) in ascending order. For individual measurement as well as standard deviation see Appendix B. The duration of the vowel in the mono-moraic nouns varies from 123ms for /ha/ ‘teeth’ to 238ms for /mi/ ‘body’. It is interesting to note that some di-moraic words like /koo/, /roo/, /kii/ are shorter than mono-moraic words. It can be seen that the vowel duration is affected most consistently by the nature of the preceding consonant but not by the identity of the vowel. Words with a nasal consonant such as /me/ and /na/ have a longer vowel than words with voiceless consonants. It should be noted, however, that the VOT after a voiceless stop was not included in vowel duration in the present study. If the duration of VOT had been included, the measured duration vowels following a voiceless stop would have become longer. It should also be noted that the fluctuation in production was rather large, as can be seen from the standard deviation (cf. Appendix B).

When the present data is compared with that for Osaka dialect reported in Sugito (1984), the vowel durations are generally shorter in the present study. However, difficulties arose for strict comparison as the two studies might have employed different criteria for measurement, i.e. whether VOT was included in vowel duration.

It has been reported for the Osaka dialect that the durations of vowels in mono-moraic words tend to be longer in word isolation form than in sentence context (Sugito 1984). In the present data from Monobe dialect, no notable difference was found between speaking contexts. The mean durations for the word isolation form and the sentence context *__ ga aru* ‘there is __’ were 186ms and 185ms respectively. One of the possible reasons for this may be that the speaker focused on the “__” portion. Figures 2, 3, and 4 show *ho ga aru* ‘there is an ear (of rice plant)’, *me ga aru* ‘there are eyes’, and *ho ga agaru* ‘the hoist goes up’. In the latter two tokens, prolongation of the particle *ga* has occurred.

3.2 Mono-moraic words versus di-moraic words

The durations of mono-moraic words and di-moraic words are compared for the following seven pairs of varying consonant.

1.	/kii/	194ms	2.	/koo/	179ms
	/ki/	151ms		/ko/	174ms
	/ki/	145ms		/ko/	195ms

3.	/sii/	218ms	4.	/suu/ ‘suck’ (v.)	158ms
	/si/	140ms		/suu/ ‘number’	266ms
				/su/ ‘nest’	163ms
				/su/	136ms
5.	/too/	224ms	6.	/tii/	210ms
	/to/	146ms		/ti/	124ms
7.	/nii/	261ms			
	/ni/	201ms			

It can be seen that vowel duration for phonemically long and short vowels differs considerably. In the /su(u)/ pair, vowels differ greatly reflecting their phonemic status while in the /ni(i)/ pair, the difference is rather small. For the /ko(o)/ pair, the vowel in /ko/ ‘child’ is longer than that in /koo/ ‘filial duty’. Previous research has demonstrated that those mono-moraic words that are of literary use and not for everyday use are generally less likely to be lengthened (cited in Sugito 1984). The present data show the same tendency, as neither /koo/ ‘filial duty’ nor /kii/ ‘strange (the version that is not for everyday use)’ are everyday words.

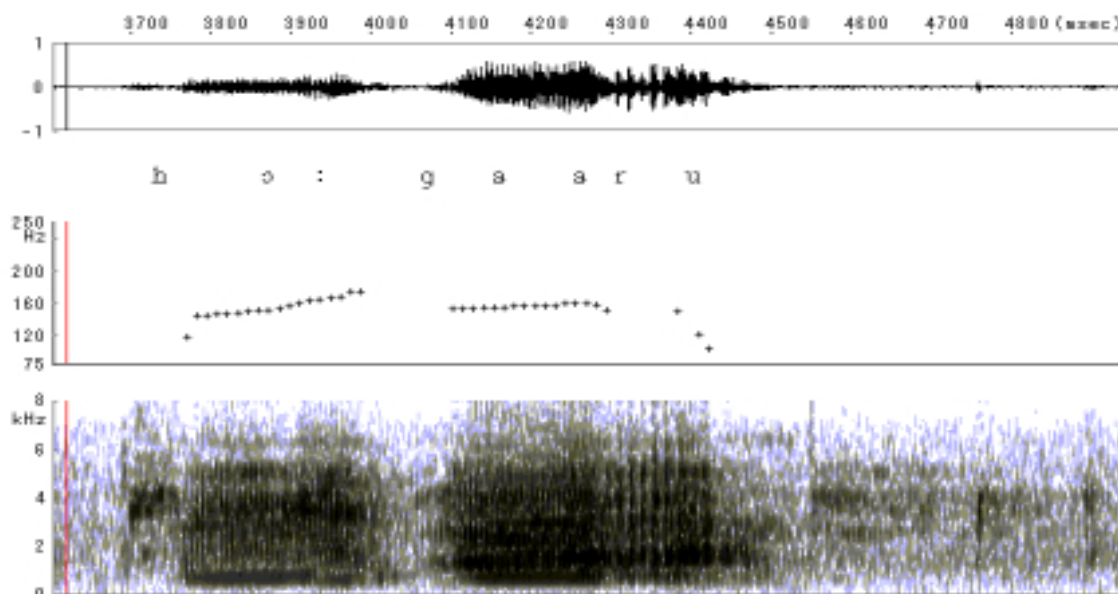


Figure 2. *Ho ga aru* ‘there is an ear (of rice plant)’
(Note that this token is not included in Table 1 for the lack of other tokens.)

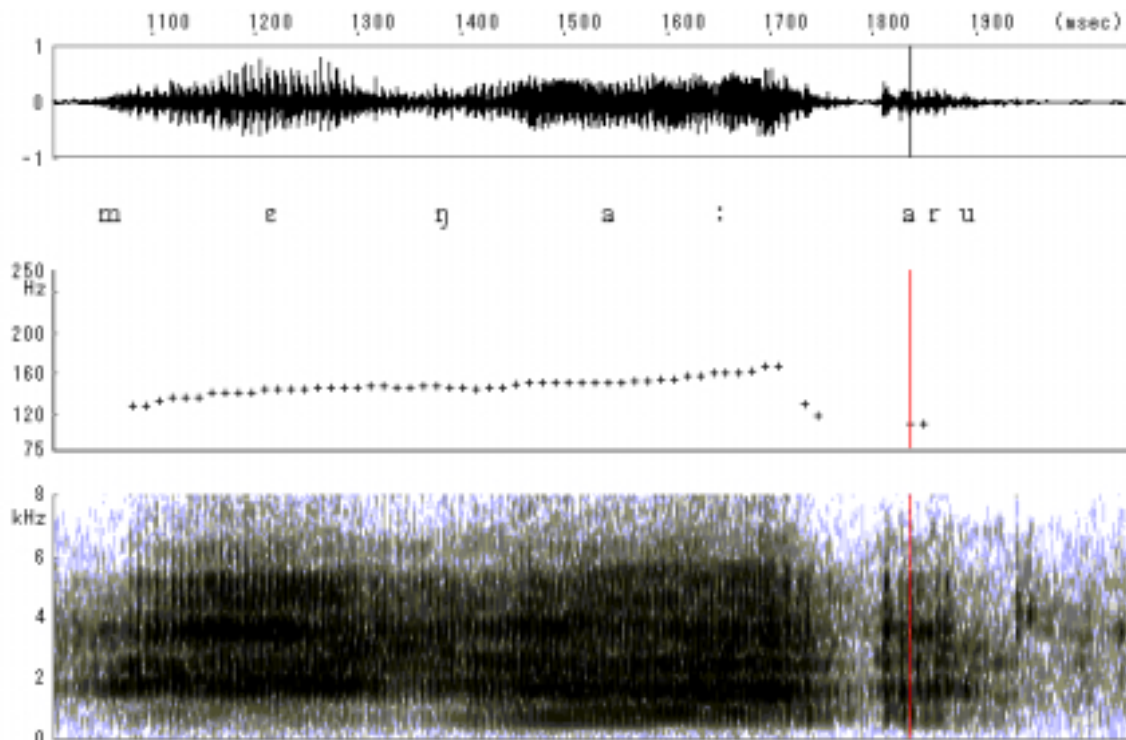


Figure 3. *Me ga aru* ‘there are eyes’

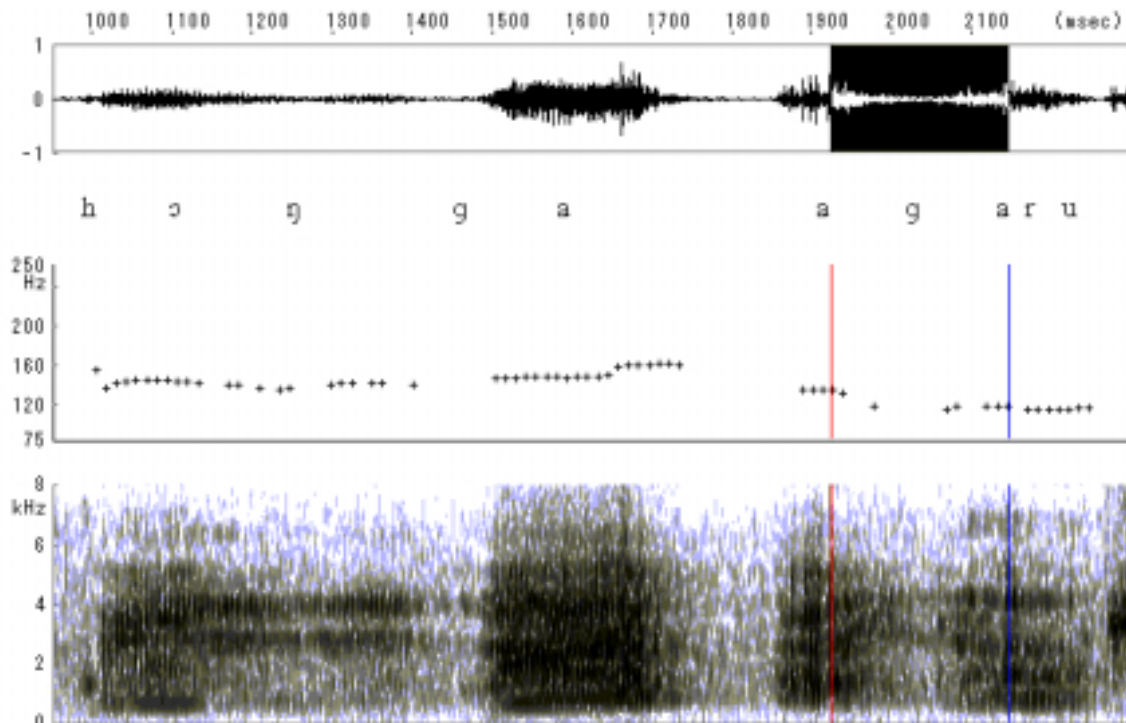


Figure 4. *Ho ga agaru* ‘the hoist goes up’

An interesting observation was that some of the phonemically short vowels had two amplitude peaks in the sound wave, which may indicate that they were produced as two units. These patterns were found regardless of the absolute vowel durations or pitch accent patterns.

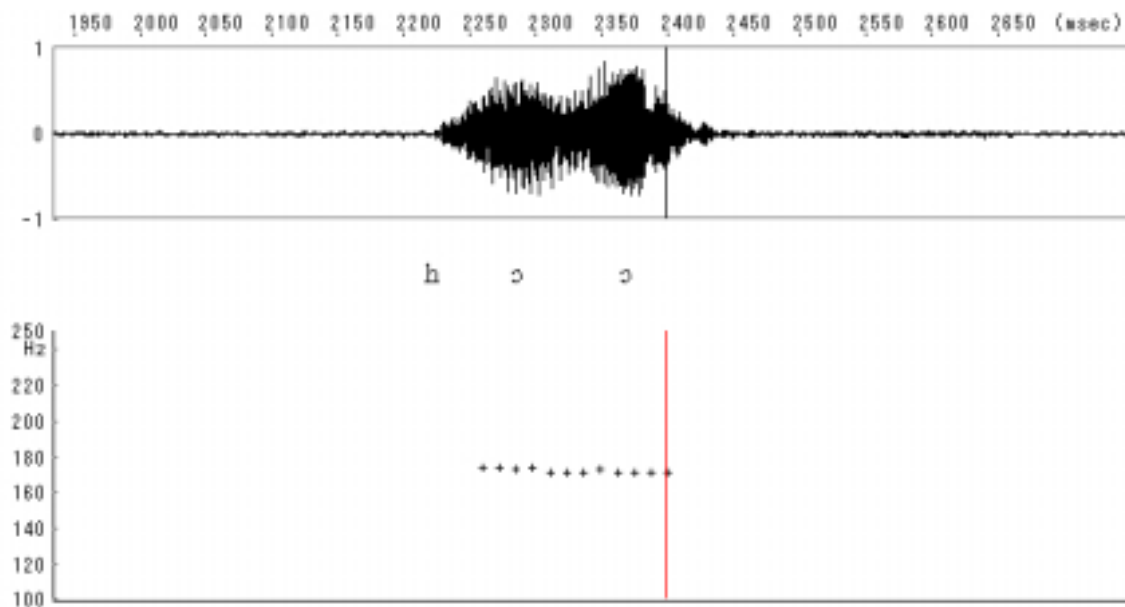


Figure 5. The sound wave and F0 curve for /ho/ 'hoist' produced in word isolation form.

Figure 5 shows the sound wave and F0 contour for the word /ho/ 'hoist' in which two amplitude peaks in the sound wave can be observed. This finding leads us to the issue of how the mora should be defined: should it be defined as length for which the absolute duration is the acoustic correlate? Or should it rather be defined as two articulatory units regardless of the absolute duration, or both?

3.3 Tonal pattern

As was the case for durational manifestation, considerable fluctuation was found for the manifestation of pitch accent. In some cases, the same word was produced with different accent patterns. However, there was a regularity in that the inconsistency being between the HH and HL/LH patterns and never between the HL and LH patterns. Table 2 shows the auditory analyses of the tonal patterns spoken in isolation (material 1). For comparison, the corresponding tonal pattern of a speaker of the Kochi-city dialect, which was recorded at the same time, is listed. The general observation is the predominant occurrence of the HH pattern. Thus, the three-way contrast found in the Kochi-city dialect is not found in this

Word	Monobe	Kochi-City	Word	Monobe	Kochi-City
/i/	LH	HH	/na/ (2)	HH	HH
/e/ (1)	HH	LH	/ni/	HH	HH
/e/ (2)	HH	HH	/ne/ (1)	HH	HH
/e/ (3)	HH	HL	/ne/ (2)	HH	LH
/o/	LH	LH	/ne/ (3)	HH	HL
/ka/	HH	HH	/ha/ (1)	LH/H	HL
/ki/	LH	HH	/ha/ (2)	LH	HH
/ki/	HH	LH	/hi/ (1)	HH	LH
/ke/	HH	HH	/hi/ (2)	HH	HL
/ko/ (1)	LH	LH	/hi/ (3)	HH	HH
/ko/ (2)	H/LH	HH	/ho/	HH	LH
/sa/	HL	HH	/ma/	HH	HH
/si/ (1)	HL	HH	/mi/ (1)	*	HH
/si/ (2)	HH	HH	/mi/ (2)	HH	HH
/su/ (1)	LH	LH	/me/ (1)	HH	LH
/su/ (2)	HH	HH	/me/ (2)	LH	LH
/se/	HH	HH	/ya/	HH	LH
/ta/	HH	LH	/yu/	HH	LH
/ti/	HH	HH	/ri/	HH	HH
/te/	HH	LH	/ro/	HH	HH
/to/	LH	HH	/wa/	HH	LH
/na/ (1)	HH	HH			

Table 2. Tonal patterns for mono-moraic nouns in the Monobe and Kochi-city dialects. (Word in isolation form. Where the two dialects differ, this is marked with bold face.)

dialect, at least not for this speaker. Thus, the three /e/s and /hi/s differentiated by different tonal patterns are all produced with the HH pattern in the Monobe dialect.

The HL and LH accent was more frequently found among the tokens obtained for the recording material (3) where the utterance was supposed to be an answer to a question “what is this?”. Since the F0 range is raised for the utterances in material (3) as compared to (1) and (2), it can be conjectured that the utterance in (3) is somewhat emphasized. In contrast, the speech material (2)

where the test word appeared as a subject followed by a particle *-ga*, the majority of the tokens were produced with a flat pitch pattern.

The tonal patterns of the lengthened mono-moraic nouns in Osaka dialect are known to have a HL, LH, or HH tonal pattern both in Osaka dialect and Kochi dialect. This three-way contrast is found even when the particle *-ga* is added to it. This three way contrast was reduced to a two way contrast in the Monobe dialect by merging the class 1 and 3 nouns to one category as exemplified below. Similar patterning has been reported for the Okuda dialect, the adjacent community to the Monobe village (Hashio 2000).

(1) LH *-ga aru-* LHHL, LHLL_

Group I nouns:

/e/ 'handle', /ka/ 'mosquito', /ko/ 'child', /su/ 'nest', /ti/ 'blood', /to/ 'door',
/ho/ 'hoist', /mi/ 'fruit, nut', /mi/ 'body'

Group III nouns:

/e/ 'picture', /o/ 'tail', /ki/ 'tree', /ko/ 'powder', /ta/ 'rice field', /te/ 'hand',
/na/ 'greens', /ni/ 'luggage', /ne/ 'root', /hi/ 'fire', /yu/ 'hot water'

(2) HL *-ga aru-* HLLL_

Group II nouns:

/na/ 'name', /e/ 'feed', /ha/ 'leaf', /hi/ 'sun', /ya/ 'arrow'

For the LH pattern on mono-moraic nouns in Osaka dialect, Sugito (1984) analyzed the timing of L and H in relation to segments using analysis by synthesis. She reports that the timing of L and H is strictly associated with mora boundaries for the di-moraic words whereas the timing of L and H in the lengthened one mora words is not. In the present data from the Monobe dialect, we found both types of realizations, i.e. one with relatively regular timing of tone with segments, and the other without.

3.4 Acoustic realization of tones

The acoustic analyses of the accent pattern showed that the difference between H and L varied in the range 10-40Hz. When the difference was less than 10Hz, the auditory analysis carried out by one of the authors (YNM) tended to be flat. A typical pitch range used for a L tone in word isolation form was around 140Hz while that for a H tone was around 160Hz for the present speaker.

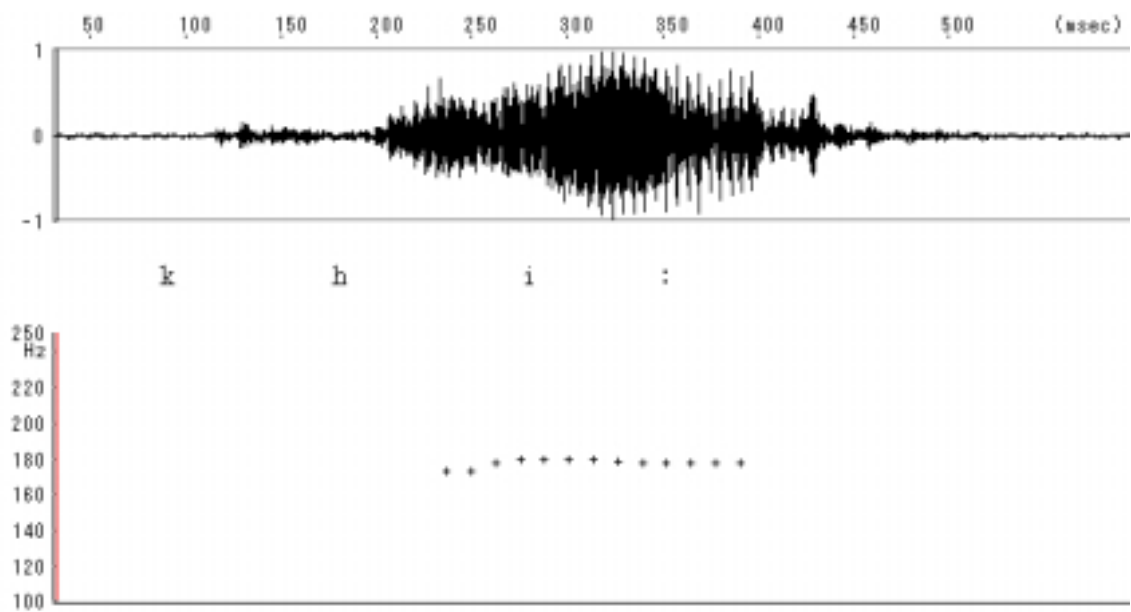


Figure 6. The F0 curve for /ki/ HH 'tree'

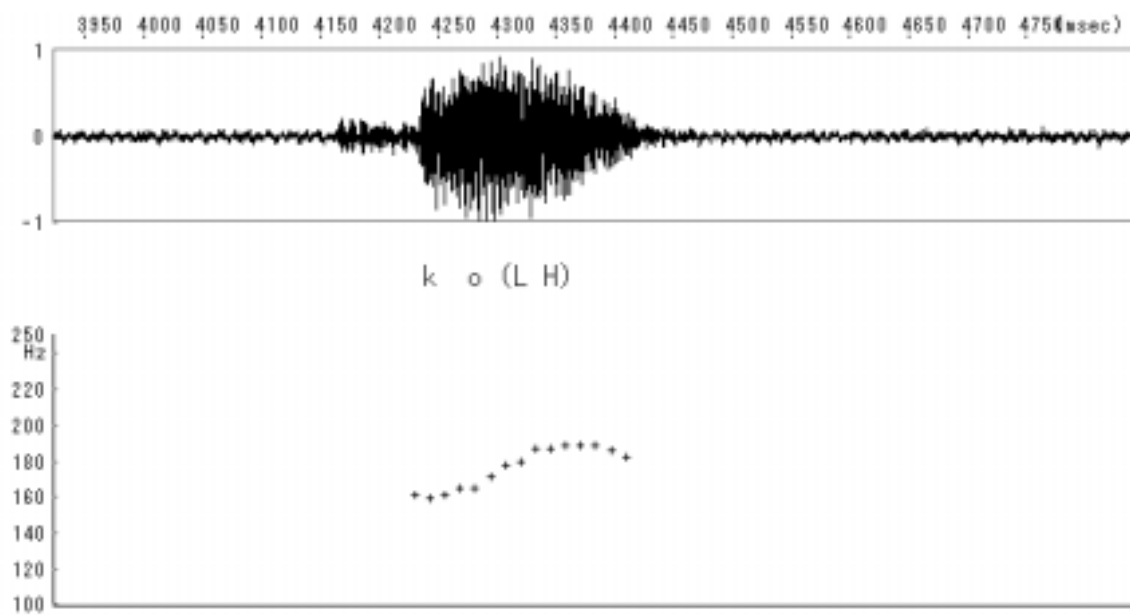


Figure 7. The F0 contour for /ko/ LH 'powder'

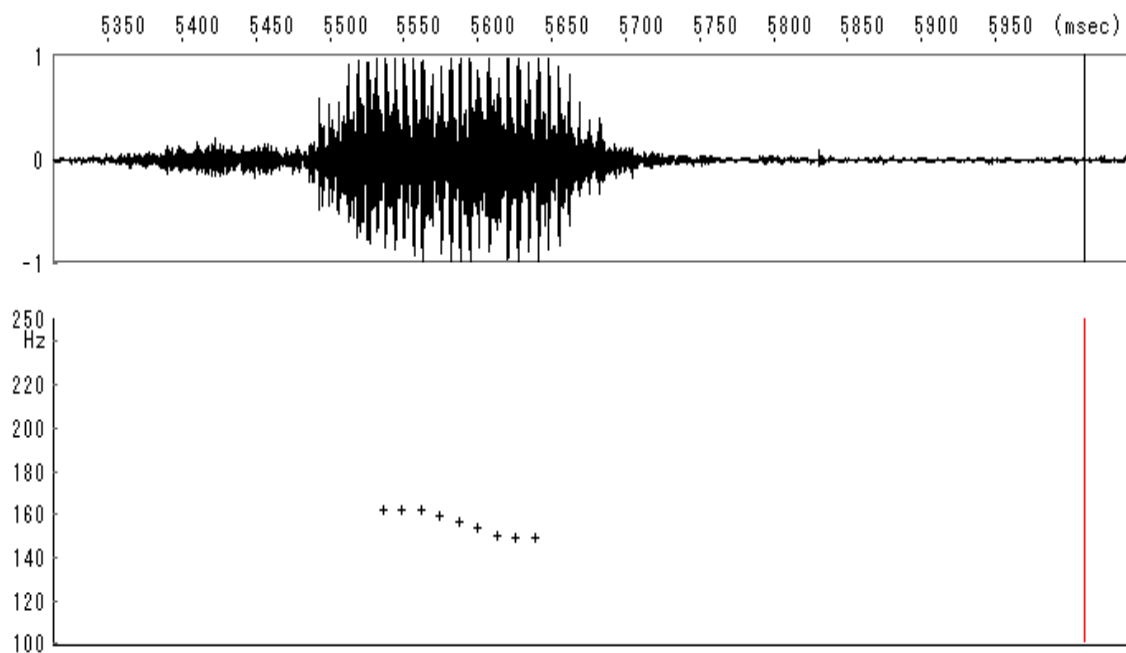


Figure 8. The F0 contour for /si/ HL 'poem'

With the following particle –ga.

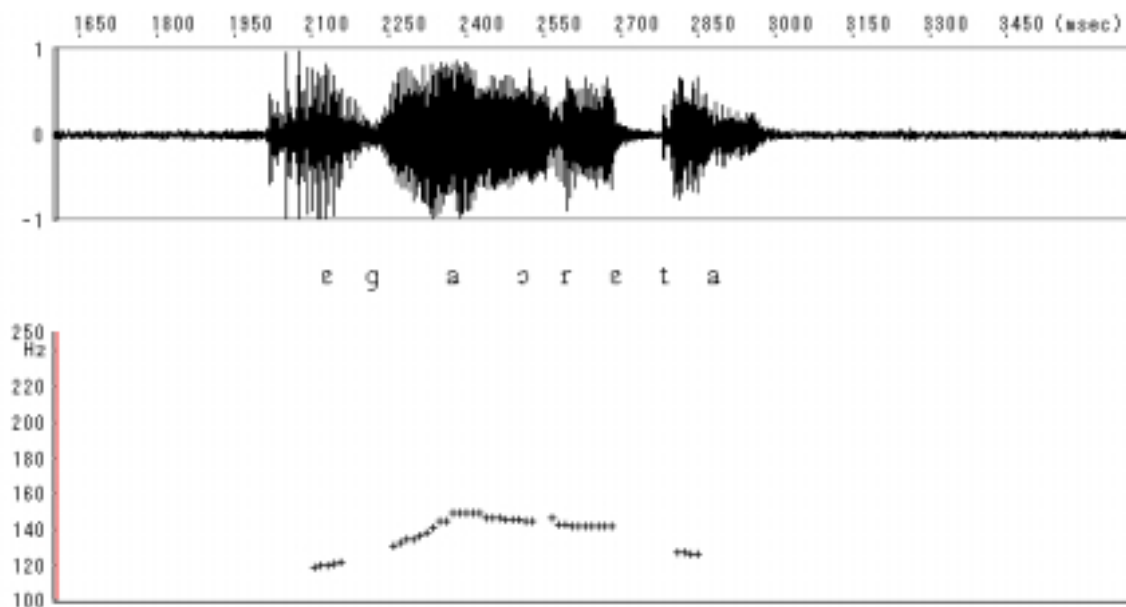


Figure 9. The F0 curve for /e gaoreta/ LHL 'the handle was broken'

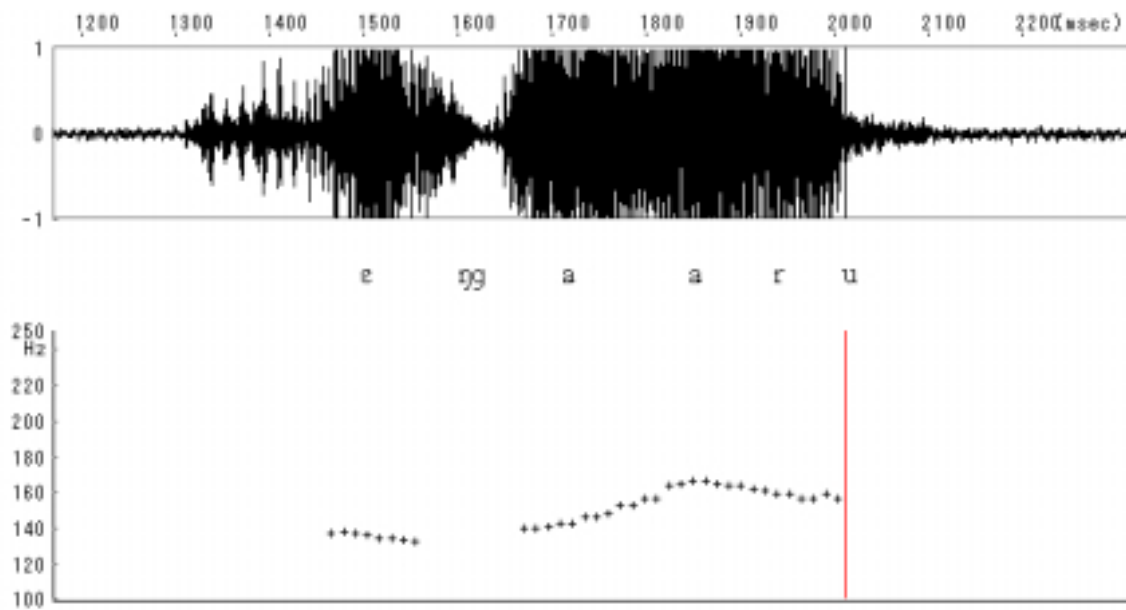


Figure 10. The F0 curve for /e gaaru/LHHH ‘there is a picture’

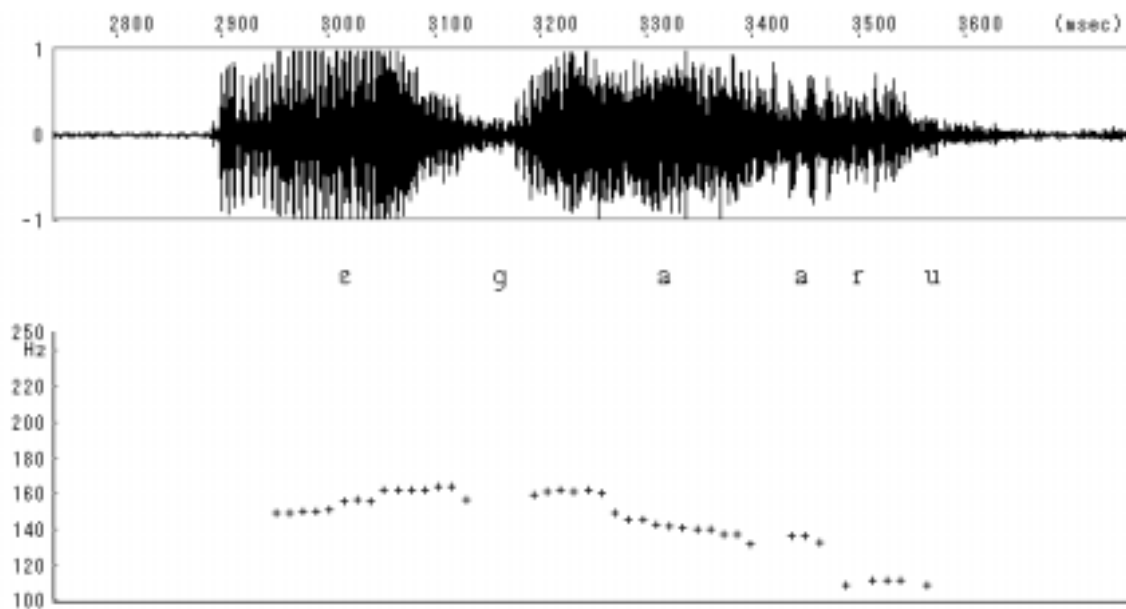


Figure 11. The F0 curve for /e gaaru/ HLLL ‘there is feed’

4 Summary

Tonal and durational characteristics of the mono-moraic nouns in Kochi-Monobe dialect of Japanese were analyzed. For the tonal patterns, the three-way contrast (HH, HL, LH) in the Kochi-City dialect was largely merged into a two-way contrast (HH, LH). The durational difference between a mono-moraic word and a di-moraic word was present in most cases but exceptions were found for the /ko(o)/ pairs. Some mono-moraic words show clear amplitude peaks in their sound waves indicating that the words were articulated as two units.

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APPENDIX A — WORD LIST WITH GLOSSES

No	Word	Gloss	No	Word	Gloss
1	/i/	Stomach	29	/ha/ (2)	Tooth
2	/e/ (1)	Picture, painting	30	/hi/ (1)	Fire
3	/e/ (2)	Handle	31	/hi/ (2)	Monument
4	/e/ (3)	Feed	32	/hi/ (3)	Sun
5	/o/	Tail	33	/ho/	hoist
6	/ka/	Mosquito	34	/ma/	Pause
7	/ki/	Mind	35	/mi/ (1)	Fruit
8	/ki/	Tree	36	/mi/ (2)	Body
9	/ke/	Hair	37	/me/ (1)	sprout
10	/ko/ (1)	Wheat powder	38	/me/ (2)	Eye
11	/ko/ (2)	Child	39	/ya/	Arrow
12	/sa/	Difference	40	/yu/	Hot water
13	/si/ (1)	Poem	41	/ri/	Profit
14	/si/ (2)	Teacher	42	/ro/	fireplace
15	/su/ (1)	Vinegar	43	/wa/	Circle

16	/su/ (2)	Nest	44	/ai/ (1)	Love
17	/se/	Back	45	/ai / (2)	Indigo blue
18	/ta/	Rice field	46	/ie/	House
19	/ti/	Blood	47	/oi/	Nephew
20	/te/	Hand	48	/kii/	Strange
21	/to/	Door	49	/koo/	Filial duty
22	/na/ (1)	Name	50	/sii/	chinquapin
23	/na/ (2)	Vegetable	51	/suu/ (1)	Suck (v.)
24	/ni/	Luggage	52	/suu/ (2)	Number
25	/ne/ (1)	Sound	53	/tii/	Position
26	/ne/ (2)	Root	54	/too/	Tower
27	/ne/ (3)	Price	55	/nii/	Second
28	/ha / (1)	Leave	56	/roo/	Jail

The words are arranged in the order of the Japanese writing system *Kana*.

APPENDIX B — VOWEL DURATIONS, MEANS AND STANDARD DEVIATIONS

Word	1	2	ga 1	ga 2	mean	SD
/i/	200	216	331	169	229	70.7
/e/ (1)	115	150	154	130	137	18.1
/e/ (2)	135	137	140	133	136.25	2.9
/e/ (3)	139	120	203	130	148	37.4
/o/	141	144	298	160	185.75	75.2
/ka/	146	139	223	225	183.25	47.1
/ki/	152	111	176	168	151.75	28.9
/ki/	162	125	160	133	145	18.7
/ke/	165	138	189	137	157.25	24.8
/ko/ (1)	197	162	164	-	174	19.6
/ko/ (2)	219	185	199	179	195.5	17.7
/sa/	111	127	247	167	163	60.7
/si/ (1)	199	153	172	108	158	38.3
/si/ (2)	194	131	137	100	140.5	39.1
/su / (1)	143	189	145	178	163.75	23.2
/su/ (2)	119	125	154	146	136	16.6
/se/	180	177	133	98	147	39

/ta/	151	192	159	141	160.75	22
/ti/	154	112	120	110	124	20.4
/te/	181	157	151	178	166.75	14.9
/to/	138	138	160	151	146.75	10.7
/na/ (1)	202	195	307	242	236.5	51.3
/na/ (2)	165	167	330	261	230.75	79.9
/ni/	245	165	256	138	201	58.3
/ne/ (1)	206	173	238	201	204.5	26.6
/ne/ (2)	175	194	208	226	200.75	21.5
/ne/ (3)	150	110	201	201	165.5	44.1
/ha / (1)	178	169	146	165	164.5	13.4
/ha/ (2)	139	111	131	113	123.5	13.6
/hi/ (1)	206	177	119	127	157.25	41.4
/hi/ (2)	198	208	103	115	156	54.6
/hi / (3)	174	144	127	99	136	31.4
/ho/	205	174	125	126	157.5	39
/ma/	235	204	130	312	220.25	75.3
/mi/ (1)	158	211	268	176	203.25	48.4
/mi/ (2)	230	202	278	242	238	31.4
/me/ (1)	256	188	210	218	218	28.3
/me/ (2)	212	213	246	246	229.25	19.3
/ya/	231	208	95	240	193.5	67
/yu/	211	211	168	142	183	34
/ri/	231	161	192	154	184.5	35.1
/ro/	207	187	207	165	191.5	20
/wa/	207	166	156	175	176	22
/ai/ (1)	234	236	370	365	301.25	76.5
/ai / (2)	293	249	260	305	276.75	26.5
/ie/	240	235	280	240	248.75	20.9
/oi/	214	196	220	-	210	12.4
/kii/	201	188	-	-	194.5	9.1
/koo/	214	144	-	-	179	49.5
/sii/	214	222	-	-	218	5.6
/suu/ (1)	412	275	-	-	343.5	96.8
/suu/ (2)	280	252	-	-	266	19.7
/tii/	213	208	-	-	210.5	3.5
/too/	249	199	-	-	224	35.3

/nii/	263	260	-	-	261.5	2.1
/roo/	198	171	-	-	184.5	19

APPENDIX C — F0 VALUES

F0 values for the mono-moraic nouns spoken in word isolation, tokens (1) and (2). Token (3) is uttered as answer to “what is this?”. (Note that only selected tokens were obtained for this category.) *All values are given in Hz.*

Word	Token 1	Token 2	Token 3	Word	Token 1	Token 2
/i/	142-186	149-163		/na/ (2)	130	155
/e/ (1)	156	156		/ni/	155	152
/e/ (2)	160	160		/ne/ (1)	156	156
/e/ (3)	160	*		/ne/ (2)	145	145
/o/	163	156	145-216	/ne/ (3)	145	136
/ka/	164	154	164	/ha/ (1)	152-163	150
/ki/	164	149-168	149-168	/ha/ (2)	141-170	146-172
/ki/	172	179	179	/hi/ (1)	207	190
/ke/	166	186	186	/hi/ (2)	183	186
/ko/ (1)	158-188	155-183	183-210	/hi/ (3)	197	172
/ko/ (2)	183	156-231	156-231	/ho/	175	172
/sa/	*	160-146	132-98	/ma/	140	130
/si/ (1)	161-148	152	152	/mi/ (1)	*	*
/si/ (2)	156	160	177-188	/mi/ (2)	172	149
/su/ (1)	*	121-158	121-158	/me/ (1)	148	145
/su/ (2)	140	164	164	/me/ (2)	139-163	149
/se/	137	131	158-168	/ya/	136	137
/ta/	131	130		/yu/	156	158
/ti/	153	158		/ri/	163	160
/te/	158	161		/ro/	156	148
/to/	161-192	160-205		/wa/	161	148
/na/ (1)	139	141				

* = Pitch extraction was not possible.