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Aspects of the pitch-accent system of Ibuki-jima

Robb, Thomas N., Ph.D.

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300 N. Zeeb Rd.
Ann Arbor, MI 48106

ASPECTS OF THE PITCH-ACCENT SYSTEM OF IBUKI-JIMA

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By

Thomas N. Robb

Dissertation Committee:

Timothy Vance, Chairperson
Iovanna Condax
P. Gregory Lee
Anatole Lyovin
Ho-min Sohn
James M. Unger
Arthur Thornhill

Abstract

This dissertation explores the pitch accent of Ibuki-jima, Kan'onji City, Kagawa Prefecture, Japan which had been discovered, in the mid-1960's to maintain the 5-way distinction for 2-mora nouns which is documented in the Ruijuumyougisho, a dictionary compiled in 1081. As described in Wada(1966b) not only does a 5-way distinction exist, but there is also a difference in the manifestation of the pitches between different age groups. The dissertation reconfirms Wada's observations concerning the 5-way distinction for 2-mora nouns using a statistical approach, discriminant analysis. Further, it is demonstrated that for the 3-mora nouns, there are only 5 valid accent classes although some scholars (Uwano and Sato) have claimed that up to seven exist.

Using the model for Japanese pitch-accent proposed in Pierrehumbert & Beckman (1988) sequences of the 3-mora nouns are analyzed to determine the degree and manner that 'catathesis' applies in the dialect. We conclude that catathesis most likely does apply, but unlike Osaka, focus, does not cause a lowering of the F_0 for words that start Low.

In emulation of Pierrehumbert & Beckman, the dissertation presents an algorithm for generating pitch contours for Ibuki accent classes using a set of parameters including declination, maximum and minimum F_0 levels, accent

peaks as a percentage of available pitch range, focus increment, and catathesis. To demonstrate the validity of the algorithm, a computer program, IBUGEN, is used to produce contours which are matched with pitch extractions of actual utterances. The program is available as 'ibugen.tar.z' over Internet by anonymous ftp from ftp.Hawaii.edu.

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Chapter 1

Background

Introduction

This dissertation is a study of the accent system of a unique dialect of Japanese, that of Ibuki-jima, Kan'onji City,[1] Kagawa Prefecture. It was Shuuko Senoo, at that time a graduate student at Kagawa University, who originally discovered that this dialect preserved the original five classes of two mora nouns which were reported in the *Ruijumyoogisho*, a document of the Late Heian period (1081). This document indicated pitch by the position of a dot to the right of each kanji graph. See Martin(1987:167) for further details.

My interest in this dialect stems from a summary of Wada(1967) found in a pre-publication version of Martin (1987). The fact that a dialect possessing the original five-way distinctions for five-mora nouns was still alive in Ibukijima appears to be the main point of interest for many scholars. For me, however, the same report presented more puzzling data. First it reported that the children on the island, while maintaining the 5-way distinction, had a different accent pattern for some of the classes, and second, it appeared that for two of the classes, traditionally labelled 2.2 and 2.3, the adult's and child's patterns were virtually the opposite. This state of affairs, going against my linguistic intuitions, has resulted in this study. See the

section on Previous Scholarship below for a more detailed discussion of research questions.

There have been numerous reports on the dialect, including Wada (1967a,b), Yamaguchi (1971), Kindaichi (1977), Kindaichi (1978), Sato (1986) and Uwano(1986) but even Uwano who collected a copious word list has done no more than categorize the lexical items and attempt a possible phonemic analysis of the tonemes.

Ibuki-Jima--Physical Description

Ibuki-jima, with a population of approximately 2,000, is a small island in the Seto Inland Sea, 8km due west of Kanonji-shi on the Shikoku mainland with which is politically affiliated. It can be reached by a boat which makes five daily round trips taking 40 minutes in each direction. There are an elementary and a junior high school on the island, but high school students must make the daily commute to one of the high schools in the main city of Kanonji. Apart from a number of small stores selling sundries and provisions there are no commercial establishments on the island. As is the case with many other rural areas, many of the males of working age have departed for greener pastures, the majority working in the Hanshin area. Apart from the fishermen, the island is mainly populated by women, children and the elderly.

The main industry is fishing, in particular for sardines, which are boiled and dried and sold as 'niboshi

iwashi.' There are no rice paddies on the island, but a small area is devoted to raising vegetables and fruit.

One clear sign of the island's historical isolation is the paucity of family names on the island. Below is a list culled from a telephone directory (1980) of all family names occurring more than 5 times.

Fukuda	7	
Gooda	45	(Also common in Kan'onji-proper)
Ise	36	(Only 14 in Kan'onji-proper)
Iwata	24	
Kawabata	12	
Kubo	21	(Also common in Kan'onji-proper)
Manabe	25	
Matsumoto	12	
Miyoshi	111	(Approx 70% of all listed for Kan'onji)
Ookawa	10	
Shinohara	19	
Toyoura	6	

Particularly, the disproportion of the Ise and Miyoshi family names on the island, as well as the existence of common family names in Kan'onji-proper which do not exist on the island (such as Takahashi - over two pages of listings in Kanonji) speaks clearly for the island's historical isolation.

Linguistically, the Ibuki dialect shares most features of Kagawa dialects, syntactically, morphologically and lexically. Only the accent system and some fairly straight-forward phonological processes, separate it from its neighbors. There are also several hundred archaic words in active use in Ibuki, but these are most likely common in other Inland Sea dialects, as well. See Kubo (1974) for a

compilation of these words produced for the Ibukijima Elementary School.

Previous Scholarship

Senoo (1966)

As stated above, Senoo (1966) was the first to note the 5-class distinction in 2-mora nouns. Her published report simply reported three classes for standard 1-mora nouns (which because the vowel is lengthened have two moras in most Kansai dialects), 5 classes of 2-mora nouns, what appears to be two classes of adjectives (she lists three examples YOI 'good' LH, NAI 'not' LH, and KOI 'dense" HL), one class for 3-mora adjectives LHL, the standard 3 classes for 2-mora verbs, IKU 'go' HH, KAKU 'write' LH, and ORU 'exist' HF and 3 classes for 3-mora verbs, LHH.

Wada (1966a); Wada (1966b)

According to Senoo's postscript, it was Minoru Wada of Kobe University who, upon seeing copies of her presentation handout, realized the significance of her discovery. Wada then went with Senoo on two occasions in February and March of 1966,and the findings are reported in Wada (1966a) and Wada (1966b). Wada (1966b) is presented in full translation in Appendix 1. Below are the essentials concerning the 2-mora nouns:

CLASS	WORDS	ADULTS	BOTH	CHILDREN
2.1	niwa, miti		HH	
2.2	hasi('bridge')	HL-L		HF/HH-L
2.3	yama, tuki	HM/HH-M		HL-L
2.4	sumi, sora		LH/LL-H	
2.5	ido, mado	LH/LH-L		LF/LL-F

(H = high; M = mid; L = low; F = falling)

Table 1.1
Summary of data presented in Wada(1966a)

This provocative report raises a number of questions, answers for which were not to be found therein:

1) How can the children have a system where the basic pattern of 2.2 and 2.3 words is almost the reverse of the adult system? Is it possible for two accent patterns to shift in opposite directions and cross without actually merging?

2) Can the difference in the adult's system and children's system be explained by a simple and coherent rule?

3) Does the fact that the children are different from the adults indicate that the dialect is actually in transition? It does indeed seem a little strange to think that a dialect which has preserved a system, and in most cases the same pitch contours, for nearly a thousand years could just now be caught in the midst of a change. Our conclusion speculates on this but the answer to this question must await a future investigation.

4) Does the fact that all 5 classes of 2 mora nouns are retained mean that all 7 (or 10) classes of 3 mora nouns are also extant?

5) Are there any other aspects of the pitch accent system which are remarkably different from other dialects, and possibly relics of an earlier stage of the language?

Yamaguchi (1971)

Yamaguchi went to Ibuki-jima for the purpose of confirming the existence of the five accent classes, which we did. He reported, however, that for him, the 2.1 and 2.3 classes seemed to be very similar and that it was extremely difficult to hear the difference. Contrary to this, Wada had said that it was 2.2 and 2.3 that were similar.

Yamaguchi proposed using a different symbol, akin to an accent grave, to mark the 2.3 class, in effect suggesting that a single phonemic opposition (HIGH/LOW) was not sufficient..

Uwano (1985)

Zendo Uwano, who has surveyed innumerable dialects, surveyed Ibuki in the spring of 1983 and compiled a lengthy list of 1-4 mora nouns and verbs. He lists 6 classes for 3-mora nouns, which we shall argue later is too many based on the evidence at hand.

Sato (1985)

Sato, going to the island at about the same time as Uwano, also found 6 classes of 3-mora nouns and 10 classes of 4-mora nouns, considerably more than in any other dialect to the knowledge of this writer. Since Sato's data for 3-mora noun agrees closely with Uwano (above), we shall primarily concern ourselves with Uwano (1985) below.

Sources of Data

The data presented herein was gathered in the period from 1977 through 1980 in four trips to the island and in an additional trip in November of 1990. The main adult informants were 1) Goda Sode(GS)[2] aged 78 at time of first recording, 2) Ise Mitsu(IM), aged 77, who provided a second set of utterances for some of the lists used. For the 1990 recordings, 3) Miyoshi Kuni (MKn), aged 83, and 4) Fukuda Kikue (FK), aged 88 were the primary informants.. Four junior high school students (hereafter 'JHS') were also used: Miyoshi Tomomi(MT), Morimoto Kaoru(KM), Okawa Kanami (OK) and Goda Sayuri (GSy) all of whom were 13 years old at the time of the recording in 1979.

The following materials form the bulk of the corpus:

1. Martin phrase list - A list of some 600 phrases was produced, each of which incorporated one or more words listed in Chapter 5 of Martin (1987)[3]. Forms were chosen which 1) would yield useful data on the accent classes of nouns and

2) could be presumed to be in current use. Most words which were unanimously pronounced as High-Unaccented in dialects were omitted since a previous sample indicated that the Ibuki forms also followed suit. The list was elicited from Goda Sode by having her repeat the phrases after her daughter who read the list. Two JHS informants, MT and MK also recorded the list. MT read the items with MK repeating them after her.

2. "Ano hako" set - This set is a series of phrases of the form:

ANO + noun + particle + verb/adjective

These phrases were designed to elicit multiple samples of nouns in classes 2.1, 2.2 and 2.3 for statistical analysis. All of the nouns contained only low vowels to guard against devoicing phenomena which would make F_0 determination more difficult. The phrases were placed on index cards which were shuffled prior to each set of elicitations. Each of the two main adult and the two main child informants read through the set five times each. See Appendix 6 for a list of the phrases used.

3. "Tera ni" set - Elicited concurrently with the "Ano Hako" set, these consisted of phrases of the following form:

noun + particle + verb/adjective

4 "Kodomo ga kotori wo koota" (6x6) set

Nouns representing 6 hypothetical accent classes were substituted in two slots for a total of 36 combinations. The purpose was to gather sufficient data to refute Uwano's claim

for an H2 class of 3-mora nouns. Secondly, this set allows a detailed analysis of how the pitch contour is affected by the presence of a following or preceding word of another pitch class. Thirdly, it allows us to investigate the role of focus; i.e.,the relative prominence of noun-1 vs. noun-2 under various elicitation conditions.

H0	kodomo ("child")	kotori ("bird")
H1	mago ("grandchild")	megane ("glasses")
H2	itoko ("cousin")	komugi ("wheat")
M0	nakama ("friend")	hasami ("scissors")
L0	titi ("father")	kabura ("turnip")
L2	ani (older brother)	monaka ("bean cake")

Note that some 2-mora nouns were unavoidably used for the first slot despite the fact that 3-mora nouns would have been more desirable. The set, however, required a noun designating a kind of familial or inter-personal relationship which restricted the field from which lexical items could be drawn. Fortunately, the overall F_0 pattern for these classes is invariant; the contour is merely spread over more morae as necessary. For 3-mora nouns, one point was input for each mora, for a total of four points, including the final particle. For the two mora nouns, since we are 'one mora short,' four points were selected at approximately evenly-spaced intervals in a manner which most faithfully represented the accent contour.

The sentences were elicited in three ways:

1) A straight reading

2) As an answer to the question, XXXX ga nani o kootekita? ' What did XXXX buy?'

3) As an answer to the question, YYYY wo koota no wa dare? 'Who bought YYYY?'

Two complete sets were recorded from informant MKn, and one additional set from FK. While a greater number of sets might have been desirable from a statistical standpoint, it was important not to overtax the informants. At any rate, we shall see that these data are, indeed, sufficient to support the claims to be made.

5 "Oosaka no musuko ga kuruma o koota" set (O/K Focus Set)

The purpose of this set was to gather multiple instances of a few crucial combinations in order to 1) check the effect of focus on the pitch contour and 2) check the interaction of declination and catathesis.

There were four sentences:

Accent Types, Word:	1	2	3
Oosaka no musuko ga kuruma o koota (My Osaka son bought a car.)	H0	H0	H0
Oosaka no musume ga kimono o koota (My Osaka daughter bought a kimono.)	H0	H2	H0
Koobe no musuko ga megane o koota (My Kobe son bought some glasses.)	H1	H0	H1
Koobe no musume ga boosi o koota (My Kobe daughter bought a hat.)	H1	H2	H1

Condition 1 - Error in the thing bought

I made a false statement which the informant then corrected, for example,

"Oosaka no musuko ga KIMONO o koota yaroo" ('Your Osaka son bought a kimono, right?')

to which the informant replied,

"Oosaka no musuko ga KURUMA o koota" (My Osaka son bought a CAR.')

There were 12 instances of each sentence in this set.

Condition 2 - Error in the person who bought it

This run was similar to that above but the informant replied with the correct person. I asked,

"Kimono wo koota no wa, Osaka no musuko deshoo" ('The person who bought the kimono was your Osaka son, right?') to which the informant replied:

"Oosaka no MUSUME ga kuruma o koota" ('It was my Osaka DAUGHTER who bought the kimono')

The sentences in this set were elicited 5 times.

6. "Oosaka no otooto ga kabura o koota" set (O/K length Set)

This set was designed to check the effect of length on declination and catathesis:

Oosaka	ane	kuruma	H0	H0	H0
Koobe	haha	megane	H1	M0	H1
Ø	musuko	kabura	--	H0	L0
	otooto			H0	

This set had 3 x 4 x 3 (=36) combinations and I have two sets of responses from one informant (MKn) and one set from another(FK).

7. Short sets

The following sets of data have been collected but will be dealt with at a later date.

a. 2-Mora Nouns + MO

b. Compound nouns with the following first elements

i.	azuki "beans"	xi.	isi "rock"
ii.	tikara "strength"	xii.	iro "color"
iii.	abura "oil"	xiii.	haru "spring"
iv.	inaka "countryside"	xiv.	umi "ocean"
v.	usiro "behind"	xv.	kuro "black"
vi.	koori "ice"	xvi.	kuti "mouth"
vii.	tamago "egg"	xvii.	suna "sand"
viii.	hitori "one person"		
ix.	yama "mountain"		
x.	kome "rice"		

c. Compound nouns with the following second elements:

i.	ya "person who sells"
ii.	gawa "side"
iii.	heya "room"
iv.	iro "color"

d. Numerical counters with numbers from one to ten.

-mai	sheets	-hon	cylinders
-satu	books	-taba	bundles
-ko	generic	-ji	hours
-nin	people	-hiki	animals
-wa	birds	-too	"head"(animals)

Note that, whenever feasible, the items in the sets were elicited in random order. For sets 4, 5, and 6 the data were first randomized by computer and then copied onto the sheets presented to the informants. For sets 3 and 4, randomization was achieved through a card shuffling procedure.

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[1]The name of the city is pronounced /kaNoNji/ with moraic nasals which is at variance with the standard reading pronunciation, /kaNnoNji/. The apostrophe will be dispensed with henceforth.

It is also appropriate at this point to mention the system of Romanization that will be used throughout this work. All

words cited in the text for their linguistic value will use the "kunrei" system while proper names of scholars, informants, place names, historical documents, etc. will use the more familiar Hepburn system. Long vowels will be doubled rather than using a macron.

[2]The names of informants will be given in traditional Japanese order of family name+given name. The Western order, however, will be applied to the names of Japanese scholars.

[3]In reality, a previous version of the list, distributed in 1978 was used as the basis. The published list is an expansion thereof which includes not only more words, but references to more dialects, including Ibukijima, the data for which was drawn from Uwano(1985).

Chapter 2

Accent Theories

On the Correlation between Fundamental Frequency and Perceived Pitch

The data to be presented in later chapters relies crucially on the accurate translation of the fundamental frequency as shown in the spectrograms and fundamental frequency extractions into basic High and Low pitched moras. While it would be extremely convenient if one could read the Highs and Lows directly from the F_0 in the manner illustrated in Fig. 2.1, such is unfortunately not the case. In fact, there are a number of factors, including devoicing,the voicing of the

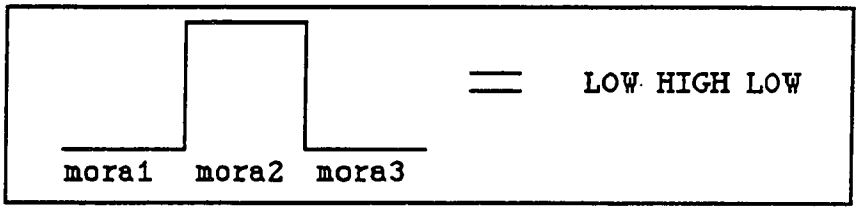

Figure 2.1
Idealized, hypothetical pitch contour

mora-initial consonants, downdrift, vowel height and speech rate which make this task surprisingly complex.

Sugito (1982) presents a compilation of a series of experiments which she and her colleagues conducted to ascertain the effects of these various factors. Since her work has appeared mainly in Japanese publications, we will review her findings in some detail in this chapter.

Pitch or Amplitude

Sugito presents with convincing evidence that pitch is the primary factor in determining Japanese accent. Her evidence comes from a number of experimental sources. In an examination of a large corpus of utterances of known pitch patterns, she cites numerous examples of words in which the mora with the strongest amplitude carries a tone which is universally accepted as being low.

Sufficient conditions for determining accent type.

Sugito quotes Kindaichi (1967) who attempts to establish minimal conditions for determining accent types for the Tokyo dialect. In his discussion, Kindaichi uses three segmental homonyms and states rules a-d:

1a.	OKA-SHI	('Mr. Oka')	HLL
b.	OKASHI	('cakes')	LHL
c.	O-KASHI	('lend')	LHH

a) For HLL it is only necessary for the first mora to be higher than the second. The third mora is free to vary.

b) For LHL, i) the second mora must be higher than the third mora, and ii) the second mora cannot be lower than the first mora.

c) For LHH, i) the third mora should not be but slightly lower than the second mora, and ii) the second mora should not be lower than the first.

d) For words of four or more morae, one additional rule is required: For a series of 3 or more successive low morae, there must be no intermediate rises or falls.

In terms of features these rules can be stated thus:

	HLL	LHL	LHH
M1 > M2	+	-	-
M2 > M3		+	-

(We have not worried about the condition in c, "should not be more than slightly lower than the 2nd mora" because all Kindaichi is doing by stating this is allowing for a slight declination due to downdrift. If we ignore downdrift, his rule could then be rewritten as: c) For LHH, 1) the third mora must be at least as high as the second mora.) Sugito counters by citing the fact that 1a) usually undergoes a process of "OSOSAGARI" (literally 'late falling'), in which the physical drop in pitch does not occur until well into the 2nd mora. This process is common when the second mora begins with a voiceless consonant. For 1c, she continues, it is usually the case that the third mora is considerably lower than the second mora yet still is perceived as H. Additionally, the third mora is often devoiced, which means that there is no measurable F_0.

Sugito makes the following assertions (p. 74-75)

1) The locus of accent is usually manifested by a fall in pitch in the succeeding mora.
2) Pitch slowly decreases over successive syllables ("downdrift"), but except in the case of a drastic

drop in pitch, following syllables are not perceived as being lower.

3) In a long word, such as WASUREMONO ('forgotten item') in Osaka, if succeeding moras maintain exactly the same pitch, the final mora will be perceived as being slightly higher than the others.

4) The pitch of a mora with a devoiced vowel can be determined by the pitch of the previous mora and the behavior of the succeeding mora.

Successive chapters of Sugito (1982) describe a series of experiments in which informants reported their perceptions of syllables in which the pitch was systematically varied. Some of the most revealing experiments are reproduced below. In each experiment, the synthesized utterances were reproduced randomly on tape with each utterance occurring five times.

1) Variation in the height of a level F_0 in M1 with M2 being a constant sharp fall (p.138-141). A total of 19 synthesized utterances, as shown in Figure 2.2, were randomly recorded on tape, 5 times each, with an additional 5 dummy utterances at the beginning which were discarded. Informants listened to the tape 6 times each, thus judging each synthesized utterance a total of 30 times.

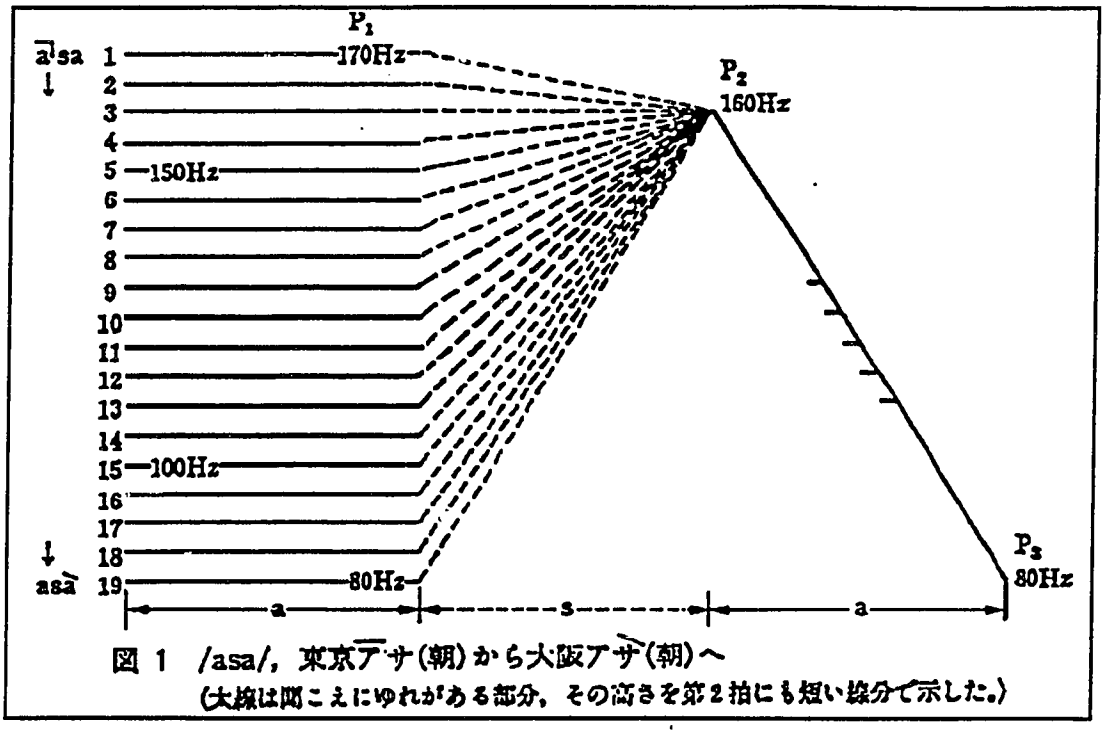

図 1 /asa/, 東京アサ(朝)から大阪アサ(朝)へ
(大線は聞こえにゆれがある部分, その高さを第2拍にも短い線分で示した。)

Figure 2.2
/asa/ systematically varied from HL (Tokyo 'morning') to LF (Osaka 'morning')

The bolder lines (utterances 9-13) indicate the perceptual boundary between the ASA (HL) (Tokyo 'morning') and ASA (LF) (Osaka 'morning'). Two of the subjects (MS & AS) were native Tokyoites, while the latter two (KN & YI) were speakers of the Osaka dialect.[1] The poorest discriminator of the 4 subjects made errors of judgement over 4 of the variations (9 through 12) while the best discriminator (Miyoko Sugito herself!) was ambivalent only on line 9.

According to these data, only when the second mora starts its fall from a point greater than 30Hz above the F_0 of the first mora, was the second mora perceived as falling (F).

2) Variation in the height of a level F_o in M1 with M2 being a level 130hz[2]. (pp. 141 - 143)

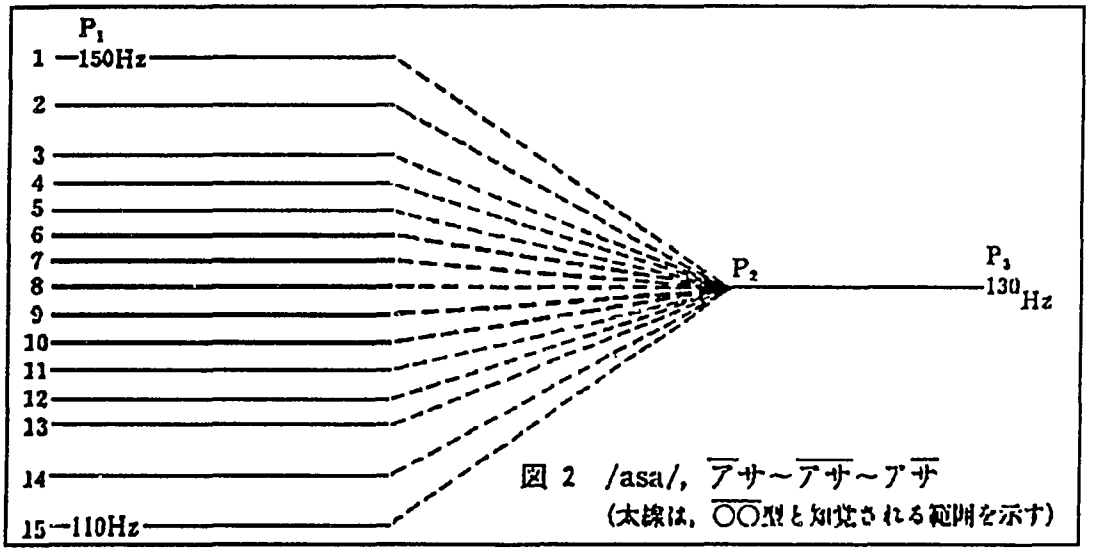

Figure 2.3
Variation in the height of the first mora with the second held constant at 130Hz for the phrase /asa/
(See Figure 2.4 for data for each informant)

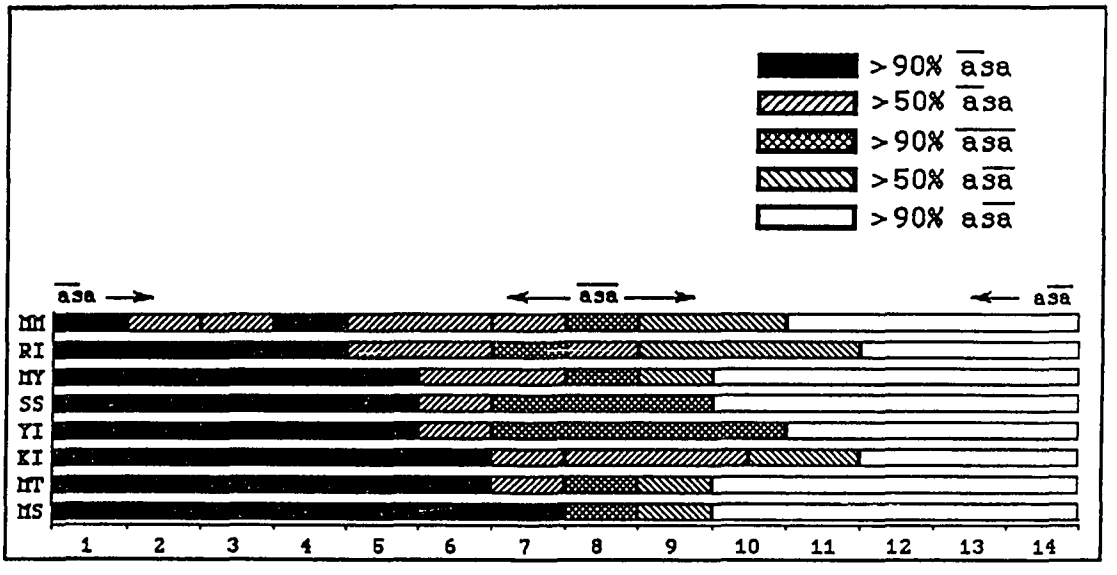

Figure 2.4
Judgments of 8 informants showing the percent of each type perceived (HL, HH, LH) for each of 15 synthesized utterances

As can be seen in Figure 2.4, the word ASA was perceived as HH when the first mora was approximately 2-4hz above the second mora. It is actually quite interesting that the band where a level HH is perceived is actually quite narrow. Six out of the eight informants perceived as HL utterance #5 in 90% of the cases despite the fact that there was only a 6hz drop.[3]

3) Systematic variation of the onset of rise and fall. (p. 158-160)

This experiment was done with a more sophisticated algorithm for synthesis which could combine two separate waveforms, one for the voicing and another for the pitch contour, allowing separate control of their respective onsets and lengths. In the Figure 3, the circled utterance number identify those utterances which were the perceptual boundaries between the two accent types shown on the top and bottom of each column. The word used was AME, which has a meaning in only two of the four accent classes, HH being 'candy' and LF being 'rain' in the Osaka dialect, the LH and HL forms generated are thus nonce forms. Utterances were thus identified by the informants by pitch class rather than by the meaning of the word. The data was presented in the same fashion as the earlier experiments with the 11 utterances in each column being randomly reproduced 5 times. A separate tape was prepared for each column in Figure 2.5.

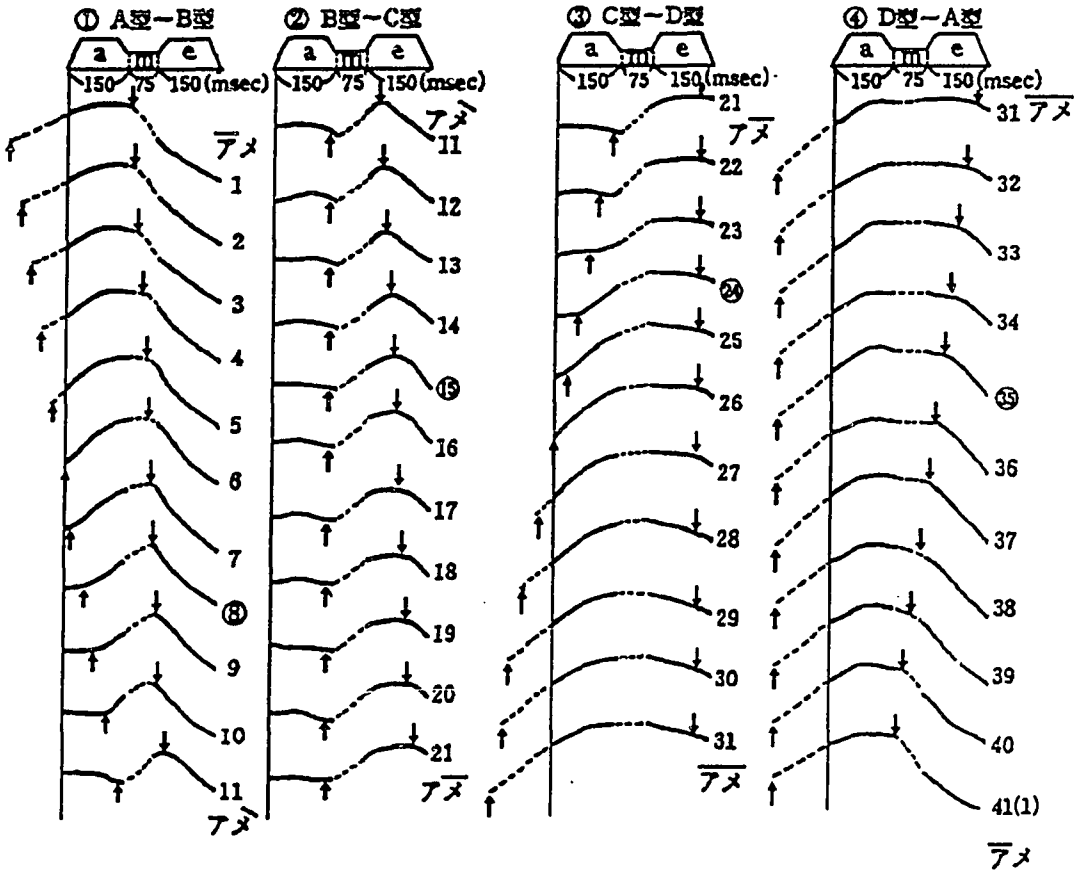

Figure 2.5
Gradual variation of locus of rise and fall for the sequence /ame/. From Sugito(1982) p. 160.

Of particular interest is that fact that a contour (column 1) is not judged to be LF unless the onset of the second mora is considerably higher than the highest point in the previous mora. Thus despite the sharp fall in utterance #7, it is still perceived to be HL. Further, as observed in column 2, once the duration of the fall has been shortened and the locus of fall moved towards the center of the segment, the utterance is perceived as LH. It thus appears than LF is only possible when 1) the fall runs over the

entire mora and 2) the onset of the fall is considerably higher than the high point at the end of the first mora.

The most important generalization that we can derive from these data is that the end point in a mora is the most important factor in determining the perceived pitch of the mora.

Conclusion

From perception experiments reported in Sugito(1982) we have noted that of the four patterns, HH,HL,HF and LH, HH and HF in particular are perceived in a rather narrow range of values.

Review of Robb(1986)

Robb(1986) was intended to be part of this dissertation, but the dynamics of Japanese university life forced its early publication. The aspects of Robb(1985) and Robb(1986) which deal with statistical confirmation of the existence of 5 noun classes will be reported in Chapter 3. Here we shall review the noun contours from the data and apply the findings of Sugito(1982) in order to reconcile the reports of Wada and others with the observed fundamental frequency contours.

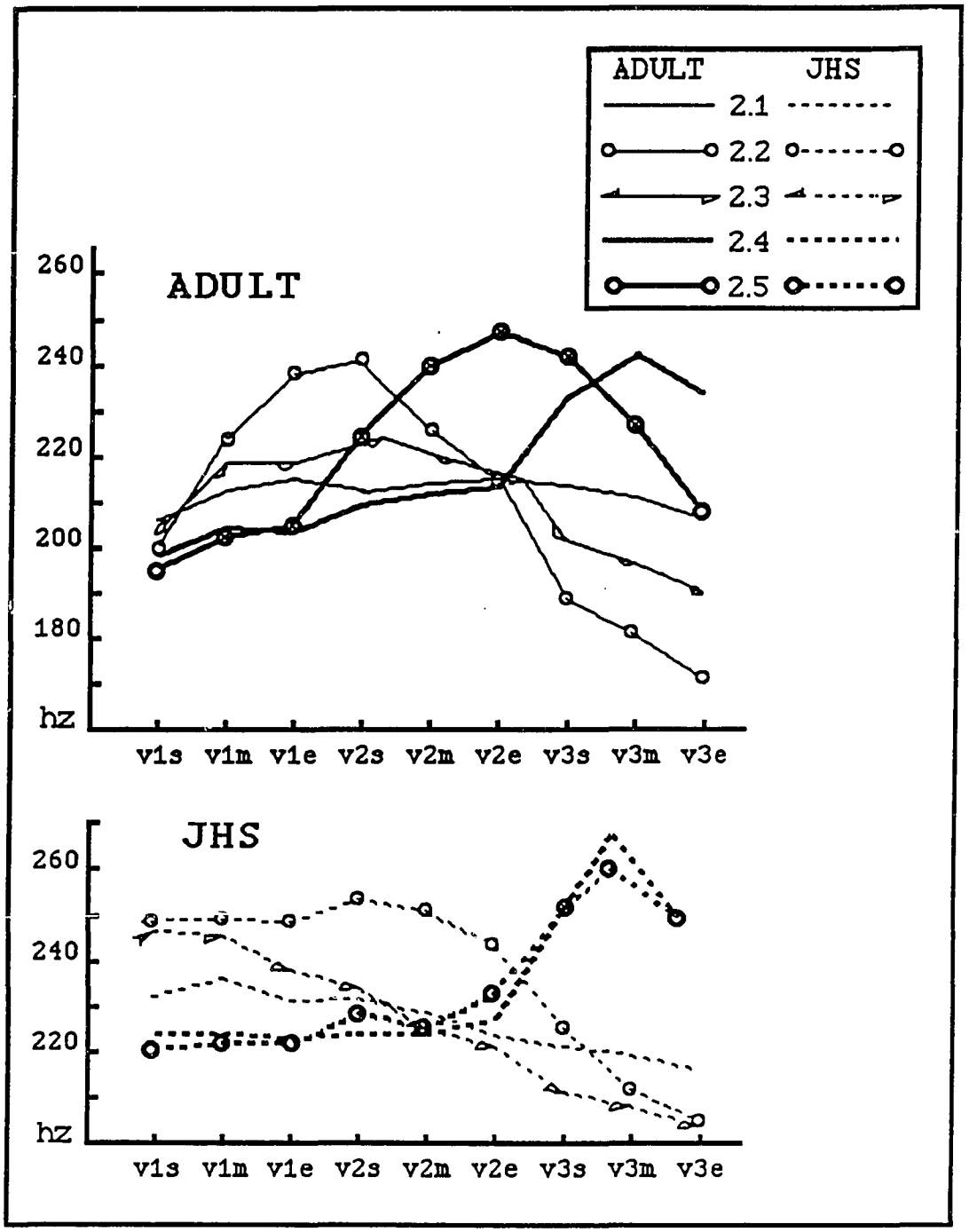

Figure 2.6
Two-mora noun contours for Adults and JHS

Before looking at each tone class individually let us observe Figure 2.6. Apart from the variation in the location of peaks for some of the classes, a striking difference between the adult and JHS informants is the onset. Note that in all cases the onset for the adults comes from below, while for the JHS subjects, the onset is fairly level. We shall see below that this across-the-board rule (be it the adults who lower the onset or the JHS who raise it) is one of the factors which causes the pitch for some classes to be perceived as different for the two groups. Consider the 2.2 class, for example. Figure 2.7 illustrates the averaged contours for the adults (solid line) and the JHS informants (dotted line) for the class Uwano labels "H1."

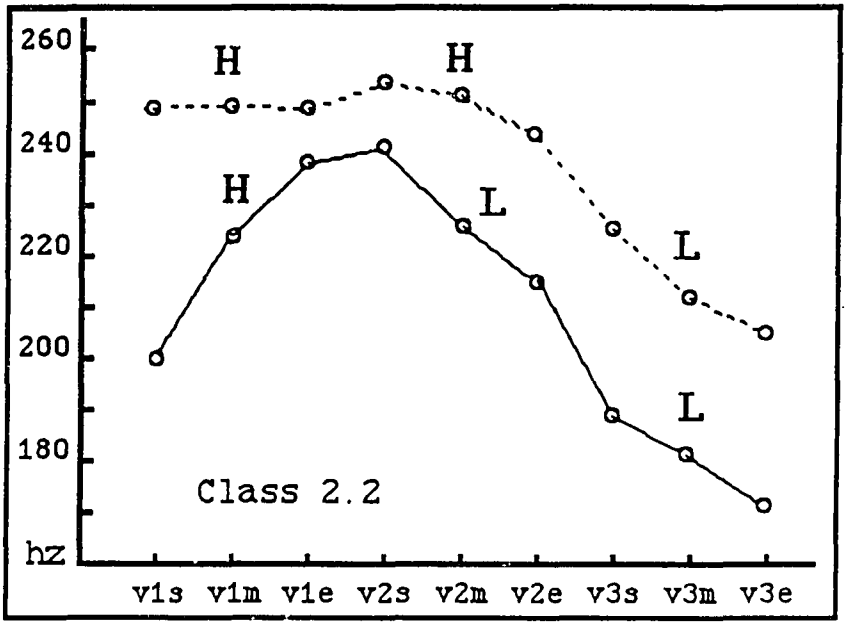

Figure 2.7
Adult and JHS contours for noun class 2.2

First note that for both age groups the slope from the peak to the end of the utterance is nearly identical. A glance below at Figure 2.8 (class 2.3) reveals that for this class, too, the slopes from the peak onwards are identical, although quite distinct from class 2.2 The two charts are overlaid as Figure 2.9 for ease of comparison.

Next, returning our attention to class 2.2, recall that Wada(1966) (data reproduced below as Table 2.1 for ease of reference) reported that the JHS pattern sounded High-Falling (HF) without a particle and HH-L with a particle attached. The JHS have delayed the fall so that the drop begins

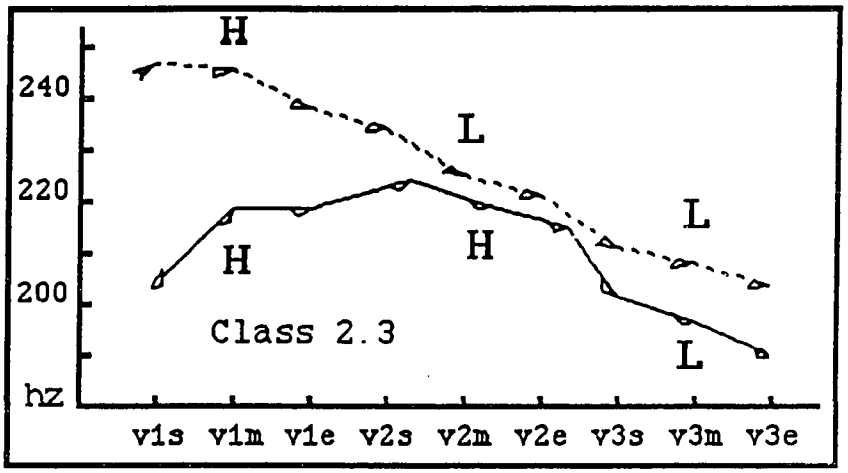

Figure 2.8
Adult and JHS contours for noun class 2.3

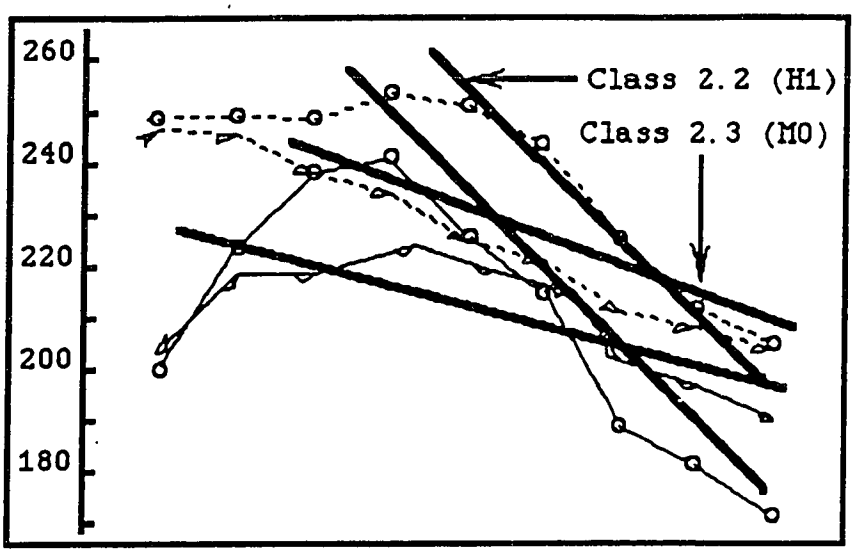

Figure 2.9
Adult and JHS contours for noun classes 2.2 and 2.3 compared with slopes marked

more slowly, dropping more precipitously as time increases. The net effect of this is that the end of mora-2 is still not low enough for the mora to be perceived as Low. Referring back to Figure 2.5 from Sugito(1982) we can see that the Adult form is most similar to contours 40 through 3 (contour 41 = contour 1) while the JHS utterance in more akin to contours 33-35.

For class 2.3, one could say that the JHS utterance has no peak since there is fairly smooth downward slope from beginning to end. One could, however, posit a "peak" at a similar location to that in the Adult utterance and then claim that the mechanism which elevates the onset of JHS utterances has caused the peak to disappear. In other words, one could derive the JHS contour from the Adult contour by rotating the initial segment of the adult utterance upward.

Regardless of how this variation has arisen, the net effect of the change is that the second mora is no longer heard as High. The slope contrasts with both class 2.1 (H0) which has virtually no slope (Figure 2.10), and class 2.2 (H1) which has a rather abrupt one. Thus, class 2.3 is labeled as High-Mid.

CLASS	WORDS	ADULTS	BOTH	CHILDREN
2.1	niwa, miti		HH	
2.2	hasi('bridge')	HL-L		HF/HH-L
2.3	yama, tuki	HM/HH-M		HL-L
2.4	sumi, sora		LH/LL-H	
2.5	ido, mado	LH/LH-L		LF/LL-F

(H = high; M = mid; L = low; F = falling)

Table 2.1 (Repeat of Table 1.1)
Summary of data presented in Wada(1966a)

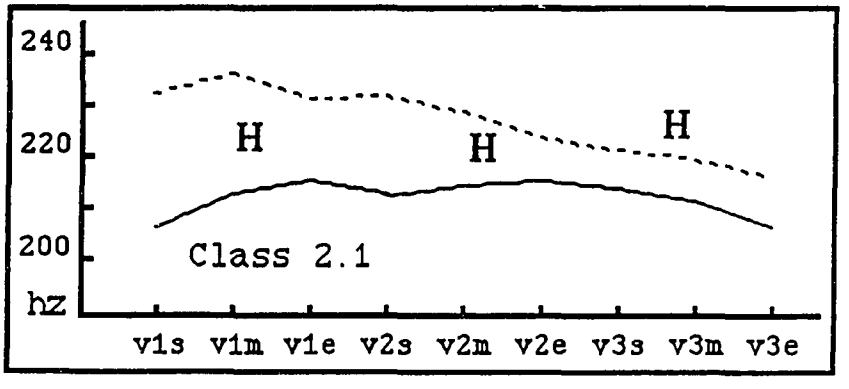

Figure 2.10
Adult and JHS contours for noun class 2.1

Now we turn our attention now to the two Low-starting classes. For Class 2.4 (low-starting, unaccented) we observe that the contours for both groups are quite similar. The major difference between the two is the initial slope. Here, as with the other classes, the JHS subjects have raised the onset. Pivoting the onset of the Adult utterance upward at point v2s would make the two contours almost identical.

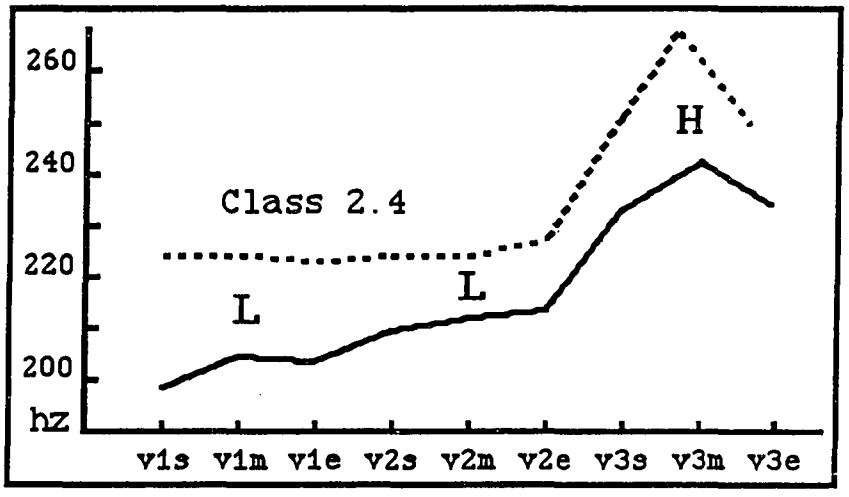

Figure 2.11
Adult and JHS contours for noun class 2.4

Class 2.5 (Figure 2.12) is in some ways the most interesting class since here not only have the JHS subjects shifted the peak, they have made the contour almost identical with that of the unaccented class 2.4 (Figure 2.13).

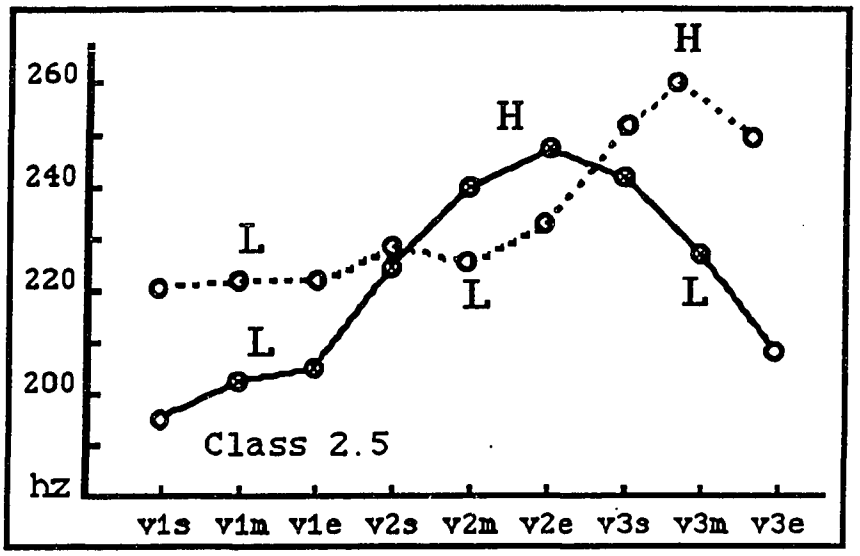

Figure 2.12
Adult and JHS contours for noun class 2.5

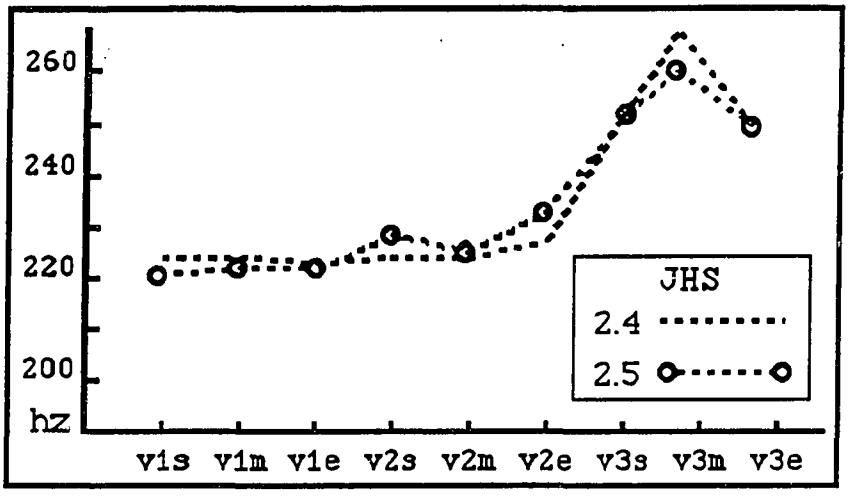

Figure 2.13
JHS contours for noun classes 2.4 & 2.5 compared

Conclusion

We have noted that the the Adult and JHS utterances are not as different as one might be led to believe by looking only at the differences in their manifestations in terms of High and Low pitches. The JHS speakers have regularly raised the onset (relative to the adults) for each class. Further,

this raising combined with a modest shift towards the end of the word in the locus of fall in the H1 and L2 classes results in a major difference in the interpretation of the tones.

---

[1]One of the four subjects was Sugito Miyoko, herself. Her judgements varied only on line number 9 with everything above and below being perfectly discriminated. The other three subjects exhibited a buffer zone of 15-20hz (3-4 lines).

[2]Rather than needlessly clutter the diagram with the initial frequencies of each utterance, I shall list them here: 150, 145, 140, 138, 136, 134, 132, 130, 128, 126, 124, 122, 120, 115, & 110.

[3]As summarized in Martin (1979ms:32-33) both the 2.4 and 2.5 classes were marked LH in the RMS. He suggests that this might be due to the difference only appearing when they were followed by a particle, such as is true in the modern Kochi dialect. 2. McCawley (1974:42) cites data from Valdis Zeps on Latvian dialects which exhibit a similar phenomenon of a "buffer area." He observes that Zeps' conjecture, that a buffer area arises when "marked pronunciations" on both sides of the border correspond to "unmarked pronunciations" of the other side. This explanation, McCawley states, also holds for the Kyushu single-accent buffer area, but would not apply to the case of Ibuki since the only "unmarked category," 2.1 is shared by all accents of the area and thus does not fulfill Zeps' conditions.

Chapter 3

Two-Mora Nouns

It can be extremely difficult to discriminate Ibuki noun classes 2.1, 2.2 and 2.3 merely by ear. A clear indication of this is the fact that Wada (1967a) and Yamaguchi (1969) cannot agree on which two of the three classes are the hardest to distinguish. Wada states that 2.1 and 2.2 are very similar, while Yamaguchi, disagreeing with Wada, states that 2.1 and 2.3 are difficult to differentiate.

As a preliminary exercise, we should try to determine, with some degree of precision, that there are, indeed, five classes of two mora nouns. Robb (1985) and Robb (1986) both attempted to accomplish this through statistical methods (T-tests), but with little success. Below we will review those two attempts and then move on to a more refined technique, discriminant analysis, which will set to rest any lingering doubts about the existence of five classes.

Robb (1985)

Robb (1985) observes that when the difference between classes is so slight, the traditional method of overlaying multiple F_0 traces from spectrograms or pitch extraction readouts is inadequate. Two things confound the problem. One is there is inherent variation in pitch contours; utterances will not always be pronounced with exactly the same shape. The other is that not all utterances examined

will be the same total length, making them difficult to overlay unless their length is somehow normalized.

Robb (1985) made use of a set of 216 utterances, consisting of three words each from classes 2.1, 2.2 and 2.3 and one word each from classes 2.4 and 2.5.[1] To avoid problems with possible devoicing, words were chosen containing only non-high vowels (/a/, /e/ and /o/)[2]

Robb (1985) plotted initial, mid and end points of morae to surmount problem of variation in length, while normalizing the values of each speaker's utterances to make comparison of utterances from adults and children feasible. Then taking two of the classes at a time, t-tests were performed on all values for the initial, mid and end points of the vowel of each mora. This process resulted in significant F-values for those places where the contours had noticeably different mean values. Unfortunately, the most crucial case, adult 2.1 vs adult 2.3 produced no significant difference! None of the t-values at any point exceeded the critical value of 2.30 at a .05 level of significance (with 8 degrees of freedom).

Robb (1986)

This attempt added one more innovation to the above which resulted in a more effective analysis. Rather than comparing the normalized values at each point, the *change in frequency* or slope between adjacent points was measured. This time, the t-tests for the slopes for the adultsrevealed

some extremely significant figures, especially between two sets of points Mora-2-Mid<->Mora-2-end and Mora-2-end<->Mora-3-Initial, one or both of which were significant at the .01 level for pair-wise comparisons of classes 2.1, 2.2 and 2.3.

There is, however, one major flaw in the procedure used in both Robb(1985) and Robb(1986): the use of multiple t-tests is normally frowned upon. If, for instance, 20 t-tests are run and one proves to be significant at the .05 level, this could be a fluke since the .05 level itself means that there is one chance in 20 that the measured value is due to chance.

Discriminant Analysis

Discriminant Analysis (henceforth, "DA") is a method for predicting the class an object belongs to on the basis of a set of predicting variables for that object. In terms of the present study, DA can be used to predict the class of an utterance on the basis of a series of F_0 measurements. For an excellent discussion of this method, the reader is referred to Wilkinson (1989:292-299).

To my knowledge, the only report of discriminant analysis applied to F_0 contours is Demenko et al (1987), who investigated the characteristics of eight intonation patterns in Polish. In Demenko, however, the number of variables input was made equal to the number of assumed classes, eight in their case. With the Ibuki data, however, we shall see that

even 3 measurements can be sufficient to predict all five classes with a reasonable degree of accuracy, although a greater number of points yields, at times, better results.

Since there are obvious differences between the adults and the JHS speakers, separate analyses were performed on the respective subsets of the data, as well as on all 216 cases together. In the analysis, a maximum of 12 data points were used, each of which is designated by an abbreviation:

S = Start, M = Mid, E = End, H = High Point

Thus, M1H refers to the high point of Mora 1.

As will be seen, DA is an art rather than an exact science. Numerous statistical measures are available through regression analysis, but none could accurately predict the best subset of values for yielding a DA with the highest predictive value. Generally speaking, however, the more points that were incorporated into the predictive model, the more accurate the results were. For the complete, mixed data set of both Adult and JHS, a 'hand-picked' set of four variables performed better than any other systematic measure, as can be seen in Table 3.4 below.

Tables 3.1, 3.2 and 3.3 show the results of the DA when all 12 available variables were used in the regression model for the entire data set, the adults and the JHS, respectively.

CLASS	1	2	3	4	5	TOTAL TOKENS	Misassign-ments
1	**46**	2	9	0	1	58	12
2	1	**47**	11	0	1	60	13
3	12	6	**38**	0	2	58	20
4	0	0	0	**16**	4	20	4
5	1	0	0	7	**12**	20	8
TOTAL ASSIGNED	60	55	58	23	20	216	57

Table 3.1
Discriminant analysis of 216 2-mora noun tokens (JHS & Adult) using all 12 variables

CLASS	1	2	3	4	5	TOTAL TOKENS	Misassign-ments
1	**29**	0	1	0	0	30	1
2	1	**26**	2	1	0	30	4
3	5	2	**22**	0	1	30	8
4	0	0	0	**9**	1	10	1
5	0	0	0	1	**9**	10	1
TOTAL ASSIGNED	35	28	25	11	11	110	14

Table 3.2
Discriminant analysis of 110 2-mora noun tokens (Adult) using all 12 variables

CLASS	1	2	3	4	5	TOTAL TOKENS	Misassign-ments
1	**20**	2	6	0	0	28	8
2	0	**30**	0	0	0	30	0
3	2	2	**23**	0	1	28	5
4	0	0	0	**8**	2	10	2
5	0	0	0	4	**6**	10	4
TOTAL ASSIGNED	22	34	29	12	9	106	19

Table 3.3
Discriminant analysis of 106 2-mora noun tokens (JHS) using all 12 variables

Data on the above three trials as well as other runs using subsets of data are presented in Table 3.4 below. "Best 6" refers to those variables which had the highest univariate F-scores on the prior run with all 12 variables. The following trial in each of the three informant sets was based on a hand-picking of variables which from prior experience seemed to represent crucial points in the contours. The next set of variables was based on those with the highest standardized coefficients in a straight regression analysis in which the class was the dependent variable and all 12 points (plus a constant) were used an independent variables. The lines labelled "Factor Analysis" will be discussed in the next section.

	CLASS->	1	2	3	4	5	Errors
Adult+JHS	**TOTALS->**	**58**	**60**	**58**	**20**	**20**	**=216**
	12 Variables	46	47	38	16	12	57
	Best 6	46	44	37	16	13	60
	1E,2S,3M,3E	45	48	42	19	13	49
	1E,2H,3S,3H	48	39	35	17	15	62
Factor Anal.	1S,2S,2E,3E	33	48	39	19	12	65
Adult	**TOTALS->**	**30**	**30**	**30**	**10**	**10**	**=110**
	12 Variables	29	26	22	9	9	14
	Best 6	28	25	22	10	8	16
	1E,3M,3E	24	26	23	9	10	17
	1E,2H,3S,3H	29	26	19	10	9	17
Factor Anal.	1S,2S,2E,3H	24	26	19	10	9	32
JHS	**TOTALS->**	**28**	**30**	**28**	**10**	**10**	**=106**
	12 Variables	20	30	23	8	6	19
	Best 6	19	26	25	7	8	23
	1M,3M,3E	18	19	20	8	7	36
	1E,2M,3E	18	30	17	5	5	31
Factor Anal.	1S,2M,3M,3H	21	29	24	7	9	16

Table 3.4
Results of discriminant analysis with different combinations of variables

Predicting New Cases

One might object to the results of the discriminant analysis reported above since the very same data used to generate the predicting matrices was then used as the basis for forming new predictions. The true power of DA comes from its ability to predict the class assignment of new data which had not been previously "seen" by the procedure.

For illustrative purposes, this was done using the Adult 110 cases as the basis. The SYSTAT random generator was applied to the data set, dividing it into two sets of approximately 80 percent and 20 percent of the data. The larger set (84 "training" cases) was then used to generate the predicting matrices which were then applied to the other 20 percent (26 "test" cases). All 12 variables were used in the model.

CLASS	1	2	3	4	5	TOTAL TOKENS	Misassign-ments
1	**9**	0	2	0	1	12	3
2	0	**4**	0	1	0	5	1
3	1	0	**2**	0	0	3	1
4	0	0	0	**3**	0	3	0
5	0	0	0	0	**3**	3	0
TOTAL ASSIGNED	10	4	4	4	4	26	5

Table 3.5
Discrimnant analysis of 26 2-mora noun tokens (Adult) based on 84 predictor utterances (12 variables input)

The run on the "test" utterances produced 5 mis-assignments out of a total of 26 predictions for a 80 percent

success rate. This is not a good as the rate for all 110 utterances (87 percent) shown in Table 3.2 above, but is in the right ballpark. The "training" items exhibited a remarkable predictive rate of 79 accurate assignments out of 84 items (94 percent). It would thus appear that the "test" items selected included an disproportionately large number of outliers. Such is the luck of the draw.

Factor Analysis of the Data

A "factor analysis" is one way to isolate the factors which underlie our data. This statistical method derives abstract "factors" or "components" by assigning "weights" for each of the factors it produces, for each of the original variables which have been input into the analysis. From such an analysis we can determine, for example, that all of the M1 variables contribute essentially the same information towards predicting the accent class of any given word since they all show similar weightings for the same factors, that is, they all "load" on the same factor.

In addition to the variables for points in time, our data also includes a "grouping" variable, the five accent classes, which would influence the results of a factor analysis. The SYSTAT MGLH module, according to Wilkinson(290), allows the effect of the grouping variables to be removed, the factor analysis then being computed on the resulting residuals. The results of componential factor

analyses of the Adult and JHS data are presented in Tables 3.6 and 3.7.

		1	2	3	4
1	M1S	**0.882**	0.000	0.277	0.000
2	M1M	0.877	0.000	0.356	0.000
3	M1E	0.861	0.000	0.440	0.000
4	M1H	0.851	0.000	0.439	0.000
5	M2S	0.000	**0.970**	0.000	0.000
6	M2M	0.301	0.619	0.528	-0.400
7	M2E	0.411	0.000	**0.845**	0.000
8	M2H	0.411	0.000	0.844	0.000
9	M3S	0.461	0.000	0.833	0.000
10	M3M	0.369	0.000	0.820	-0.297
11	M3E	0.399	0.000	0.654	-0.591
12	M3H	0.358	0.279	0.650	**-0.593**

Table 3.6
Factor analysis of 110 Adult utterances,
sorted rotated loadings on first 4 principal components
(loadings < 0.25 made 0.0)

		1	2	3	4	5
1	M1S	**0.883**	-0.295	-0.271	0.000	0.000
2	M1M	0.859	-0.352	-0.300	0.000	0.000
3	M1E	0.847	-0.343	-0.317	0.000	0.000
4	M1H	0.823	-0.281	0.000	0.000	0.325
5	M2S	0.581	-0.436	-0.429	0.413	0.000
6	M2M	0.269	**-0.901**	0.000	0.000	0.000
7	M2E	0.310	-0.872	0.000	0.000	0.000
8	M2H	0.413	-0.834	0.000	0.000	0.000
9	M3S	0.271	-0.762	0.000	0.479	0.000
10	M3M	0.483	-0.257	**-0.826**	0.000	0.000
11	M3E	0.298	-0.285	-0.812	0.382	0.000
12	M3H	0.341	-0.454	-0.322	**0.737**	0.000

Table 3.7
Factor analysis of 106 JHS utterances
sorted rotated loadings on first 4 principal components
(loadings < 0.25 made 0.0)

The two factor analyses are rather similar. Both have a first factor which loads most heavily on the first mora, with subsequent factors loading on progressively later sets of points. The Adult set, however, has a clear second factor

the end of M2 and the beginning of M3. In both groups the final point, 3E and the high point 3H load on a discrete factor, although the tendency is more pronounced with the Adult set.

These data would seem to suggest that a good strategy for selecting points for the Discriminant Analysis would be to choose the variable with the highest loading on each factor, which in our case, basically means points which are evenly spaced in time.

The last line in each group of Table 3.4 shows the results of a DA performed in this manner. In the case of the JHS speakers, this resulted in a superior analysis. Four factors, 1S, 2M, 3M and 3H were sufficient to predict 85 percent of the cases, yielding 3 more "hits" than when all 12 factors were used.

With the Adults and the combined sets, however, the results were inferior to the other approaches. We can thus conclude that there is no single metric which permits the selection of an optimal set of variables for a discriminant analysis.

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[1]In retrospect, 3 items from each class would have been more desirable. However, at that time, I was more interested in ascertaining the differences between the first three classes, the differences between the last two, 2.4 and 2.5 being rather clear. The JHS data includes only 4 instances of each /hana/ phrase ('flower' and 'nose') which reduces the total JHS utterances to 106 vs 110 for the adults.

[2]One exception is /niwa/ where the initial /n/ blocks devoicing.

Chapter 4

Three Mora Nouns

While one of the most important research questions was to determine whether the Ibuki dialect maintained the 7-way distinction for 3 mora nouns which is evident in the RMS, it now appears that this is, unfortunately, not the case.

Uwano (1985) does, in fact, posit 7 classes of 3 mora-nouns for Ibuki, but these classes only partially correspond to the 7 classes hypothesized by modern Japanese scholars (See Martin 1988;162). In this chapter, we will see that there is sufficient evidence to warrant only a 5-way distinction in Ibuki, of which four classes, H0,M, L0, and L2 show close correspondence with the 3.1, 3.4, 3.6 and 3.7 classes, respectively.

A Brief Outline of 3 Mora Noun Typology

Martin lists the following original classes, given below with examples[1]:

3.1	HHH	inaka, kodomo, kuruma, mukasi, yanagi
3.2	HHL	aida, ekubo, higasi, mukade, tobira
3.3	HLL	awabi, misaki, musume, tikara, wasabi
3.4	LLL	atama, hakama, kagami, katana, momizi, uzura
3.5	LLH	asahi, kagura, kokoro, makura, sazae, warabe
3.6	LHH	karasu, nezumi, tubame, unagi, usagi
3.7	LHL	itigo, kabuto, kuzira, mekura, tubaki

Table 4.1
Examples of 3-mora nouns in 7 Ruijuumyoogisho classes

The classes can be generally considered to have the following counterparts in the modern Tokyo, Kyoto and Kagoshima dialects, although there are numerous exceptions:

	Tokyo		Kyoto		Kagoshima		Ibuki	
	Contour	Class	Contour	Class	Contour	Class	Contour	Class
3.1	LHH	0	HHH	0	LHL	A	HHH	H0
3.2	LHH	0	LHL	1:3	LHL	A	LHL	L2
&	HLL	1	HLL	0				
3.3	LHH'	3	HLL	2	LLH	B	HHM	M0
							&	
3.5	HLL	1	HLL	2	LLH	B	HLL	H1
3.4	LHH'	3	HLL	2	LLH	B	HHM	M0
3.6	LHH	0	LLH	1	LLH	B	LLH	L0
3.7	LHH	0	LHL	1:3	LLH	B	LHL	L2

Table 4.2
Tokyo, Osaka, Kagoshima & Ibuki 3-mora classes

(Terms for the accent classes of each dialect are from Hirayama. The 3.1 through 3.7 designations refer to the seven original classes attested in the *Ruijumyoogisho*.)

As can be seen from this chart, classes 3.2 and 3.3 are the most confused, with no clear-cut groupings in these or any extant dialects of Japanese[2], nor with any apparent systematic correspondences based on the segmental structure of the words.

Kyoto and most Kansai dialects thus have only a 4-way distinction for 3 mora nouns. The classes labeled as 0, 1 and 1:3 (which we will refer to below as H0, L0 and L2, respectively) show similar F_0 contours in Ibuki, while Kyoto 2 (M0 below), exhibits a gradual fall in the same manner as

the two-mora 2.3 class. This accent pattern is consistent with the original RMS patterns for both 2- and 3-mora nouns which were LL and LLL, respectively.

To these four classes, it appears that Ibuki has either maintained a fifth distinction or has added a category in recent history, which we will call H1, following Uwano (1985). Membership in this class, however, is distributed over a number of RMS classes with a handful of words from classes 3.2, 3.3, 3.4 and 3.5. No pattern to their distribution is apparent based on vowel height, consonant voicing, a pre-RMS a/b (koo/otsu) vowel distinctions.

Ibuki 3-mora Classes

Our discussion will be structured as follows. First we shall review the class distinctions claimed by Uwano and quickly discount his claim for a 7th class which he labels L3. Next we shall look at the evidence for his 6th class, called H2 and argue that it also is not justified. We shall present arguments from a variety of standpoints: 1) an examination of the F_o contours, 2) the philological relationship of his H2 words to the original classes, and 3) a Discriminant Analysis of the 3-mora noun classes.

The class types as outlined in Uwano (1985) are presented in Table 4.3[3]:

	Class	Pattern	Examples
H0	HHH		sakura, kodomo, kuruma, kotori
H1	H'LL		awabi, misaki, uzura, wasabi, megane
H2	HH'L		higasi, itoko, minami, musume, komugi
M0	HHM		atama, abura, inoti, nakama, hasami
L0	LLL(-H)		karasu, kaeru, usagi, kabura
L2	L'HL		kusuri, monaka
L3	LLH'		sakki, noroma, magure, monpe

Table 4.3
Ibuki 3-mora classes according to Uwano(1985)

Uwano's Seventh Class--L3

Uwano(p.84) hypothesizes a seventh category, L3, which we shall promptly dispense with. He provides only four examples, SAKKI, NOROMA, MAGURE and MONPE. Two of these, SAKKI and MONPE contain a vowel-less second mora, while NOROMA ('dullard') is listed as both L2 and L3.

MAGURE is listed with (DE) in parenthesis following it. Unlike other particles such as WA, GA and NI, DE will normally not accept an accent in Ibuki. two-mora L0 words poken in isolation have a high final mora (LH), but when a particle is attached, such as WA, GA or NI, it is the particle that receives the accent (LL-H) since such particles are bound to the previous noun to form a single accentual phrase

L L H H H H
UMI NI OYOGU

With DE, however, we find this form:

L H L H M L L H
UMI DE KAI O TORU

'Find shells at the sea'

Since Uwano elicted MAGURE with the DE particle attached, LLL forms will be pronounced as LLH-L. Further, since he made a special note of the fact that DE was attached, he most likely was aware of the fact that it was the DE which produced the LLH contour.

Thus, while words of the L0 class will normally stay LLL, passing the H onto the following particle, in this case, even with a particle attached, the word will remain LLH. This most likely lead Uwano to assign it to the L3 class since it appeared that the accent always remained on the third mora. MAGURE is most likely L0, as it is in the Kyoto dialect.

Uwano's Sixth Class--H2

Uwano's H2 class, comprising words he observed to be of an HHL contour, consists of the following items: KOMUGI ('wheat'), MOMIZI ('maple'), MUSUME ('daughter'), ITOKO ('cousin'), HIGASI ('east'), MINAMI ('south') and four numbers, all of which contain a geminate consonant: MITTU ('three'), MUTTU ('six'), YATTU ('four') and YOTTU ('eight').

There are some dialects where the locus of fall has been hypothesized to be between geminate consonants (Osaka) and others where the fall comes before the geminate pair (Tokyo), there is no dialect which makes use of both distinctively. It is thus largely an academic exercise to determine whether the accent falls after the first mora or after the second for

such items. We shall therefore concentrate our attention on the non-geminate items.

The data we shall be working with is summarized in the two graphs below, representing the fundamental frequency contours of the 6x6 set in Word-1 and Word-2 position, respectively. Note the compression of the contours in the Word-2 graph.

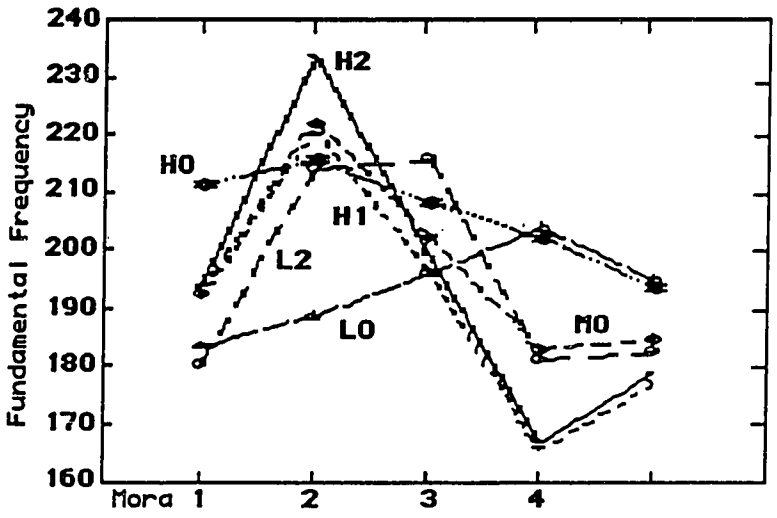

Figure 4.1
Six classes for Word-1 of the 6x6 utterance set

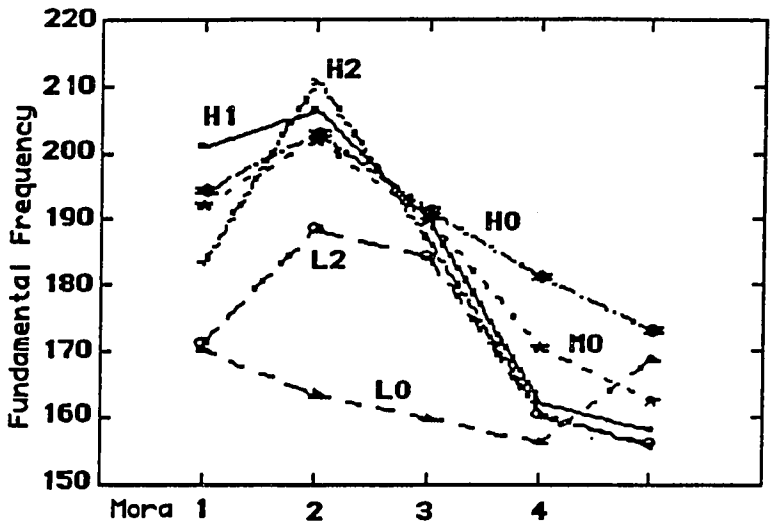

Figure 4.2
Six classes for Word-2 of the 6x6 utterance set

Figure 4.3 shows two purported H2 items along with one H1 item for reference. The values shown are averages from the 6x6 data from MKn. ITOKO occurred as WORD 1 while the other two items occurred as WORD 2. This accounts for the slightly higher F_o observed for ITOKO.

The patterns for all three words are very similar. The differences which are apparent have a straight-forward phonetic explanation. Both high vowels and voiceless stops tend to promote a higher F_o (cf. Hombert 1978). Thus ITOKO, which begins with a high vowel, followed by a voiceless consonant can be expected to have a higher-than-normal pitch on the second mora, whereas MEGANE containing low vowels and voiced consonants would be somewhat lower.

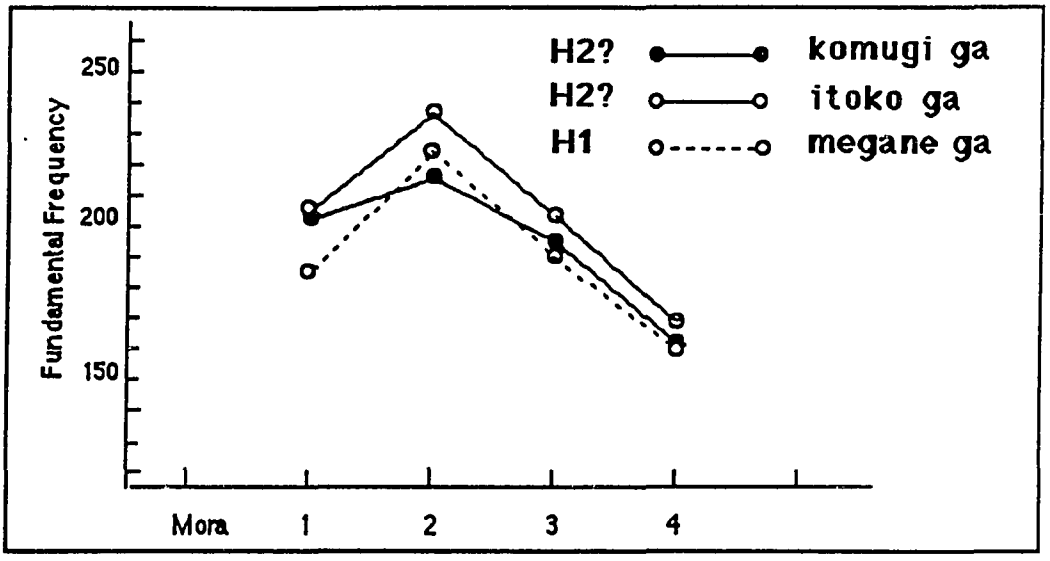

Figure 4.3
Purported H2 items compared to /megane-ga/(H1)

Figure 4.4 shows pitch tracings of both KOMUGI and MEGANE in the same environment. Both tracings show typical contours for the data analyzed. The first mora of KOMUGI is typically partially devoiced which accounts for its relatively short duration. For both words, the fall occurs near the END of the second mora despite the fact that fact that all scholars agree that MEGANE is H1. .

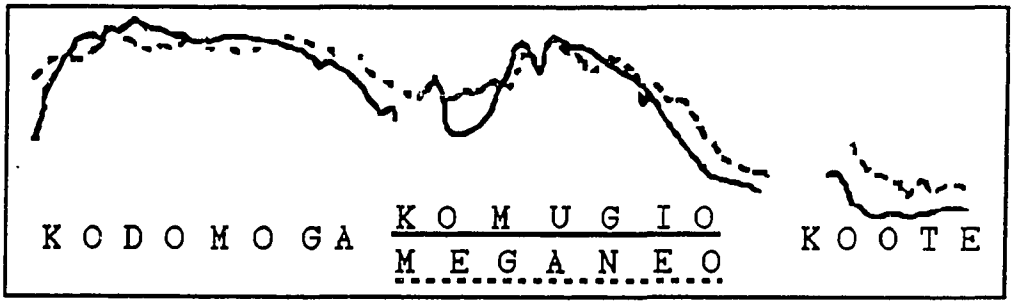

Figure 4.4
Tracings of KODOMO GA KOMUGI-O/MEGANE-O

Discriminant Analysis

Discriminant analysis was performed on 211 utterances or two runs through the 36 combinations x 3 types of focus. Five utterances were unsuitable for analysis thus reducing the set to 211 from the expected 216 (36 x 3 x 2).

While there are some aspects which make these data less than ideal as discussed in Chapter 1, the results can be considered valid for the points under discussion. The nouns used are reproduced below as Table 4.4:

H0	kodomo	kotori
H1	mago	megane
H2	itoko	komugi
M0	nakama	hasami
L0	titi	kabura
L2	ani	monaka

Table 4.4
Nouns used in 6x6 elicitation

At first glance, it would appear that the second column of items, containing all 3-mora nouns and mostly low-vowels, would form a reasonably good set for this analysis. Unfortunately, since the items were in second position in the elicited sentences, the pitch range had already been somewhat compressed resulting in a smaller pitch difference between items. Another problem had to do with focus assignment. The items with focus on Word-1 exhibited an even further reduction of pitch range. In addition, pitch distinctions appear to have been collapsed, perhaps through some sort of phonological neutralization process. For informant MKn, classes H1, M0, and Uwano's H2 appear virtually identical

when overlaid. For informant FK, this neutralization extends to class L2, as well.

All this notwithstanding, we shall see that the DA worked out reasonably well once items with Word-1 focus were removed from the analysis.

The DA was more successful with the first column, Word-1 items. Here however, we do not have a legitimate 3-mora H1 word, but rather a 2-mora stand-in. As explained in Chapter 1, however, four measurement points were chosen which allow the analysis to proceed as if this were a 3-mora item.

Word-2 Discriminant Analysis

The following DA was performed using the following points as dependant variables: all four points in Word-2 plus, the last point in Word-1, the first point in the following verb and the average frequency for all points in each case (in order to offset variations in pitch height caused by the previous word).

TABLE OF GROUP(ROWS) BY PREDICT (COLUMNS)
FREQUENCIES

	1	2	3	4	5	6	TOTAL
1	**18**	0	3	2	0	0	23
2	0	**16**	1	0	2	4	23
3	3	1	**13**	1	2	3	23
4	0	0	0	**22**	0	0	22
5	1	4	1	1	**17**	0	24
6	1	1	3	1	1	**18**	25
TOTAL	23	22	21	27	22	25	140

Table 4.5
Discriminant analysis on 6 purported 3-mora classes

		Predictions					
H0 + H2		1	2	3	4	5	TOTAL
G	1	**42**	1	2	2	1	48
R	2	4	**16**	1	0	2	23
O	3	15	4	**1**	1	2	23
U	4	0	0	0	**22**	0	22
P	5	0	4	0	1	**19**	24
TOTAL		61	25	4	26	24	140

H1 + H2	1	2	3	4	5	TOTAL
1	**18**	0	3	2	0	23
2	1	**41**	3	1	2	48
3	4	5	**11**	1	2	23
4	0	0	0	**22**	0	22
5	1	5	1	1	**16**	24
TOTAL	24	51	18	27	20	140

M0 + H2	1	2	3	4	5	TOTAL
1	**17**	0	4	2	0	23
2	0	**15**	6	0	2	23
3	3	5	**37**	2	1	48
4	0	0	0	**22**	0	22
5	1	3	1	1	**18**	24
TOTAL	21	23	48	27	21	140

L0 + H2	1	2	3	4	5	TOTAL
1	**17**	0	3	3	0	23
2	0	**13**	1	5	4	23
3	6	3	**5**	6	3	23
4	2	3	4	**36**	2	47
5	1	5	1	4	**13**	24
TOTAL	26	24	14	54	22	140

L2 + H2	1	2	3	4	5	TOTAL
1	**17**	0	3	2	1	23
2	0	**15**	0	0	8	23
3	3	1	**10**	1	8	23
4	0	0	0	**22**	0	22
5	1	5	5	3	**35**	49
TOTAL	21	21	18	28	52	140

Table 4.6
Discriminant analysis with H2 conflated, in turn, with each of the other classes

The 25 tokens in the H2 class, here labeled "group 6", were then combined in turn with each of the other 5 groups to determine which one it was most "compatible" with:

The results are far from clear. The H0+H2 combination, in particular, wreaked havoc with Group 3 (M0). On the basis of the highest scores, one could conclude that the H2 class was most similar to either H0 or H1. In both of these cases, as well as in the M0 case, the total number of correct estimates or "hits" exceeded the original results with the 6 separate classes:

	Additional Cases Correctly Predicted
H0 + H2 →42 vs 36 (18 + 18)	6
H1 + H2 →41 vs 34 (16 + 18)	7
M0 + H2 →37 vs 31 (13 + 18)	5
L0 + H2 →36 vs 40 (13 + 18)	-4
L2 + H2 →35 vs 35 (13 + 18)	0

Table 4.7
Additional cases predicted for each conflation of classes presented in Table 4.6

The L0 class was the most robust, being the least affected by conflation with the hypothesized H2 class.

Word-1 Discriminant Analysis

This analysis worked out much better, with H1 coming out the clear winner. Not only did the H2 items combine most successfully with this category, the total number of 'hits,' 62 out of a total of 69 possible, exceeded the total of each taken individually. No other class came near to matching the

		Predictions					
H0 + H2		1	2	3	4	5	TOTAL
G	1	**48**	15	3	2	3	71
R	2	12	**16**	4	0	2	34
O	3	25	0	**8**	0	2	35
U	4	2	0	0	**32**	1	35
P	5	4	1	4	1	**26**	36
TOTAL		91	32	19	35	34	211

H1 + H2	1	2	3	4	5	TOTAL
1	**34**	0	1	1	0	36
2	0	**62**	5	0	2	69
3	1	7	**26**	0	1	35
4	4	0	0	**29**	2	35
5	0	3	6	1	**26**	36
TOTAL	39	72	38	31	31	211

M0 + H2	1	2	3	4	5	TOTAL
1	**35**	0	0	1	0	36
2	0	**13**	20	0	1	34
3	4	5	**59**	0	2	70
4	4	0	0	**29**	2	35
5	1	1	9	1	**24**	36
TOTAL	44	19	88	31	29	211

L0 + H2	1	2	3	4	5	TOTAL
1	**29**	0	0	7	0	36
2	2	**18**	1	10	3	34
3	1	0	**2**	31	1	35
4	7	16	7	**32**	8	70
5	0	1	1	9	**25**	36
TOTAL	39	35	11	89	37	211

L2 + H2	1	2	3	4	5	TOTAL
1	**34**	0	1	1	0	36
2	0	**15**	4	0	15	34
3	2	1	**21**	0	11	35
4	3	0	1	**31**	0	35
5	2	13	7	1	**48**	71
TOTAL	41	29	34	33	74	211

Table 4.8
Discriminant analysis with H2 conflated, in turn, with each of the other classes (Word-1)

results as shown in Table 4.10 below.

TABLE OF FREQUENCIES	GROUP (ROWS) BY PREDICT (COLUMNS)						
	1	2	3	4	5	6	TOTAL
1	**34**	0	1	1	0	0	36
2	0	**19**	6	0	1	8	34
3	1	1	**28**	0	2	3	35
4	3	0	0	**30**	2	0	35
5	0	1	6	1	**27**	1	36
6	0	10	1	0	1	**23**	35
TOTAL	38	31	42	32	33	35	211

Table 4.9
Discriminant analysis on 6 purported 3-mora classes (Word-1)

	Additional Cases Correctly Predicted
H0 + H2 → 48 vs 57 (34 + 23)	-9
H1 + H2 → 62 vs 42 (19 + 23)	20
M0 + H2 → 59 vs 51 (28 + 23)	8
L0 + H2 → 32 vs 57 (30 + 23)	-25
L2 + H2 → 48 vs 50 (27 + 23)	-2

Table 4.10
Additional cases predicted for each conflation of classes presented in Table 4.7 (Word-1)

Other Arguments

From a philological viewpoint, it is hard to justify a class on the basis of so few items, particularly since they show no regular correspondence to any of original classes or with the current classes in related dialects. The H2 items also contain numerous instances of high vowels which can easily distort the basic tone melody through devoicing.

Summary

We have examined the lexical items which Uwano (1985) has assigned to a class labeled H2 and concluded that there is little justification for setting up a separate class. Our discussion took into account the actual pitch contours of multiple elicitations of the items in question, a visual comparison with the F_0 contours of items established to belong to the H1 class and a statistical procedure, Discriminant Analysis.

---

[1]English glosses for Table 4.1 are presented below in the same order that the Japanese words appear in the chart:

3.1 rural area,child,car,old times,willow
3.2 time interval,dimple,east,centipede,door
3.3 a shellfish, cape(prominence), daughter, strength, Japanese horseradish
3.4 head, skirt, mirror, sword, maple, quail
3.5 rising sun, court music, heart, pillow, a shellfish, infant
3.6 crow, rat, swallow, eel, rabbit
3.7 strawberry, helmet, whale, blind, camellia

[2]Martin gives the following comparison of the Narada dialect compared to the historic types, taken from Uwano which shows the Tokyo/Narada class 2 corresponding to 3.5b (HLL followed by L when a particle is attached which is hypothesized to be pre-RMS):

0	3.1, 3.5a, 3.6, 3.7a
1	3.3, 3.7b
2	3.5b
3	3.2, 3.4 2.

[3] The English glosses are as follows:

H0 cherry blossom, child, car, small bird
H1 shellfish, cape, quail, horseradish, glasses
H2 east, cousin, south, daughter, wheat
M0 head, oil, life, friend, scissors
L0 crow, frog, rabbit, turnip
L2 medicine, bean cake
L3 a while ago, dullard, chance happening, pantaloons

Chapter 5

Catathesis and Phrase-Level Phenomena

Pierrehumbert & Beckman and Catathesis

This chapter is concerned with the interaction of word class and focus on the contour of phrases which consist of a series of three nouns plus a final verb. We will use this data to demonstrate that the phenomenon of *catathesis* does operate in Ibukijima.

Roughly speaking, "catathesis" is merely what some scholars used to refer to as "downstep." According to Pierrehumbert & Beckman (1988) the term was withdrawn "out of deference to the opinions held by scholars of African tone languages, in whose usage that term is reserved for a particular class of cases of catathesis." (p. 58). The earlier term, "downstep," however, captures the essence of catathesis--each occurrence of an accented mora forces what follows to be uttered in a lowered pitch range.

This chapter will make extensive reference to Pierrehumbert & Beckman (1988) (hereafter, "P&B") which develops an comprehensive tone theory for the Tokyo dialect and to a slightly lesser extent for the Osaka dialect (based on the work of Kori, 1987).

Their claims for the Osaka dialect system can be summarized as follows[1].

1. Words can be either HIGH- or LOW-starting which is lexically marked as either a H% or L% initial boundary tone.

2. Unaccented words have a lexically-marked final H% boundary.

3. Accented words are marked by an HL at the locus of fall. This means that there is an H target for the pitch contour which is immediately followed by an L target, resulting in a precipitous drop in the fundamental frequency.

4. An H followed by an L, whether it be the accent HL or a boundary H% followed by an initial boundary L, results in *catathesis,* i.e. a significant lowering of the ceiling for future peaks in the utterance.

5. Catathesis is blocked by word focus occurring after the point in question.

6. L tones are scaled downward under increases in prominence and H tones are scaled upward (p. 224).

To state our conclusion first, we shall see below that these observations generally appear to hold true for Ibuki as well.

Word Shapes in Isolation

Figure 5.1 shows typical contours for utterances of each accent class using utterance-initial words with continuous voicing for uniformity of presentation.

The reader will note that in all but one case, the onset comes from below, reminiscent of the standard Tokyo dialect. In Ibuki, however, this rise occurs with all classes except L0; even the accent class which is claimed to have an accent on the first mora (the H1 class) exhibits a rising onset.

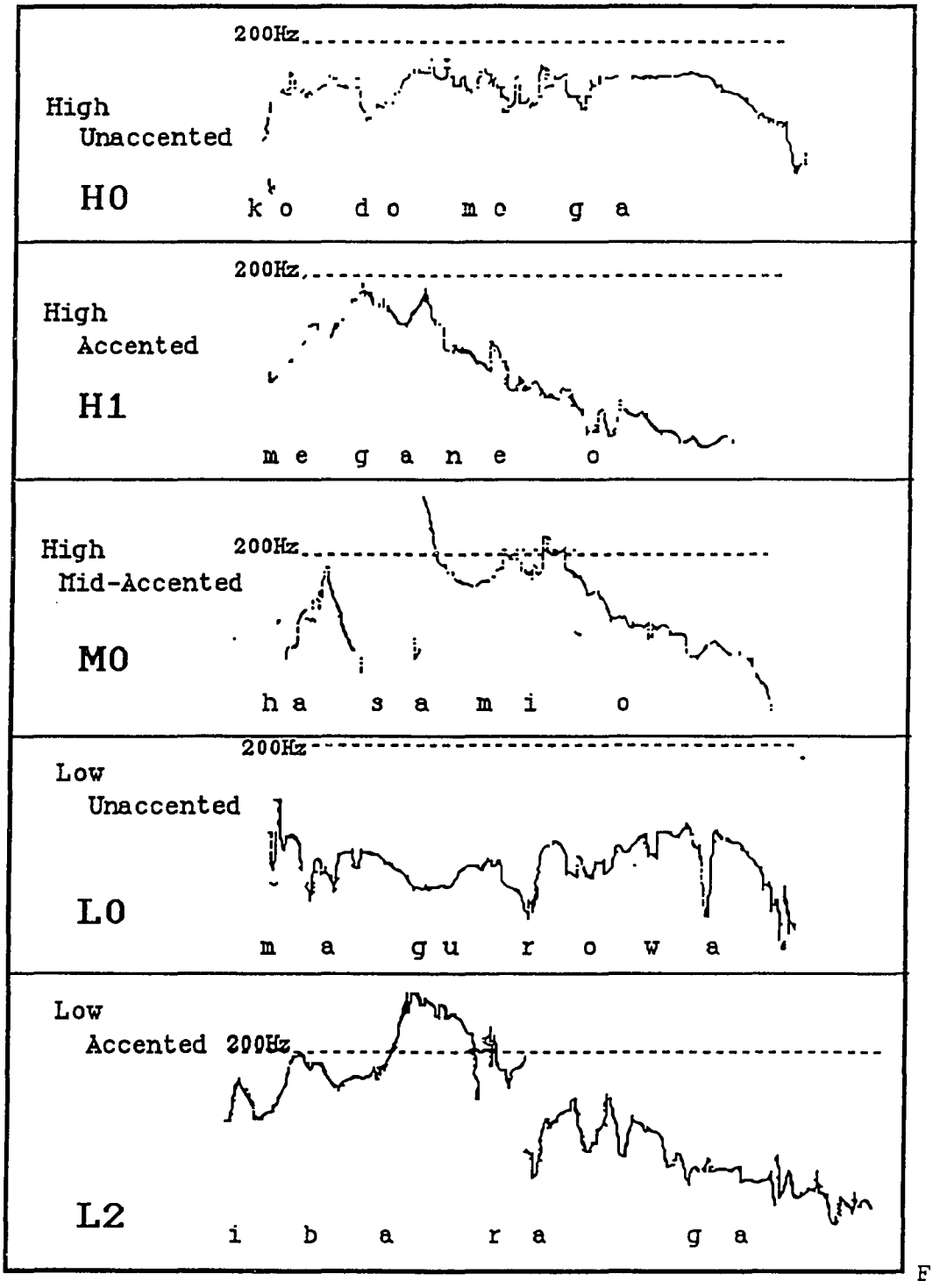

Figure 5.1
3-mora accent types in Ibuki

Of particular interest is the M0 group, which behaves similarly to the H1 group with the exception that the fall is not as abrupt. M0 words typically exhibit a fall from peak to word-end of approximately 40 Hz as opposed to 60 Hz for H1 items. The location of the fall in all cases appears to be identical with that for H1, i.e., at the beginning of Mora 2.

Figure 5.2 reproduces one of P&B's figures for the Osaka

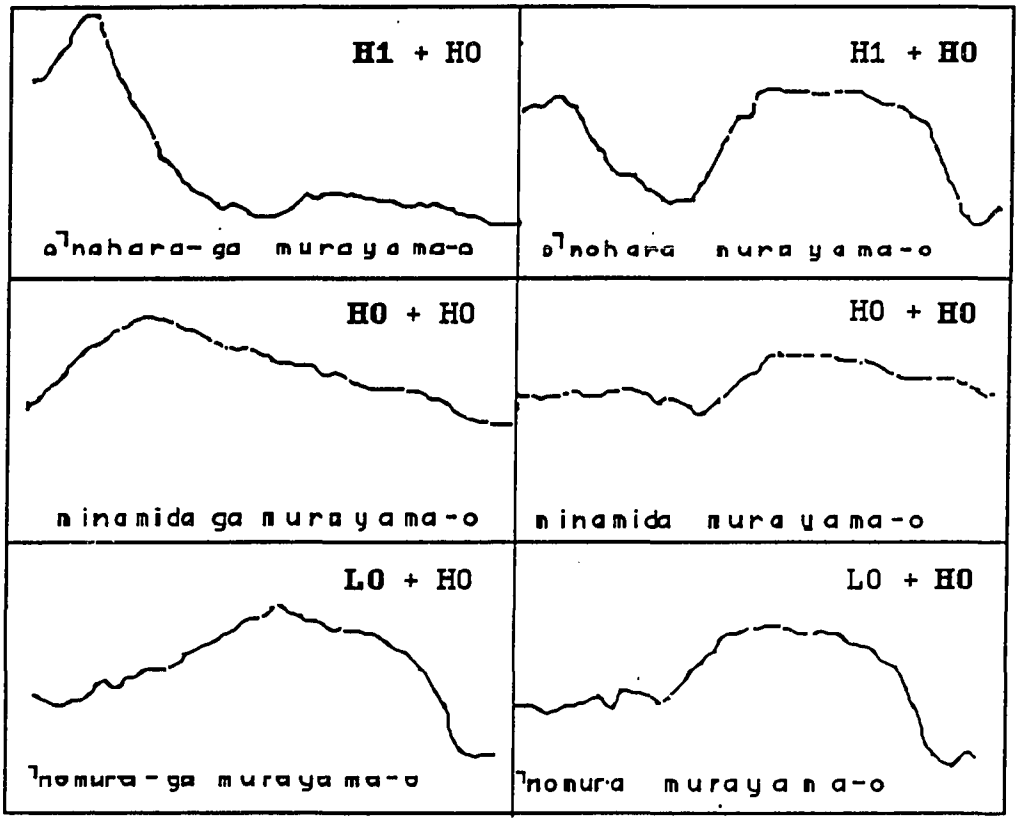

Figure 5.2
Osaka F_0 Contours of unaccented high-beginning *Murayama-o* preceded by (top) accented O'nohara(-ga), (middle) unaccented high-beginning *Minamida(-ga)* or (bottom) unaccented low-beginning *'Nomura-ga* with narrow focus either (left) on the preceding word or (right) on *Murayama*. (Modified from P&B p. 230, Figure 8.10)

dialect which clearly shows the role of focus in shaping the pitch contour. Note that in all cases the word in focus has a clearly higher F_0 than its unfocussed counterpart.

In Ibuki, while we can observe a clear reduction of the ceiling for the following word for items with Word-1 focus, very interestingly, items with Word-1 focus do not necessarily have the higher F_0 that would be expected. Figure 5.3 presents representative forms with Word-1 focus (thin line) and Word-2 focus (heavy line) using representative contours from the data.

Noun-Noun Combinations

One of the most interesting developments recently in Japanese tonology has been the establishment of catathesis as an explanation for the sudden lowering of the ceiling level for high tones. In the Tokyo dialect catathesis occurs after the HL accent, but only if it has already been preceded by the word focus. Word focus following the HL drop blocks catathesis.[2] Also, it must be the HL of an accented word, not an H followed by a boundary L. P&B claim that catathesis occurs in Osaka, and under more liberal conditions than in Tokyo, occurring any time an H happens to conjoin an L.

In order to discover whether catathesis operates in Ibukijima, and, if it does, under what conditions, the Osaka/Kobe focus set was elicited. (See Chapter 1 for a further description of the set.) Chart 5.2 summarizes that

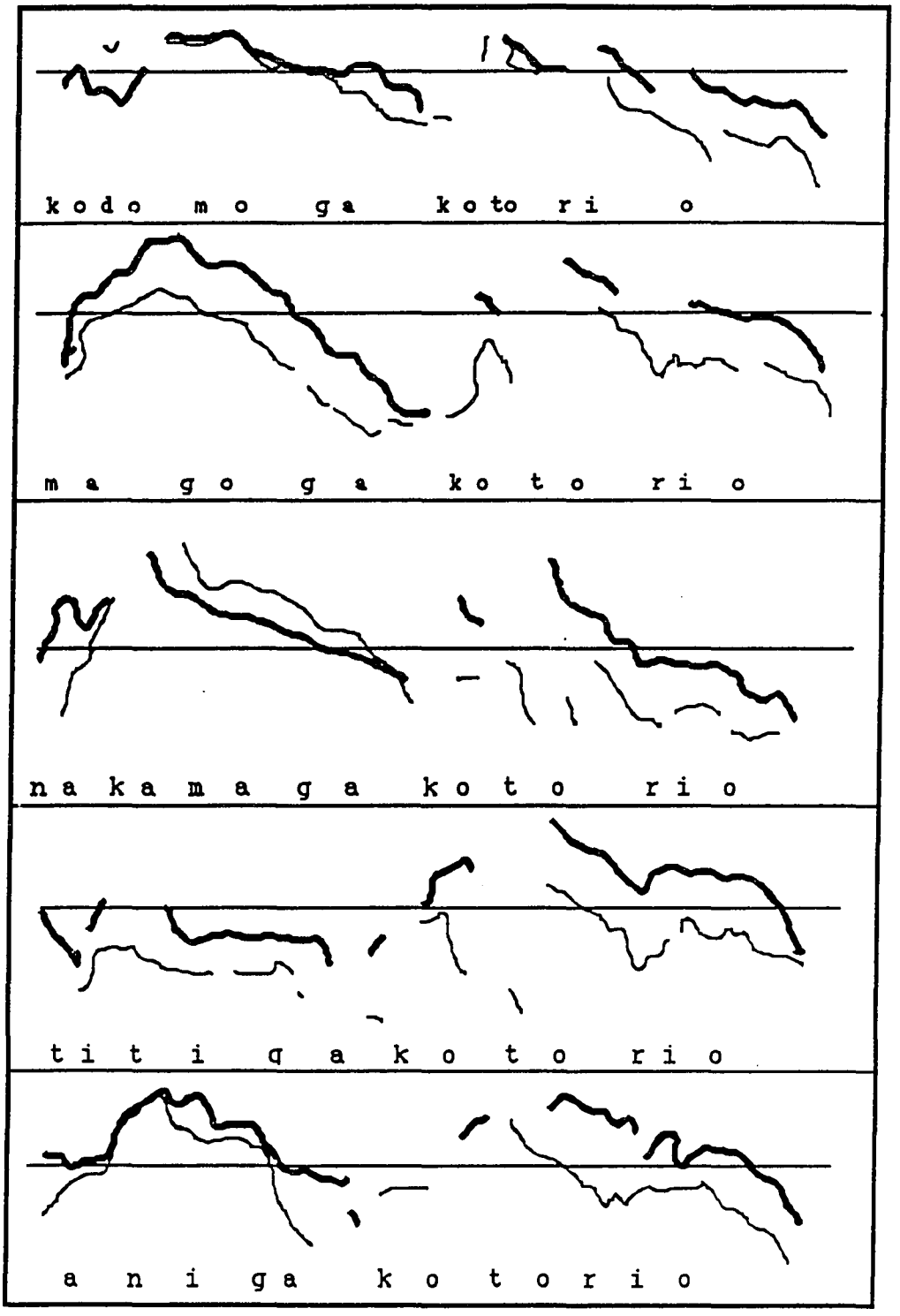

Figure 5.3
Fo Contour traces for each Ibuki 3-mora word class followed by high-starting, unaccented *kotori-o*. Thin line = Word 1 Focus, Thick line = Word 2 focus.

data, ignoring the data from our spurious H2 set as well as the straight readings without a noun focus. Our five accent classes are represented with the "W1" line representing 15 utterances with Word-1 focus, and the "W2" line representing 15 utterances with Word-2 focus. The W2-1 figures indicate the difference in the mean values. The bold faced "ALL GRP" values are means of all 5 rows above it, for a total of 15 utterances per word class

Each line on the chart represents the mean of 15 utterances which all have the same first element (the accent class under examination) followed by 3 instances each of our 5 accent classes.

The values for W2M1 (Word-2 Mora-1) onwards are thus "apples and oranges" to a certain extent. Since, however, each of the 5 classes contains exactly the same Word 2 representation of 5 accent classes times 3 utterances each, we can legitimately hypothesize that the values for each of the Word 2 sets should be the same IF there is no influence from the preceding Word-1.

Of immediate interest to us now are the moras which show a significant difference between the two focus groups. In all three accented classes, H1, M0 and L2, there is a significant difference in the moras W2M2 and W2M3 which represent the peaks of the waveform. We can attribute this difference to the operation of catathesis.

	W1M1	W1M2	W1M3	W1M4	W2M1	W2M2	W2M3	W2M4	W3M1
HØ									
W1	201.5	205.3	200.7	192.7	178.9	181.0	170.5	155.2	152.9
W2	206.1	213.1	207.2	200.0	187.2	194.4	181.9	160.8	159.2
W2-1	4.6	7.8	6.5	7.3	8.3	13.4	11.4	5.6	6.3
H1									
W1	179.5	214.3	189.7	162.6	163.4	177.5	168.5	149.6	149.1
W2	193.8	217.5	190.5	161.3	170.5	194.2	186.7	164.4	163.1
W2-1	14.3**	3.2	0.8	-1.3	7.1	16.7*	18.2**	14.8**	14.0*
M0									
W1	186.1	212.8	196.8	176.4	167.9	170.3	163.0	149.7	151.2
W2	193.9	216.9	200.4	182.5	178.8	191.7	177.5	157.6	155.9
W2-1	7.8	4.1	3.6	6.1	10.9*	21.4**	14.5**	7.9	4.7
LØ									
W1	177.1	190.3	196.8	197.6	184.6	196.4	181.9	165.6	155.0
W2	179.0	182.6	195.1	198.5	186.0	208.3	191.4	170.4	161.4
W2-1	1.9	-7.7	-1.7	0.9	1.4	11.9	9.5	4.8	6.4
L2									
W1	173.8	207.4	198.6	174.9	167.4	179.0	171.4	154.4	156.3
W2	181.4	217.9	212.2	185.2	183.3	201.0	190.8	168.6	162.2
W2-1	7.6	10.5	13.6**	10.3**	15.9**	22.0**	19.4**	14.2*	5.9

Table 5.1
Comparison of Word-1 focus (upper line) vs Word-2 focus (lower line) for MKn & FK combined data ordered by Word-1 class (*=p<0.05, **= p<0.01)

Looking at the W2M2 column again, we can see that the two unaccented classes (H0 and L0) show a mean difference of 13.4hz and 11.9hz, while the three accented classes (H1, M0 and L2) show differences of 18.2, 21.4 and 22.0, respectively. If we assume that all classes manifest Word-2 focus by raising the height of the peak, we can then determine that focus augments the height by 12-13hz with catathesis depressing the Word-2 heights by another 8-10hz.

At first blush we could attribute the difference in height to the fact that focused elements should be higher anyway. This alternate hypothesis has been addressed by Poser(1984), a summary of which is in P&B (p.65) along with a

second argument which P&B develop to augment the first. In brief, the first argument is that the "catathesized tones are not merely lower relative to the preceding tone; they are lower absolutely." P&B additionally argue that if the process were merely a rise in pitch, a sequence of three accented words, or three unaccented words, should show identical peak-to-peak relations. Their data shows this not to be the case.

A concrete illustration will clarify matters. First let us assume that there is no natural declination of pitch height over time for the time-being since declination will only complicate the logic Second, let us assume that the peak value of an accented noun is naturally 10hz higher that an unaccented one. Finally, (assuming for the time being that pitch changes are in absolute hertz rather than a proportion of the available frequency range) let us assume that a noun in focus causes the F_o to be augmented by 10hz. Using a base of 200hz for a neutral form, we will then have the following distribution of pitch heights:

Focus	Accent	Word 1	Word 2
Neutral	uu	200	200
Neutral	au	210	200
Word-1 Focus	Uu	210	200
Word-1 Focus	Au	220	200
Word-2 Focus	uU	200	210
Word-2 Focus	aU	210	210

Hypothetical model 5.1

If catathesis operates, however, what we would expect is not an augmentation of pitch height, but rather an additional reduction of F_o. Assuming that catathesis causes a 20hz reduction, we would find the additional pattern presented in bold face:

Focus	Accent	Word 1	Word 2
Neutral	uu	200	200
Neutral	au	210	200
Word-1 Focus	Uu	210	200
Word-1 Focus	Au	220	200
W-1 Focus (+cat)	**Au**	**220**	**180**
Word-2 Focus	uU	200	210
Word-2 Focus	aU	210	210

Hypothetical model 5.2

For the sake of completeness, let us now add the two missing sets of **ua** & **aa** accents:

Focus	Accent	Word 1	Word 2
Neutral	uu	200	200
Neutral	au	210	200
Neutral	ua	200	210
Neutral	aa	210	210
Word-1 Focus	Uu	210	200
Word-1 Focus	Au	220	200
Word-1 Focus	Ua	210	210
Word-1 Focus	Aa	220	210
Word-1 Focus (+cat)	**Au**	**220**	**180**
Word-1 Focus (+cat)	**Aa**	**220**	**190**
Word-2 Focus	uU	200	210
Word-2 Focus	aU	210	210
Word-2 Focus	uA	200	220
Word-2 Focus	aA	210	220

Hypothetical model 5.3

Finally, let us factor in declination by reducing all Word-2 values by 10hz, a reasonable figure as we shall see later:

Focus	Accent	Word 1	Word 2
Neutral	uu	200	190
Neutral	au	210	190
Neutral	ua	200	200
Neutral	aa	210	200
Word-1 Focus	Uu	210	190
Word-1 Focus	Au	220	190
Word-1 Focus	Ua	210	200
Word-1 Focus	Aa	220	200
Word-1 Focus (+cat)	**Au**	**220**	**170**
Word-1 Focus (+cat)	**Aa**	**220**	**180**
Word-2 Focus	uU	200	200
Word-2 Focus	aU	210	200
Word-2 Focus	uA	200	210
Word-2 Focus	aA	210	210

Hypothetical model 5.4

While one could quibble with the values used in this exercise, the point remains the same. Catathesis, if it operates, will cause Word-2 values to become lower than one would ordinarily expect. Without catathesis, the values for **Aa** vs **aA**, for example, should only result in a reversal of their peak heights, plus an adjustment for the effects of declination. In data presented later (Tables 5.2 through 5.5), for example, the mean peak values for **Aa** (H1+H1) are 214hz and 179hz while the **aA** case is 220hz and 207hz. This is clearly not a simple transposition of peak values. (The surprisingly high value of 220hz for an unfocussed, Word-1 accented word is a unique Ibuki phenomenon which *increments* non-focussed Word-1 values. We would normally expect this value to be somewhat lower than the **Aa** value of 214hz. We will discuss this phenomenon in more detail later on.)

Unaccented nouns in our data *do* exhibit this hypothesized reversal of values. The mean peak values for the **Uu** (H0+H0)

cases in the data are 210hz and 190hz, respectively. For the **uU** case, we have values of 218 and 202. If we remove the effect of declination (10hz) from the first value, we get 210 and 200hz, which leaves a 10hz increment in the Word-1 value for the manifestation of focus. Thus, we would expect values of 200hz and 200hz (200hz base - 10hz declination + 10 hz for focus = 200hz) for focus on Word 2. This is very close to the observed value of 202hz for Word 2. Again, the fact that Ibuki *increments* rather than *decrements* the height of non-focus Word 1 elements explains why we have a higher value of 218hz for unfocussed Word-1 rather than the 200hz value which our calculations would predict.

Tables 5.2 through 5.5

Now, let us turn our attention to the more detailed tables, 5.2 through 5.4. Each table shows a breakdown into individual lines representing the mean of three utterances only. Since the number of samples is low, a rather large difference in F_0 is required for a statistically significant result. As a general rule of thumb, variation of less than 10hz is not significant in this data set, 10-15hz marginally significant ($p<0.05$) and above that, very significant.

H0	W1M1	W1M2	W1M3	W1M4	W2M1
W2=H0	211.6	210.6	202.6	192.6	195.0
W2=H1	201.3	202.6	202.3	196.0	186.0
W2=M0	205.0	210.3	206.3	204.3	192.3
W2=L0	195.0	199.0	195.0	180.0	157.3
W2=L2	194.6	204.0	197.3	190.6	164.0
ALL GRP	201.5	205.3	200.7	192.7	178.9
H1					
W2=H0	171.0	209.6	180.0	159.3	184.0
W2=H1	180.5	214.5	192.0	165.0	155.0
W2=M0	187.3	212.6	191.3	159.6	170.6
W2=L0	182.3	227.3	201.6	172.0	157.6
W2=L2	176.3	207.6	183.6	157.0	150.0
ALL GRP	179.4	214.3	189.5	162.4	164.0
M0					
W2=H0	189.3	217.6	197.3	170.6	178.6
W2=H1	190.0	212.3	192.3	173.0	160.3
W2=M0	181.3	205.3	200.0	182.3	174.0
W2=L0	188.0	215.3	198.6	185.0	160.0
W2=L2	182.0	213.6	196.0	171.3	166.6
ALL GRP	186.1	212.8	196.8	176.4	167.9
L0					
W2=H0	164.3	182.0	189.0	188.6	188.6
W2=H1	174.3	190.3	190.3	195.3	200.0
W2=M0	184.3	180.6	185.3	190.3	185.0
W2=L0	187.6	191.6	197.6	191.6	164.6
W2=L2	175.0	207.0	222.0	222.0	185.0
ALL GRP	177.1	190.3	196.8	197.6	184.6
L2					
W2=H0	174.3	206.0	200.3	176.6	175.3
W2=H1	168.0	207.0	199.6	174.0	167.6
W2=M0	171.0	196.0	187.3	178.3	166.6
W2=L0	176.0	207.3	193.3	169.0	163.6
W2=L2	180.0	220.6	212.3	176.6	164.0
ALL GRP	173.8	207.4	198.6	174.9	167.4

Table 5.2
Summary of Word-1, Word-1 focus

H0	W1M1	W1M2	W1M3	W1M4	W2M1
W2=H0	210.3	218.3	208.3	197.3	190.6
W2=H1	200.3	205.6	205.3	198.3	190.0
W2=M0	209.3	222.0	211.6	204.3	197.0
W2=L0	212.3	216.3	209.6	203.0	185.3
W2=L2	198.3	203.3	201.3	197.3	173.0
ALL GRP	206.1	213.1	207.2	200.0	187.2
H1					
W2=H0	186.3	211.6	187.6	160.3	186.0
W2=H1	199.6	220.3	192.0	168.0	167.0
W2=M0	187.6	216.3	187.6	156.3	176.3
W2=L0	194.6	213.0	186.6	159.3	163.6
W2=L2	200.6	226.3	198.6	162.6	159.6
ALL GRP	193.8	217.5	190.5	161.3	170.5
M0					
W2=H0	196.3	212.0	199.6	181.0	183.0
W2=H1	198.0	230.3	212.3	188.0	191.3
W2=M0	194.3	216.6	196.0	179.3	176.3
W2=L0	191.3	214.3	196.0	182.6	169.0
W2=L2	189.6	211.3	198.3	181.6	174.3
ALL GRP	193.9	216.9	200.4	182.5	178.8
L0					
W2=H0	167.6	175.0	190.6	195.0	202.0
W2=H1	181.3	186.0	197.3	191.3	194.3
W2=M0	181.0	182.3	184.0	188.6	185.0
W2=L0	184.0	188.6	197.6	210.6	166.0
W2=L2	181.0	181.0	206.0	207.0	183.0
ALL GRP	178.8	182.7	194.3	197.9	186.2
L2					
W2=H0	183.0	217.0	206.0	190.5	204.0
W2=H1	179.3	219.0	204.0	180.3	176.0
W2=M0	184.3	216.6	222.6	190.6	193.3
W2=L0	177.6	214.6	223.6	181.0	168.3
W2=L2	182.6	222.3	205.0	183.6	175.0
ALL GRP	181.2	218.0	212.7	184.8	181.8

Table 5.3
Summary of Word-1, Word-2 focus

H0	W2M1	W2M2	W2M3	W2M4	W3M1
W1=H0	195.0	190.3	178.6	162.6	158.0
W1=H1	184.0	185.0	164.6	160.6	147.6
W1=M0	178.6	172.0	171.0	152.0	143.0
W1=L0	188.6	210.3	195.0	193.6	178.3
W1=L2	175.3	191.6	178.6	166.0	160.6
ALL GRP	184.3	189.8	177.6	167.0	157.5
H1					
W1=H0	186.0	196.0	179.3	158.0	145.3
W1=H1	155.0	179.5	166.0	141.0	143.0
W1=M0	160.3	177.6	164.3	147.6	153.3
W1=L0	200.0	218.0	198.6	158.3	141.3
W1=L2	167.6	180.6	173.3	149.0	152.0
ALL GRP	175.1	191.1	177.0	151.5	147.2
M0					
W1=H0	192.3	190.0	179.3	159.0	156.3
W1=H1	170.6	192.0	178.0	154.6	157.6
W1=M0	174.0	174.0	162.6	148.0	167.0
W1=L0	185.0	205.3	185.3	158.0	145.3
W1=L2	166.6	183.0	175.6	157.0	150.3
ALL GRP	177.7	188.8	176.2	155.3	155.3
L0					
W1=H0	157.3	157.0	152.0	148.6	151.3
W1=H1	157.6	158.3	154.3	150.0	154.6
W1=M0	160.0	154.6	152.0	152.6	157.3
W1=L0	164.6	161.0	160.6	159.0	159.6
W1=L2	163.6	159.3	161.0	155.0	169.0
ALL GRP	160.6	158.0	156.0	153.0	158.4
L2					
W1=H0	164.0	172.0	163.3	148.0	153.6
W1=H1	150.0	173.0	179.6	142.0	142.6
W1=M0	166.6	170.3	165.3	148.3	135.6
W1=L0	185.0	187.3	170.0	159.0	150.3
W1=L2	164.0	180.3	168.3	145.3	149.6
ALL GRP	165.9	176.6	169.3	148.5	146.4

Table 5.4
Summary of Word-2, Word-1 focus

H0	W2M1	W2M2	W2M3	W2M4	W3M1
W1=H0	190.6	202.0	189.6	171.6	166.0
W1=H1	186.0	196.3	189.6	179.6	177.0
W1=M0	183.0	193.6	178.3	157.3	156.6
W1=L0	202.0	213.3	203.0	194.3	182.0
W1=L2	204.0	215.5	200.0	194.0	176.5
ALL GRP	192.3	203.3	191.5	178.3	171.2
H1					
W1=H0	190.0	201.6	181.6	153.0	144.3
W1=H1	167.0	207.0	189.3	157.0	154.0
W1=M0	191.3	211.6	190.0	156.6	158.0
W1=L0	194.3	221.3	186.3	148.6	146.0
W1=L2	176.0	201.3	186.6	160.3	161.3
ALL GRP	183.7	208.6	186.8	155.1	152.7
M0					
W1=H0	197.0	196.6	192.6	162.6	160.3
W1=H1	176.3	214.3	190.6	163.0	147.6
W1=M0	176.3	194.3	191.0	160.0	146.3
W1=L0	185.0	213.0	194.6	166.0	156.0
W1=L2	193.3	211.3	204.3	168.0	157.0
ALL GRP	185.6	205.9	194.6	163.9	153.4
L0					
W1=H0	185.3	173.6	165.6	163.0	167.0
W1=H1	163.6	172.0	169.3	163.6	178.0
W1=M0	169.0	167.3	161.0	164.6	173.6
W1=L0	166.0	172.0	174.3	162.3	176.6
W1=L2	168.3	180.3	172.3	166.6	183.6
ALL GRP	170.4	173.0	168.5	164.0	175.8
L2					
W1=H0	173.0	198.0	180.0	154.0	158.6
W1=H1	159.6	181.3	194.6	158.6	159.0
W1=M0	174.3	191.6	167.3	149.6	145.0
W1=L0	183.0	222.0	199.0	181.0	146.5
W1=L2	175.0	196.6	190.6	154.3	132.6
ALL GRP	172.2	196.2	185.4	158.0	148.5

Table 5.5
Summary of Word-2, Word-2 focus

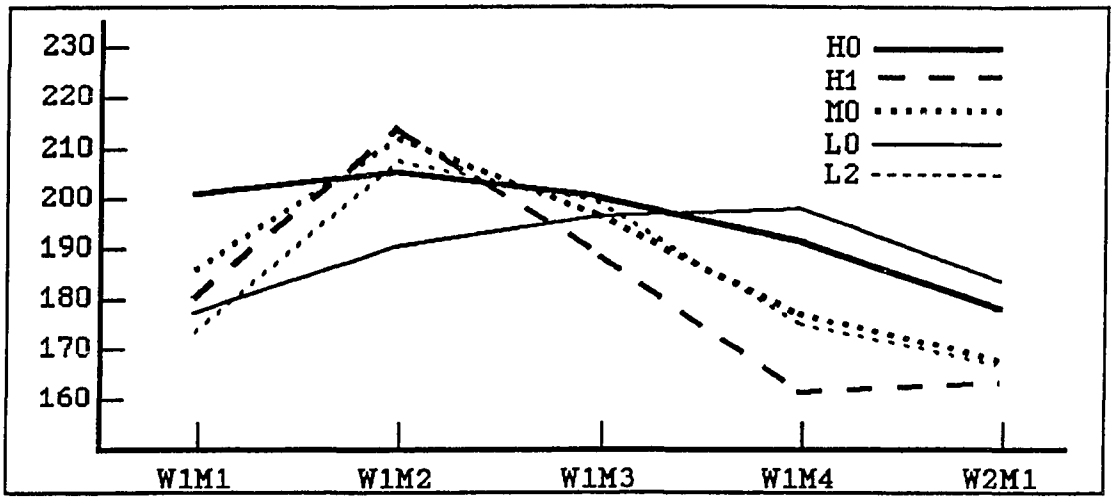

Figure 5.4
Graphic representation of "All Group" averages in Table 5.2
(Word 1 with Word 1 focus)

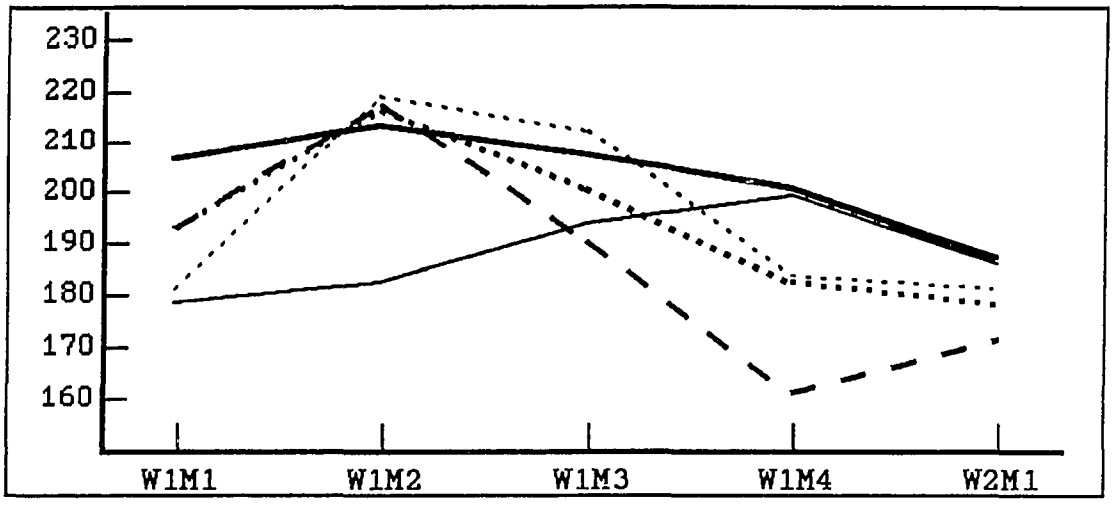

Figure 5.5
Graphic representation of "All Group" averages in Table 5.3
(Word 1 with Word 2 focus)

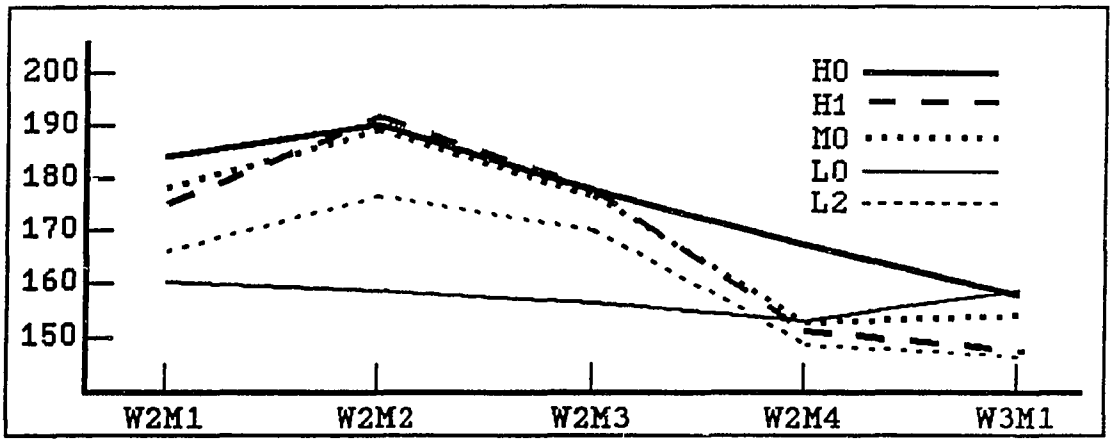

Figure 5.6
Graphic representation of "All Group" averages in Table 5.4
(Word 2 with Word 1 focus)

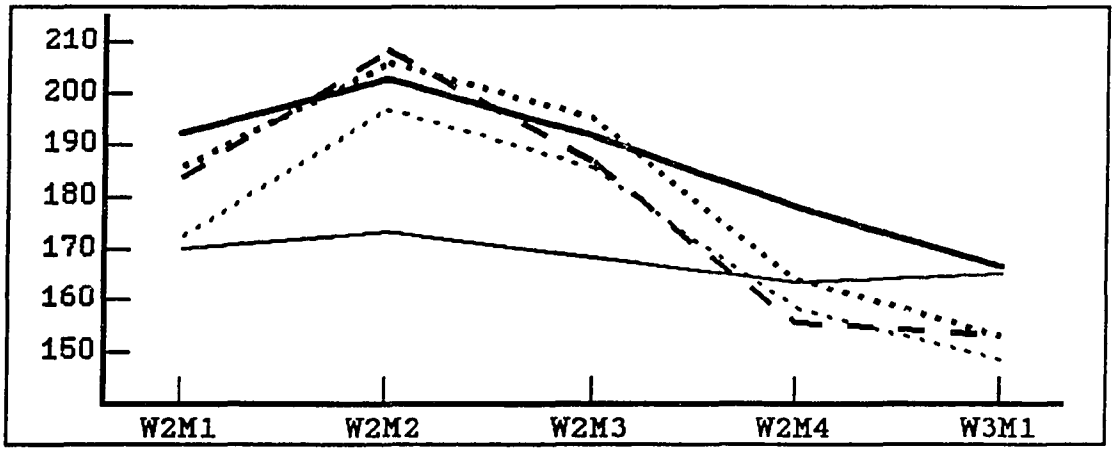

Figure 5.7
Graphic representation of "All Group" averages in Table 5.5
(Word 2 with Word 2 focus)

With the exception of the final column, which represents the first mora of the second word, we would expect the values on each of the 5 subgroup lines to be basically identical since each line represents utterances of which the *following* word was of a different class. Normally one would not expect anticipatory adjustment of the pitch range of an utterance

based on the accent class of the following word. Indeed, we do not observe any systematic variation in points W1M1 through W1M4 with the possible exception of the L0 values with a following H0 word. The next two sets are a bit more difficult to interpret since the initial values for words here have already been affected by the preceding Word 1. We therefore expect a wide range of initial values for W2M1.

Also, unlike the previous two tables, which dealt with Word 1 pitch levels, here we must pay close attention to variation within each major accent class. We can note considerable variation. For example, the initial values for H1 range from a low of 155hz when the preceding word was H1, to a high of 200hz when the preceding word was L0. This is where the effects of catathesis come into play.

Examination of F_0 Changes in the Data

We will proceed as follows. First we will look at variations in the level of onset in the 4 tables, next onset-to-peak differences, then at variation in peak height, and finally at the terminal values for each phrase.

Onset (WxM1)

In all four tables, the H0 class has the highest at onset. H1 and M0 appear to behave similarly, as do the two low-starting classes, L0 and L2. Comparing the onset values between the two Word-1 tables, we can observe that the values are somewhat higher, particularly in the accented classes

(H1, M0 and L2), when Word 1 is NOT in focus. This could be interpreted as a *lowering* of the onset when Word 1 is in focus or a *raising* of the onset when a later word is in focus.

With the next two tables, we observe the opposite phenomenon. Looking at the boldface summary lines, we note that all 5 classes are 8-10hz higher when in focus, although the picture becomes less clear when we examine the individual lines. There does not appear to be any systematic variation here, so let us attribute this either to random variation or to a general instability of onset values. The onset is not, after all, as crucial as the relative height of the peak and degree of fall as a conveyor of information.

Initial Rise

The initial rise is best examined with reference to Table 5.6 which presents the arithmetic differences between the first two columns of Tables 5.2-5.5. From these data the following facts become apparent:

1. H0 shows little rise except in Word-2 focus.
2. Classes H1, M0, and L2 behave similarly.
3. The L0 class shows little vertical movement early in the phrase although some high values appear for Word-1, W-1 focus which we cannot readily explain.[3]
4. For Word-2 focus there is a tendency for the rise to be higher by 6-10hz.

H0	Word 1, W-1 Focus	Word 1, W-2 Focus	Word 2, W-1 Focus	Word 2, W-2 Focus
H0	-1.0	8.0	-4.7	11.4
W1	1.3	5.3	1.0	10.3
M0	5.3	12.7	-6.6	10.6
L0	4.0	4.0	21.7	11.3
L2	9.4	5.0	16.3	11.5
ALL GRP	**3.8**	**7.0**	**5.5**	**11.0**
H1				
H0	38.6	25.3	10.0	11.6
H1	34.0	20.7	24.5	40.0
M0	25.3	28.7	17.3	20.3
L0	45.0	18.4	18.0	27.0
L2	31.3	25.7	13.0	25.3
ALL GRP	**34.9**	**23.7**	**16.0**	**24.9**
M0				
H0	28.3	15.7	-2.3	-0.4
H1	22.3	32.3	21.4	38.0
M0	24.0	22.3	0.0	18.0
L0	27.3	23.0	20.3	28.0
L2	31.6	21.7	16.4	18.0
ALL GRP	**26.7**	**23.0**	**11.1**	**20.3**
L0				
H0	17.7	7.4	-0.3	-11.7
H1	16.0	4.7	0.7	8.4
M0	-3.7	1.3	-5.4	-1.7
L0	4.0	4.6	-3.6	6.0
L2	32.0	0.0	-4.3	12.0
ALL GRP	**13.2**	**3.9**	**-2.6**	**2.6**
L2				
H0	31.7	34.0	8.0	25.0
H1	39.0	39.7	23.0	21.7
M0	25.0	32.3	3.7	17.3
L0	31.3	37.0	2.3	39.0
L2	40.6	39.7	16.3	21.6
ALL GRP	**33.6**	**36.8**	**10.7**	**24.0**

Table 5.6
Onset to Peak values by word accent type subcategorized by accent type of previous/next word

Mid Values (WxM2, WxM3)

The most interesting observation we can make about the peak values is that, with the exception of the L0 classes, the values are basically identical, although we would expect

that the H0 class, at least, to have a lower peak realization than the three accented classes. Examining the individual lines, we see that there is little variation in each major group for both Word-1 tables, but for Word-2 the 'W1=H0' and 'W1=L0' values for W2M1 are higher since Word-1 utterances of these two classes ended higher as revealed by the W2M1 values on Tables 5.2 and 5.3.

Drop from Peak (WxM2-> WxM4)

Table 5.7 is the result of subtracting column 4 (WxM4) from column 2 (WxM2) with the exception of the L0 data where column 1 is used instead of column 2. From these data, we can make the following observations:

1. Unaccented Phrases - There is only a mild fall from the peak for H0, the fall being approximately the same regardless of focus. The fall, however, is much less in the case of Word-1 (approximately 13hz) then for Word-2 (23-25hz).

H0	Word 1, W-1 Focus	Word 1, W-2 Focus	Word 2, W-1 Focus	Word 2, W-2 Focus
H0	-18.0	-21.0	-27.7	-30.4
W1	-6.6	-7.3	-24.4	-16.7
M0	-6.0	-17.7	-20.0	-36.3
L0	-19.0	-13.3	-16.7	-19.0
L2	-13.4	-6.0	-25.6	-21.5
ALL GRP	**-12.6**	**-13.1**	**-22.8**	**-25.0**
H1				
H0	-50.3	-51.3	-38.0	-48.6
H1	-49.5	-52.3	-38.5	-50.0
M0	-53.0	-60.0	-30.0	-55.0
L0	-55.3	-53.7	-59.7	-72.7
L2	-50.6	-63.7	-31.6	-41.0
ALL GRP	**-51.9**	**-56.2**	**-39.6**	**-53.5**
M0				
H0	-47.0	-31.0	-31.0	-34.0
H1	-39.3	-42.3	-37.4	-51.3
M0	-23.0	-37.3	-26.0	-34.3
L0	-30.3	-31.7	-47.3	-47.0
L2	-42.3	-29.7	-26.0	-43.3
ALL GRP	**-36.4**	**-34.4**	**-33.5**	**-42.0**
L0				
H0	24.3	27.5	-8.7	-22.3
H1	21.0	10.0	-7.6	-0.0
M0	6.0	7.6	-7.4	-4.4
L0	4.0	26.6	-5.6	-3.7
L2	47.0	26.0	-8.6	-1.7
ALL GRP	**20.5**	**19.1**	**-7.6**	**-6.4**
L2				
H0	-29.4	-26.5	-24.0	-44.0
H1	-33.0	-38.7	-31.0	-36.0
M0	-17.7	-26.0	-22.0	-42.0
L0	-38.3	-33.6	-28.3	-41.0
L2	-44.0	-38.7	-35.0	-42.3
ALL GRP	**-32.5**	**-33.2**	**-28.1**	**-38.2**

Table 5.7
Peak to word-end values by word accent type subcategorized by accent type of previous/next word (Negative number = FALL)

For L0 we observe negative values, which we would expect since low-starting unaccented words in Kansai dialects normally rise towards the end. Unusual, however, are the instances of Word-2 Focus where we observe *falls* instead of rises.

The are some instances of utterances with L0 in Word-1 (and to some extent, H1) which exhibit a greater fall than would be expected. As shown in Table 5.7, for instance, the F_0 between points W2M2 and W2M4 drops 72hz in the case of H1 with previous L0. Unfortunately, the occurrences are too unsystematic for us to be able to pinpoint or even speculate about a possible cause.

2. Accented Phrases - It would appear, from these data, that the word in focus has a slightly *lower* value than its counterpart out of focus, although the difference in case of H1 and M0, in particular, is not great enough to reach significance. While in Osaka, it was noted that "L tones are scaled downward under increases in prominence" (P&B:224), here we see the opposite happening. Just as the other classes which we expected to be scaled *up* have been scaled *down* (in Word-1 position, at least), for L0 words the opposite occurs. From these data, it would appear that word focus is not manifested by an increase in pitch range. This observation, like the initial onset height, seems to be limited to the first mora.

Terminal Values (WxM4-)

The data for Word 1 is unambiguous. H0 and L0 finish high, with M0 and L2 showing remarkably similar behavior, while H1 falls the most. These data would suggest that M0 and L2 share the same final target value while H1 has a lower target.

Turning to the Word-2 tables, we see a similar pattern, The terminal values generally reflect the degree of fall from the peak that we have previously determined.

Summary of Findings

We will restate our findings below, generalizing them in terms of percentage of currently available pitch range. We will assume here an initial pitch range of 240hz to 140hz, which facilitates hz/percent conversion. Values thus obtained will be experimentally verified, and modified when appropriate, in Chapter 6.

Word 1 Focus					Word 2 Focus			
	Base	Rise	Fall			Base	Rise	Fall
H0	200	5	-15	W	H0	205	5	-15
H1	180	35	-50	O	H1	195	20	-55
M0	185	25	-35	R	M0	195	20	-35
L0	180		20	D	L0	180		20
L2	175	35	-35	1	L2	180	35	-35
H0	185	5	-20	W	H0	190	10	-25
H1	175	15	-40	O	H1	185	25	-55
M0	175	10	-35	R	M0	185	20	-40
L0	160		-5	D	L0	170		-10
L2	165	10	-30	2	L2	170	25	-40

Table 5.8
Summary of pitch changes in Kobe/Osaka data set for Word-1 and Word-2 both in and out of focus

From this simplified chart, we can make the following rough generalizations:

1. Word 1 starts lower by 5-10 hz when the focus is on Word 2 except in the case of L0.

2. The lower starting point is compensated for by a slightly increased rise, but there is no effect on L0 and perhaps H0, as well.
3. The fall from the peak is essentially the same for Word 1 regardless of whether the word is in focus or not.
4. Focus on Word 2 increases the peak by roughly 10hz for all but the L0 class.
5. There is a correspondingly deeper fall for all classes.
6. Class L0 in Word 2 position does not rise, but rather exhibits a slight dip. We cannot tell if this is always the case or is perhaps due to the accent class of the verb since only one verb (KOOTEKITA) was used in all utterances.

We have also seen some indication that catathesis applies, although the variation in the data did not allow us to reach a firm conclusion.

Longer Phrases

Observe the following contour, which contains a sequence of three high-starting accented nouns (Figure 5.8). The focus was on the third word, the object BOOSI.

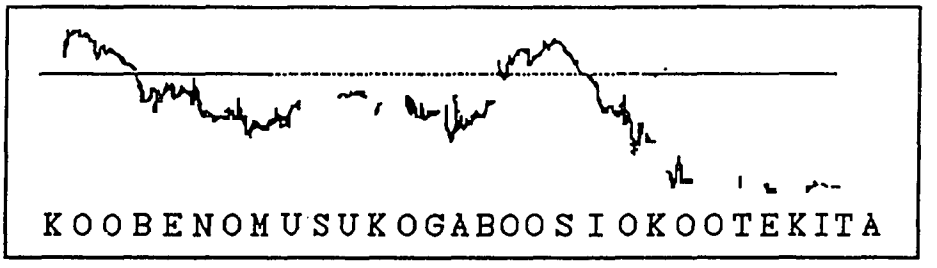

Figure 5.8
F_0 extraction for /koobe no musuko ga boosi o kootekita/

According to P&B, catathesis is blocked by focus to the right of the point in question. In this utterance, however, the very low average F_0 which occurs on MUSUKO can only be caused by catathesis. We would therefore be tempted to hypothesize that a boundary occurs between word 2 and word 3 which allows the pitch range to be reset. While this would account for the height of Word 3, it would leave us without an explanation for the fact that when the focus is on Word 2 (left side of Table 5.9), the range is not reset at all, but rather continues a natural decrementation in height until the end of the utterance.

Declination could be claimed to have produced the difference in height between Word 1 and Word 3. If, however, the focus is on Word 3, we would expect Word 3 to be higher than Word 1, that is, that the additional height caused by the focus would be greater than any possible declination. Declination is usually on the order of 10hz per second. If one allows for 5 morae to be uttered per second, we could expect something on the order of a 15hz difference due to

declination, while the mean difference for a set of these utterances was 25hz.

Let us now look at data from a set of four sentences, elicited multiple times with the focus either on the second word (MUSUME high-accented and MUSUKO high-unaccented) or on the third word (BOOSI, MEGANE high-accented and KIMONO, KURUMA high-unaccented). See Chapter One for further details on the O/K Focus set.

First we will just examine the peak values for each noun and the final verb phrase. Later, we will include the low points in the discussion as well.

Focus on W2 (Person)					Focus on W3 (Object)				
	W1	W2	W3	Verb		W1	W2	W3	Verb
ꜱAꜱ	239	**236**	**168**	132	ꜱꜱA	248	**187**	**223**	143
ꜱUꜱ	**232**	**219**	**206**	148	ꜱꜵA	**252**	**187**	**231**	145
ꜵAꜵ	219	**240**	**169**	**156**	ꜵꜱU	218	**204**	**203**	**182**
ꜵUꜵ	*209*	**218**	191	**165**	ꜵꜵU	*219*	**203**	213	**190**

Table 5.9
Peak values for nouns with word-2 & word-3 focus
Figures in boldface indicate a significant t-test difference for W2/W3 item pairs. (*italics*: p< .05, **bold**: p < 0.005)

Range of Application of Catathesis

The encircled areas mark the instances of catathesis in the data, that is, all instances of an accented word which does not precede a word in focus. Based on synthesis data to be presented in Chapter 6, we can determine that each instance of catathesis causes a ceiling drop to about 45% of the current range.

Focus on W2 (Person)					Focus on W3 (Object)				
	W1	W2	W3	Verb		W1	W2	W3	Verb
aAa	239	236	168	132	aaA	248	187	223	143
aUa	232	219	206	148	auA	252	187	231	145
uAu	219	240	169	156	uaU	218	204	203	182
uUu	*209*	218	191	165	uuU	*219*	203	213	190

Table 5.10
Peak values for nouns with word-2 & word-3 focus, instances of catathesis

Note that for "Focus on W3" not only does catathesis not apply to Word 3, but the ceiling has been raised almost, but not quite, back to the original level. As we will see below, this value can be generated assuming an utterance-initial ceiling level of 250hz, and a declination rate of 3hz per mora.

Conversely, in cases where catathesis does not apply, we see only a small decrement in the F_0. Note, for example, the relatively high values of 206 and 191 for **aUa** and **uUu** for Focus on W2, Word 3.

Focus on W2 (Person)					Focus on W3 (Object)				
	W1	W2	W3	Verb		W1	W2	W3	Verb
aAa	239	236	168	132	aaA	248	187	223	143
aUa	232	219	206	148	auA	252	187	231	145
uAu	219	240	169	156	uaU	218	204	203	182
uUu	*209*	218	191	165	uuU	*219*	203	213	190

Table 5.11
Peak values for nouns with word-2 & word-3 focus, highlighting word-3 with word-2 focus

Focus Anticipatory Lowering (FAL) - Observe the values for Word 1. When the focus in on Word 3, in all but one case the mean is 10hz or more higher than the corresponding utterance set with the focus on W2. Also recall from our

earlier data (Table 5.2) that the values for each Word-1/Word-2 focus pair were lower for Word-1 focus. We can therefore assume that lowering occurs when the focus is anticipated in a future phrase. We shall not try here to justify this on theoretical grounds. Suffice it to say that the introduction of such a device jibes with the facts.

Accented vs Unaccented Nouns - Unaccented nouns are not as prominent as accented nouns. This runs counter to what we noted earlier in Tables 5.2 through 5.5 where there was no significant difference in the peak values of H0, H1, M1 and L0. We will first describe the data now before us and then attempt to reconcile this with our earlier findings.

Note the **aAa** cases (first line) vs the **uAu** cases (third line). Although Word 2 in both cases is accented, there is a significant difference in the values of Word 1 ($p < 0.002$). Unaccented, high-starting words are realized at approximately 60% of the current available range while accented words a realized at 90% of the current range.

Focus on W2 (Person)					Focus on W3 (Object)				
	W1	W2	W3	Verb		W1	W2	W3	Verb
aAa	239	236	168	132	aaA	248	187	223	143
aUa	232	219	206	148	auA	252	187	231	145
uAu	219	240	169	156	uaU	218	204	203	182
uUu	209	218	191	165	uuU	219	203	213	190

Table 5.12
Peak values for nouns with word-2 & word-3 focus, highlighting word-1 values

Now let us turn our attention to the identical values for W2, with focus on W3. It would appear that the only factor

affecting the height of W2 is the accentedness of the previous word. While these values are consistent with our earlier observations, it remains to be explained why this context and the earlier context produces similar values despite the accentedness of the noun, while here we observe, in all other instances, a clear difference.

First, let us note that even if the peaks are at the same height for accented and non-accented nouns, they are still easily distinguishable from one another since in all cases, H0 is distinguished by an extremely flat contour, with a very mild uptake of less than 10hz and an ensuing drop on the order of 10-20hz. The problem is thus not how to distinguish the accents from each other, but merely how to generate similar values to those observed.

Another consideration is the range of values represented on the respective tables. The highest value on Tables 5.2 through 5.5 is 221hz, with most of the peak values lying between 200 and 210hz while the tables currently under review show much higher values *despite the fact that the same informant was used for most of the data.*[4] Perhaps the longer 3-noun utterances forced the speakers to start higher since declination places a limit on how long an utterance can be without the ceiling being reset.

Since the values following **a** are lower than those following **u**, we would like to attribute this to catathesis. This would account for the lower values, but, it would not

explain why the values are identical since a **u** should still be realized at a lower value than an **a**. I have no explanation for this at this time. A similar result does not crop up elsewhere in the data, so I shall leave this for a future analysis to untangle.

Focus on W2 (Person)					Focus on W3 (Object)				
	W1	W2	W3	Verb		W1	W2	W3	Verb
aAa	239	236	168	132	aaA	248	187	223	143
aUa	232	219	206	148	auA	252	187	231	145
uAu	219	240	169	156	uaU	218	204	203	182
uUu	*209*	218	191	165	uuU	*219*	203	213	190

Table 5.13
Peak values for nouns with word-2 & word-3 focus,
highlighting word-2, word-3 focus values

Other Significant Differences

Table 5.14 shows the results of pairwise t-tests for other relevant comparisons. Roughly speaking, values that are greater than 20hz apart represent a significant difference. With a larger sample size, surely more of the comparisons would prove significant. Rules reflecting the observations discussed above should account for these differences.

Focus on W2 (Person)					Focus on W3 (Object)				
	W1	W2	W3	Verb		W1	W2	W3	Verb
aAa	239	236	168	132	aaA	248	187	223	143
aUa	232	219	206	148	auA	252	187	231	145
uAu	219	240	169	156	uaU	218	204	203	182
uUu	*209*	218	191	165	uuU	*219*	203	213	190

Table 5.14
Pairs demonstrating a significant difference
Solid line: $p < 0.001$, Dotted line: $p < 0.01$

Terminal Values

Table 5.15 represents an expansion of Tables 5.9 through 5.14, with the target values for the end point of each phrase included. Following tradition, we shall call these points

Focus on W2 (Person)							Focus on W3 (Object)						
	W1	Valley	W2	Valley	W3	Verb		W1	Valley	W2	Valley	W3	Verb
aAa	239	168	**236**	159	**168**	132	aaA	248	164	**187**	155	**223**	143
aUa	**232**	*169*	**219**	**195**	**206**	148	auA	**252**	*161*	**187**	**167**	**231**	145
uAu	219	201	**240**	165	**169**	**156**	uaU	218	195	**204**	161	**203**	**182**
uUu	*209*	195	**218**	170	191	*165*	uuU	*219*	195	**203**	174	213	*190*

Table 5.15
Values for peaks and valleys for Osaka/Kobe data
Figures in boldface indicate a significant t-test difference for W2/W3 item pairs. (italics: $p < .05$, **bold**: $p < 0.005$)

'valleys.' From the table, we can make the following observations:

1. The valley between W1 and W2 (hereafter, V1-2) is considerably lower after an accented word for both W2 and W3 focus, the drop from the peak ranging from 60-80hz. For unaccented nouns, there is only a 20-25hz drop.
2. For V2-3, we note a clear trend for the values following an accented noun to be somewhat lower than their unaccented counterpart on the line below. Only one set of conditions appears to cause a statistically significant difference in the valley height and this case is suspect. There is a question as to whether the 195 value for **aUa** is particularly high or whether the value for **uUu**, 174 is unusually low.

Both of these are values for a valley following an unaccented, focused noun. Observing the other cases in the chart of a valley following **u** we have noted that the fall is in the range of 20-25hz. It would thus appear that the value of 174 is particularly low. While many of the lines in this chart represent the mean of 12 cases, these sets have only 6-7 samples each. For this reason even the large 21hz discrepancy in the values is not significant, with p = 0.051, a borderline case at best. Until more data is forthcoming, therefore, it is probably best to assume that the 174 value is irregularly low and not attempt to account for it in our description.

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[1]We will refer to Pierrehumbert & Beckman's treatment of Kori's data rather than to Kori (1987) itself since the former is more accessible.

[2]In most cases where a focussed noun is preceded by an accented adjective which could potentially cause catathesis, an intermediate phrase boundary is inserted which prevents catathesis from applying. See P&B's discussion on pages 102-109.

[3]The test word used here was not ideal (/titi/ 'father') since it lends itself easily to devoicing. This not only made measurement difficult but perhaps also distorted the normal waveform pattern. The test sentences, however, required a noun for a human relationship and there were no other L0 words to choose from.

[4] Approximately two thirds of the 6x6 data in Tables 5.2 through 5.5 comes from MK (Miyoshi Kuni).

Chapter 6

An Analysis by Synthesis Approach

One approach to the analysis of data such as ours is *Analysis by Synthesis*, in which an analysis is arrived at by determining a system, through trial and error, which most closely approximates the system being studied. P&B synthesize utterances towards the end of their work as one means of demonstrating that their rules work; they have not, however, relied solely on the synthesized data to argue their case.

We have also approached our Ibukijima data from a number of viewpoints. We are not, however, in the position of being able to provide quantifiable sets of data which vary one feature at a time in order to carry out the regression analyses which P&B relied on for the bulk of their evidence.

Instead, we will analyze our data through analysis by synthesis using a program, Ibugen (Ibuki generator), which I developed for this purpose. Below we will first look at P&B's approach to F_0 synthesis. Next we will examine the Ibugen program in detail and justify our approach to the handling of specific elements such as declination and the determination of the positions of peaks and plateaus. Finally we will apply the program to the Ibuki data, comparing its results with the actual contours generated by the Pitch Extraction Program described in Appendix 5.

Pierrehumbert & Beckman's Approach

Since P&B's work is readily available, only the points essential for understanding what follows will be presented here.

There are four basic steps in the synthesis process, as illustrated in Figure 6.1, which is reproduced from P&B (p.177):

1. linear interpolation
2. declination
3. smoothing, and
4. adjustment for voiceless segments and jitter.

Linear Interpolation

Of these steps, it is the first, linear interpolation, which is of most concern to us here. P&H's approach can be summarized thus:

a. **Mora Timing**. In the time domain, morae were all assigned equal intervals of time. This, they mention, is not a theoretical statement that all morae are of equal duration but rather a heuristic. They state that, "We foresee the necessity of someday including variation controlled by speech rate and possibly mora duration." (p.178)

b. **Pitch Range**. Tones were scaled between a baseline, which essentially represented the lowest possible value for the speaker under study, and the high tone parameter ***h***, which represented the maximum possible tonal value for the speaker. P&B actually worked within a transformed pitch range, with

values of 0 for the baseline and 1 for the initial ***h***, which permitted a more general treatment without having to deal with absolute frequency differences (p. 182)

c. **High Tone Line.** The value of the high tone line was reduced with each instance of catathesis and applied to all points after that point in time. Additionally, any further interpolations within the domain of an intermediate phrase were relative to a separate h_α high tone line which was equal to the value of the first H in the intermediate phrase. This second tone line was necessitated by the fact that without it, all low tones within the intermediate phrase would have equal values rather than exhibiting slightly decremented values. (See P&B p.190 for a complete discussion of this issue.)

d. **Tone Scaling.** In P&B's description of the Tokyo dialect, each accent phrase consists of an initial L% (which technically is either the utterance-level initial L% or the final L% of the preceding phrase),followed by either H or HL(the accent) at the onset of Mora 2. If Mora 2 contains only an H, a later mora may contain the HL accent. There is also a phrase-final Low.

Tones are determined by applying the appropriate reduction in value to the current available range (from the baseline **r** to the current high tone line).

Declination

Declination was handled as a simple proportional lowering, depending on time, of the points generated by the linear interpolation.

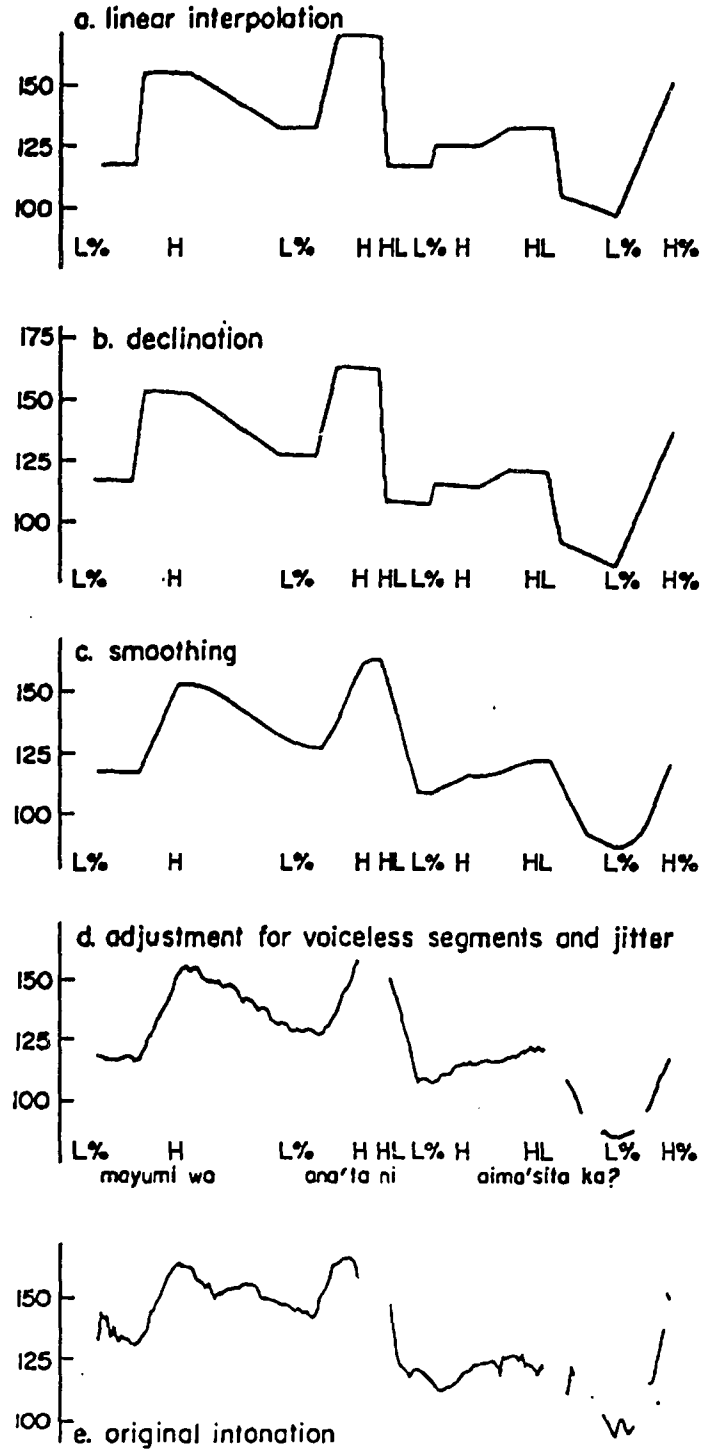

Figure 6.1
Four steps in synthesizing an F_0 contour.
Taken from Pierrehumbert & Beckman p. 177

Smoothing

Smoothing was performed within a moving window of approximately 1-mora in length (p.176) taking into account only values up to the current point, a "causal" handling rather than incorporating future values.

Adjustment for voiceless segments and jitter

Random noise was added in order to make the derived contour appear more natural. Further, the F_0 was set to zero for voiceless segments.

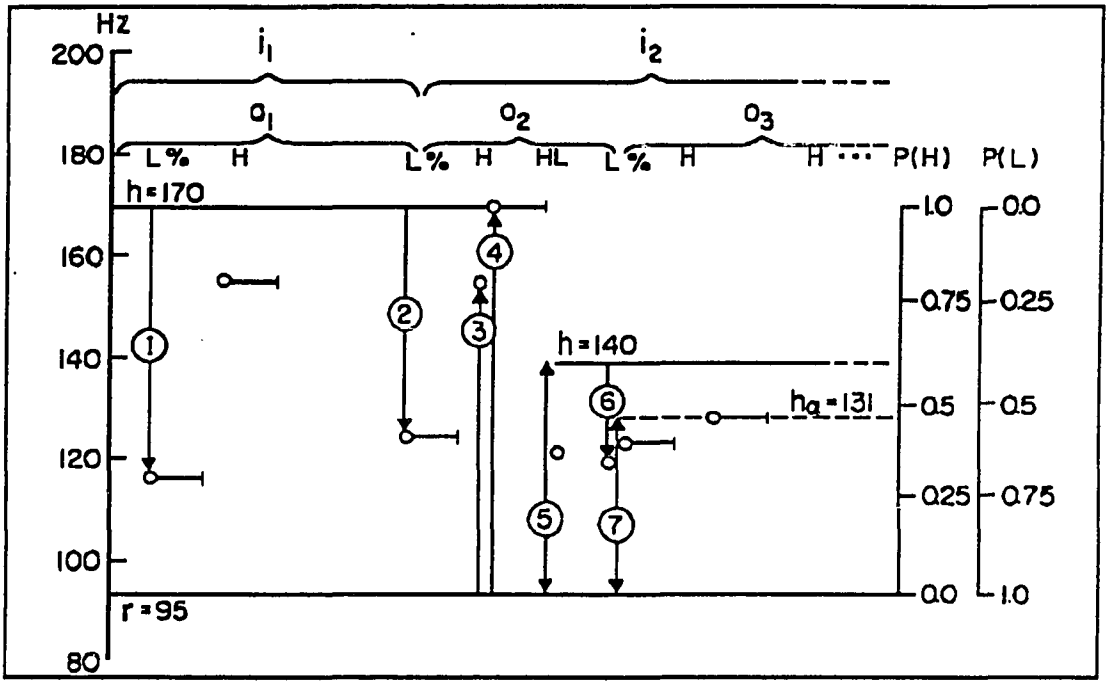

Figure 6.2
F_0 levels calculated for the phase *Mayumi-wa anata-ni aimasita ka?* taken from Pierrehumbert & Beckman p. 208

Synthesis of Ibuki Tone Contours

We will now attempt to apply a similar algorithm to the Ibuki data. Below we will first examine the data in order to

discover how declination is applied in Ibuki and then examine how peak placement and plateau length vary with word class and phrase length.

Declination

While declination is simply defined as a rule-unrestricted decrease in frequency over time, there are a number of computational methods to implement declination in a waveform synthesis algorithm. We will examine two of these below.

Absolute declination

P&H apply an algorithm which post-processes the waveform, reducing all frequencies proportionately depending on their distance from the onset. Using a value of 10hz/sec, a point 2 seconds from the onset would then be reduced 20hz.

Declination in Proportion to Position in Current Range

In this algorithm, the value is decremented based on its relative position in the current range of possible values. Thus, if the current range is 100hz (from 140hz to 240hz, for example) and we are 1 second into an utterance with a declination rate of 10hz/sec, then a point 90% above the baseline would be decremented by 9hz while a point 20% above the baseline would only be decremented 2hz. The advantage of this system is that the baseline value (MInhz) is sacred, nothing can be calculated below that value while with the Absolute declination algorithm, a value after declination is applied can fall below the baseline value.

Maximum Value = 250			Minimum Value = 120	
	+1 sec		+2 sec	
Ceiling Value	250hz		180hz	
Current Range	130hz		60hz	
Pct of range	84.6%	15.3%	100.0%	33.3%
Undeclinated Value	**230**	**140**	**180**	**140**
Absolute	220	130	160	120
Proportional	222	136.9	160	126.6

Table 6.1
Comparison of two approaches to declination

For clarity's sake, the calculations used to produce the 1 sec/230hz values are given below:

Absolute: 230 - (1 sec * 10hz) = 220hz
(Undeclinated value - 10/sec)

Proportional: 230 - 8.46= 221.54
(Undec'd val-((10hz/sec * 1 sec)*(Pct. of Range))

For a ceiling value of 140hz at 2 seconds, however the calculations look like this:

Absolute: 140 - (2 sec * 10hz) = 120hz
(Undeclinated value - 10/sec)

Proportional: 140 - (10*2*0.66)= 126.6
(Undec'd val-((DEcl * 2 sec)*(Pct. of Range))

Figure 6.3 compares contours generated with the absolute and proportional methods. Note the considerable difference these algorithms make towards the end of the utterance.

Figure 6.4 compares contours of the same utterance as above, but with the MIn val of the proportional line lowered so that the resulting contour is adjusted downwards to approximately the same level as the one generated by the

proportional method. Surprisingly, the MIn val has to be lowered to 80hz (from 120hz) to achieve this, a value which is unnaturally low for a female speaker, even an elderly one such MK. The proportional system also results in a first valley which is 20hz lower than required.

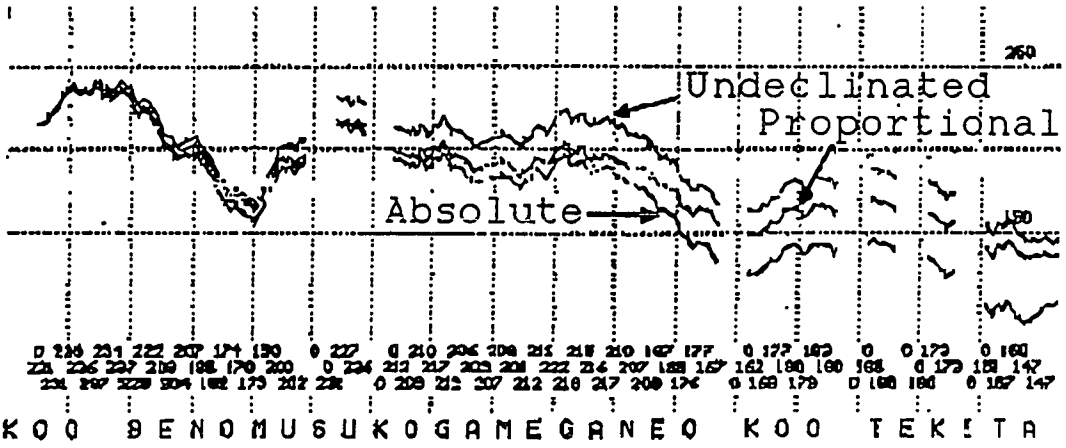

Figure 6.3
Contours generated by the Absolute and Proportional algorithms compared to the undeclinated contour

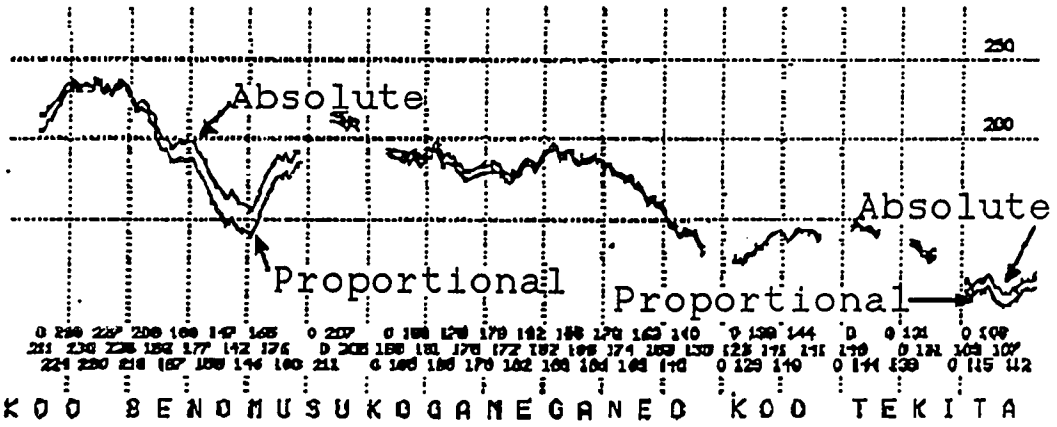

Figure 6.4
Contour generated by the Absolute method (120hz baseline) compared to the Proportional method with an 80hz baseline.

Through a series of generated comparisons, of which the above is only one, it has become clear that absolute declination, as used by P&H is the preferred method since it generates utterances which most closely concide with those observed.

Placement of Peak Value within the Phrase

In order to determine where in a phrase the peak should occur, multiple instances of the most difficult cases, H1, M0 and L2 where extracted from the Martin database. Each utterance was divided into nine sections of approximately equal length. Three marks were used to indicate the slope of the utterance for these nine intervals. '/' = upward, '-' = level and '\' = downward. The data thus gathered is summarized in Figure 6.5.

H1 Accent			M0 Accent			L2 Accent		
medoga	//---\\\\	2	honeo	//--\\\\\	3	amega	///----\\	5
baraga	//-\\\\\\	2	ieno	///---\\\	3	amega	///---\\\	5
ekino	//-\\\\\\	2	ieto	///---\\\	3	hiruni	///---\\\	5
amaga	///--\\\\	2	imoo	///---\\\	3	saruni	////----\	5
azaga	///--\\\\	2	komeo	///--\\\\	3	aniga	////---\\	5
huroni	///-\\\\\	2	kumo	///-\\\\\	3	madoni	////---\\	5
huyuwa	///-\\\\\	2	simao	///-\\\\\	3	abuni	////--\\\	5
kawano	///-\\\\\	2	yamano	///-\\\\\	3	hebiga	/////--\\	5
teraniwa	///-\\\\\	2	kokega	///-\\\\\	3	tobirao	/-----\\\	5
uzuo	///-\\\\\	2	tanini	///-\\\\\	3	kusuride	///------	5
hizini	////-\\\\	2	togao	///-\\\\\	3	midoriga	///---\\\	5
ekuboga	//-\\\\\\	2	togeo	///-\\\\\	3	mukadeni	///---\\\	5
awabiwa	///---\\\	2	amini	////---\\	3	azukio	////--\\\	5
komugi	///---\\\	2	yamano	////--\\\	3	hotorini	////--\\\	5
manako	///---\\\	2	hamani	////-\\\\	3	kabutoo	/////----	5
sudareo	///---\\\	2	yumio	////-\\\\	3	kuzirao	/////---\	5
musumewa	///--\\\\	2	yamano	/////-\\\	3	kaikowa	/////-\\\	5
hinoki	///-\\\\\	2	huroba	/---\\\\\	3	tanukiga	/////-\\\	5
hokoo	///-\\\\\	2	makura	//-----\\	3	tasukio	/////-\\\	5
kagura	///-\\\\\	2	hakama	///-----\	3			
katati	///-\\\\\	2	kotoba	///-----\	3			
warabi	///-\\\\\	2	kagamio	///----\\	3			
minami	////---\\	2	komugi	///----\\	3			
kinoowa	////--\\\	2	takarao	///----\\	3			
momizi	////--\\\	2	hanageo	///---\\\	3			
higasio	////--\\\	2	hayasio	///---\\\	3			
anata	////-\\\\	2	hibikiga	///---\\\	3			
nimotu	////-\\\\	2	hotokeo	///---\\\	3			
siraga	////-\\\\	2	humotoni	///---\\\	3			
uzura	/////---\	2	inoti	///---\\\	3			
sumika	/////--\\	2	katakio	///---\\\	3			
asahi	/////-\\\	2	katanao	///---\\\	3			
wasabi	/////-\\\	2	sugatago	///---\\\	3			
			iniki	///-\\\\\	3			
			atamaga	////----\	3			
			hikariga	////----\	3			
			aida	////---\\	3			
			arasiga	////---\\	3			
			kagami	////---\\	3			
			abura	/////--\\	3			
			hikari	/////--\\	3			
			asita	//////---	3			

Figure 6.5
Analysis of rise, plateau and fall for selected words for accent classes H1, M0 and L2

Each accent class has been further subdivided into two groups, words of 2 morae and those with 3 or more morae. Since the data is not random and the sample is small, we can only draw some tentative conclusions from it.

H1 Class -- Most items have a very short peak which usually starts slightly before mid-phrase. This is confirmed by the data in Chapter 5, Table 5.2 which shows a drop of approximately 25hz between the W1M2 and W1M3 points.

M0 Class -- Two mora words tend to have a single short peak similar to the H1 class, but there seems to be a stronger tendency for longer words to have a plateau which lasts for the mid-third of the phrase or longer.

L2 Class -- There seems to be a very slight tendency for the plateau to begin later than in the case of M0 or H1. Note that Table 5.2 shows only a 6-8 hz drop between points W1M2 and W1M3 followed by a 25hz drop to point W1M4.

Due to the sparsity of data, we cannot derive any definitive rules for peak placement. The IBUGEN program, however, uses the following algorithm which tends to produce waveforms similar to the utterances elicited.

	Peak in morae from left boundary	Plateau length [If > 2 morae]
For H0:	1.2	No Plateau
For H1:	1.0	(MN - 3 * 1.2) [only if > 3 morae]
For M0:	1.0	(MN - 3) * 1.2
For L0:	1.2	No Plateau
For L2	1-3 morae, 1.4 4+ morae, 1.8	(* 1.0 MN - 2)

MN = Mora Number

Table 6.2
Rules of peak placement and plateau length

Even with multiple cases of the same phrase, however, we notice variation which makes it difficult to derive hard and fast rules for their behavior. With more data, it might be possible to determine the effect of voicing, vowel height or other phenomena on the positioning and length of the plateau.

The IBUGEN Program

Parameter Settings -

For each setting, the CAPITALIZED letters are those which we will use as an abbreviation for the parameter. The figures in parenthesis are the values used for the O/K Focus set for informant Miyoshi. All values are represented as a percentage of the current available range.

DEclination - 3hz per mora

MAxhz - the maximum pitch level for a speaker's utterance.(250)

MInhz - the minimum level level for a speaker's utterance.(120)

Accent Peaks - the percentage of the current range utilized for the peak value of each accent type

HP - High-Accented peak (0.90)

H0P - High-Unaccented peak (0.75)

MP - Mid-Peak - For M0 accents (0.50)

LMin - the base value for Low-starting utterances (0.40)

Catathesis - (0.40) - (The greater the value, the larger the drop)

FI - Focus Increment - the degree that the peak value is incremented when the word is the point of focus (0.10)

SH - Start High - position of the onset for a phrase for high-starting phrases. (0.80)

SL- Start Low - position of the onset for a phrase for low-starting phrases. (0.40)

Rules for Generating Pitch Height Values

The rules apply cyclically. Three points are generated for each phrase: onset, peak, and end-point. For each set of rules, once a rule is found that applies, the later rules are ignored. In addition to the rules which determine pitch height, another set of rules applied concurrently determines the positioning of the points in time.

Beginning of Cycle (Setting ceiling)

A1. If previous phrase was H0, then set ceiling to previous peak.

A2. If phrase is attached to a higher node than previous phrase, set ceiling to that of beginning of previous phrase.

Onset

B1. If Word 1 and H0, set onset to H0P - 0.05. (There is only a slight rise from onset to peak for H0)

B2. If Word 1 and not H0 reduce the applicable value by 0.65, which provides an offset for an initial rise. For H1 and M0, this equals HP (0.9) * 0.65, for low-starting, LMin (0.3) * 0.65.

B3. If not Low-starting, set equal to end value of previous mora. (All high-starting words tend to have a smooth rise from the end point of the previous phrase.).

B4. For Low-starting, set to CCL * SL

Mid-Point

C1. If H0 set peak at CS * H0P

C2. If L0 set peak at CS * LMin

C3. If H1, M0 or L2 set peak to CS * HP

Focus

D1. If first phrase and NOT in focus, increment peak by CS * FI.

D2. If in pre-focus or in focus (but not first phrase) increment peak by CS * FI.[1]

Final Point

E1. If H0 or M0 set point to HOP * 0.9 (to produce a slight slope as observed in the data.)

E2. If H1 or L2 set point to LMin

E3. If L0 then if current word in focus or previous word also L0, the set point to HP, else set point to LMin.

Catathesis

F1. If current word is H1, M0 or L2 then lower the ceiling by CA unless the point of focus is in a later phrase at the same node level. (Note that this treatment differs from that in P&B for the Tokyo dialect, where catathesis applies immediately after the H and before the paired L value is calculated. In Ibuki, catathesis has no effect in the current phrase at all.)

An Example of Tone Generation

Figure 6.6 illustrates the application of the rules stated above for the generation of pitch contours in Ibuki. The following numbered sections refer to the circled numbers in the figure. The sentence KOOBE-NO MUSUKO-GA MEGANE-O KOOTEKITA (**aUa**) has been selected for exemplification.

1. The initial ceiling level is set to MAxhz = 250hz
2. Since the first phrase (β1) is accented, the onset is set at CCL * 0.9 * 0.65 = 196hz. (Rule B2)

5. The peak of Word 2, which is H0, is set at CCL * (H0P + FU) = CCL * (0.75+0.1) = 217hz since this phrase is under focus. (Rules C1,D2)
6. The final target is set at 192hz which is CCL * H0P * 0.9 = CCL * H0P * 0.9. (Rule E1)
7. The ceiling is lowered to the height of the previous peak since the accent class was H0. (Rule A1)
8. The peak for phrase α_2 is CFR * HP = 0.9 = 203hz (Rule C3)
9. The final point is set at CFR * LMin = 0.3 = 154
10. Since α_2 is H1, the ceiling is then lowered through catathesis to 158hz (Rule F2)
11. The peak value is CCL * HP = ((158-120) * 0.9)+120 = 154hz.(Rule C3)
12. The final value is CCL * LMin = ((158-120) * 0.4)+120 = 135 (Rule E2)

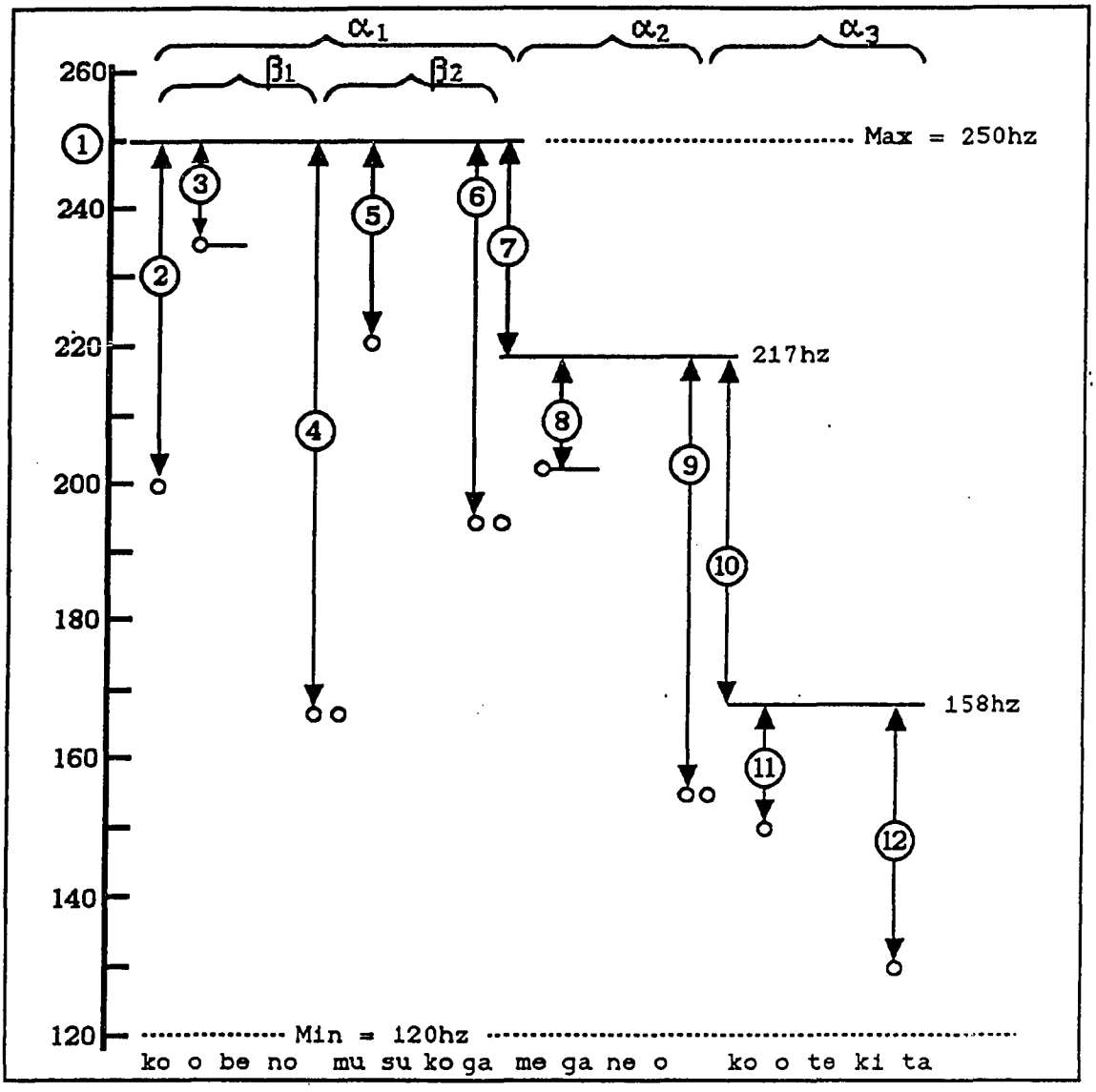

Figure 6.6
Example of rule application with IBUGEN program

Synthesis of Contours

Table 6.3 presents a comparison of the means presented in Chapter 5, Table 5.15 in bold face, with the values generated by the IBUGEN program with the parameters set to the values discussed above. There is a close match to the original values except for the italicized cases.

While there is generally a good match, the values for **uAu** tend to be slightly low while the V2-3 values for "Focus on W3" also tends to be lower than the actual mean values. At present it does not seem possible for an alteration of the parameters to bring these values into line without disturbing the other values which already fit well.

Focus on W2 (Person)							Focus on W3 (Object)						
	W1	Valley	W2	Valley	W3	Verb		W1	Valley	W2	Valley	W3	Verb
aAa	**239**	**168**	**236**	**159**	**168**	**132**	**aaA**	**248**	**164**	**187**	**155**	**223**	**143**
	233	161	234	151	165	131		246	161	183	*129*	224	150
aUa	**232**	**169**	**219**	**195**	**206**	**148**	**auA**	**252**	**161**	**187**	**167**	**231**	**145**
	233	161	217	*179*	196	151		246	161	*174*	*149*	226	150
uAu	**219**	**201**	**240**	**165**	**169**	**156**	**uaU**	**218**	**195**	**204**	**161**	**203**	**182**
	215	190	*229*	*150*	*152*	*144*		228	189	209	*148*	202	183
uUu	**209**	**195**	**218**	**170**	**191**	**165**	**uuU**	**219**	**195**	**203**	**174**	**213**	**190**
	215	198	213	*182*	184	165		228	189	197	174	*202*	183

Table 6.3
Comparison of actual means (boldface) and values generated by IBUGEN for Osaka/Kobe data. Italicized values indicate poor predictions (> 10hz off)

Figures 6.7 and 6.8 present the output of IBUGEN for these eight utterances while Figure 6.6 presents instances of actual utterances for the same eight phrases. Naturally, since these are individual utterances each with their own idiosyncratic elements, they will not match the generated utterances exactly.

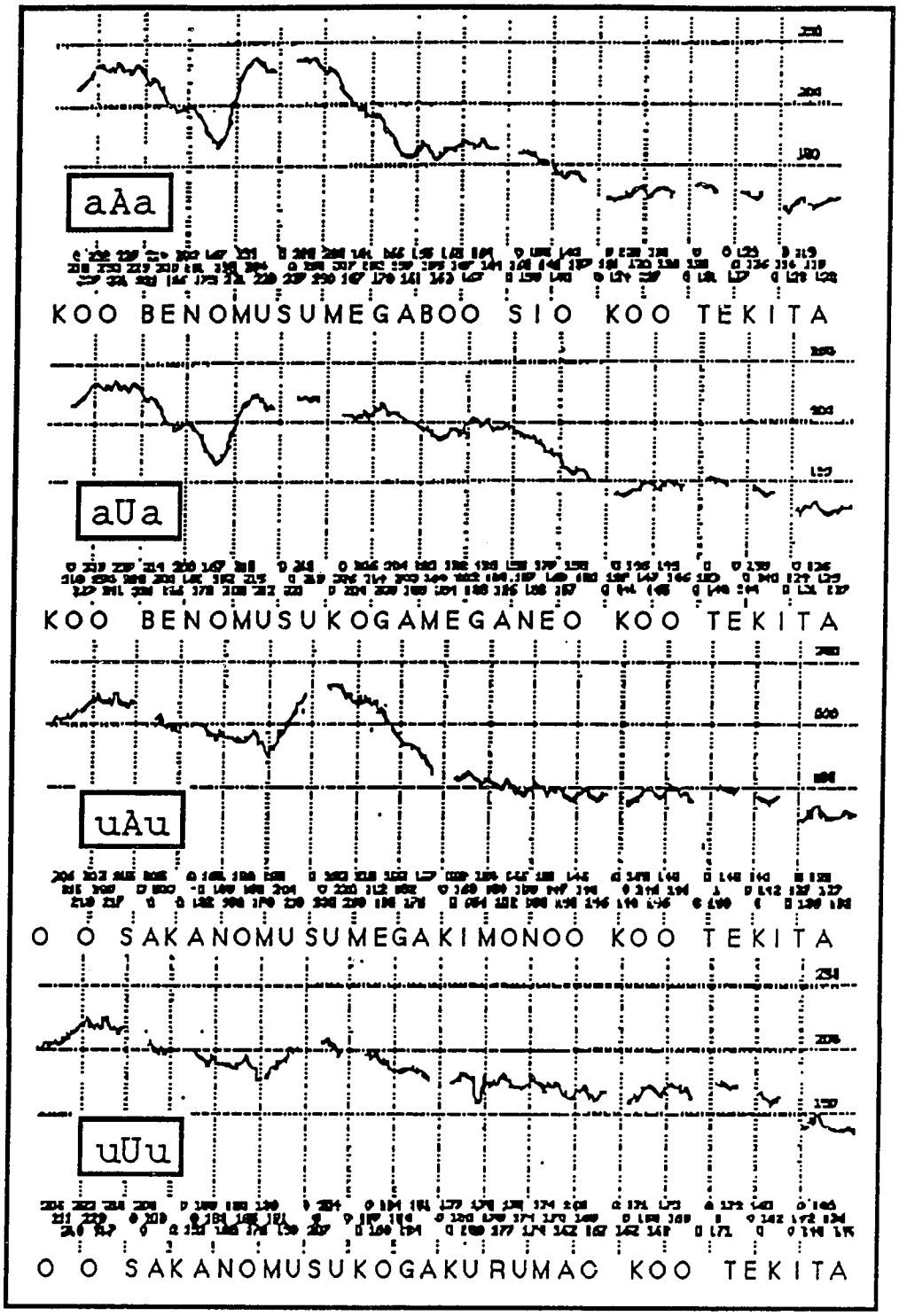

Figure 6.7
Output of IBUGEN for 4 utterances with Word-2 focus

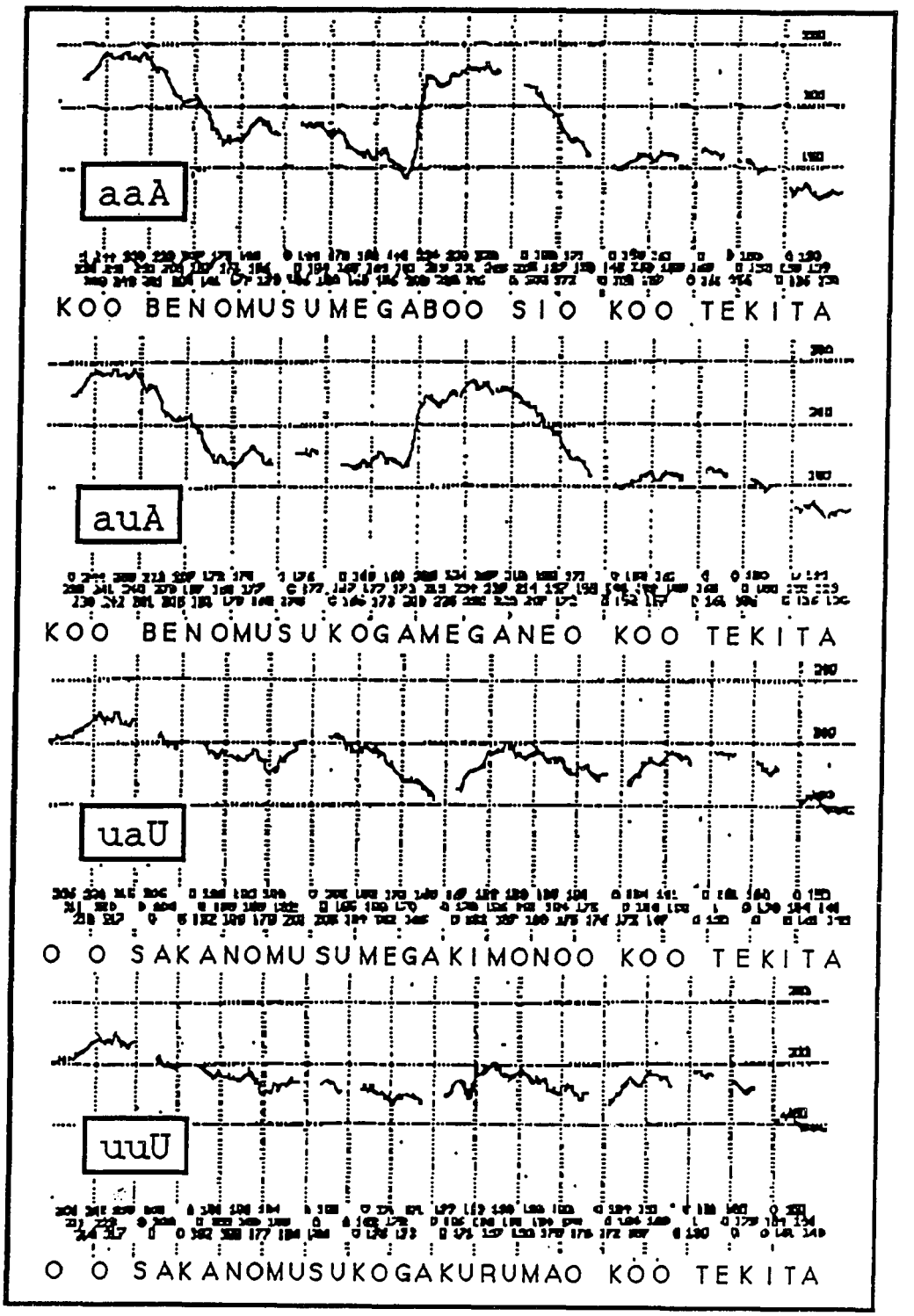

Figure 6.8
Output of IBUGEN for 4 utterances with Word 3 focus

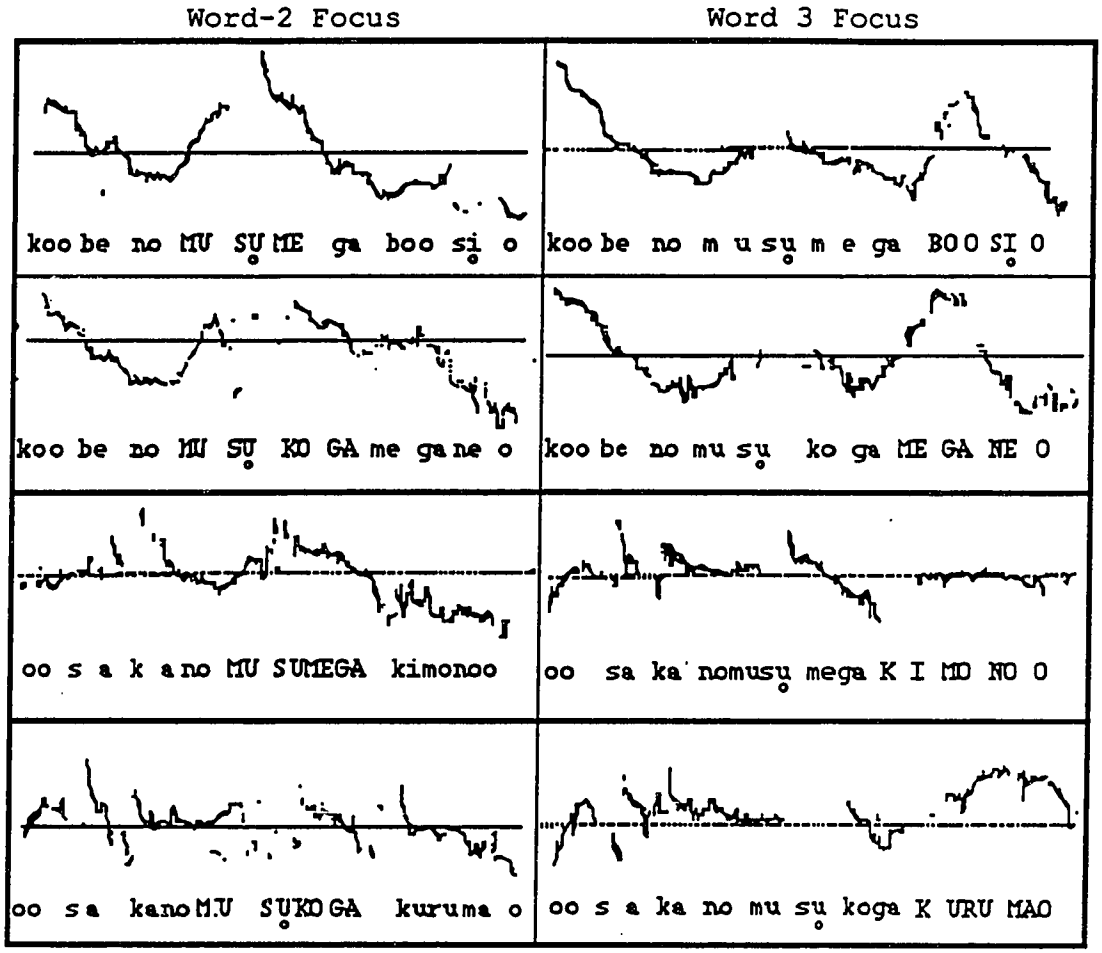

Figure 6.9
Eight actual extracted utterances (cf. Figs 6.7 & 6.8)

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[1]Whether it is only the focused element that it incremented or all peaks except for first peak that is incremented is debatable. Neither assumption appears to make correct predictions in all cases. With this rule in effect, good predictions are made for W2 for the **aaA** case and the **uuU** case. If the increment only applies to the focussed element, the W2 values for **auA** case becomes 20hz too low.

Chapter 7

Conclusion

In this chapter we will attempt to relate our findings to tonological theory for both the synchronic and diachronic description of tonemic change. We will conclude with suggestions for future research.

On Phonemic & Phonetic Systems of Representation

A phonemic system is, by definition, a system that represents language via a minimal set of non-redundant symbols, which, by the application of a set of rules can be transformed into a more detailed phonetic representation.

Further, while any arbitrarys symbol would do theoretically; the symbols chosen to represent each phoneme ordinarily have "a distinct mnemonic value because the same symbols are used...in phonetic transcriptions. There would be little point in choosing any other than a /p/ to represent a phoneme which has [p^h], [p] and [$p^\urcorner$] as its allophones, although /2/, /□/, or /x/ could actually be used to represent the abstract formal unit." (Wardhaugh, 1972:63)

With suprasegmentals, it is a symbol with 'iconic' rather than 'mnemonic' value, a symbol that, everything else being equal, is in some way indicative of the F_0 contour that is the ideal.

With this in mind let us now look see how well our two Ibuki dialects (Adult & JHS) can be handled by some of the extant systems of tonal notation.

Traditional Accent Notation

By 'traditional' I refer to the system of accent notation which is used in the large body of works on accent by Japanese scholars such as Kindaichi in his numerous works and in the two major accent dictionaries, Hirayama(1960) and Nihon Hoosoo Kyookai (1985). This system is characterized by the marking of a rises and falls by angled brackets or merely by the use of white and black circles to indicate the low and high moras, respectively.

In the case of the two Ibuki dialects (ADULT & JHS) the traditional system fails to capture the appropriate distinctions, primarily because there is no mechanism for indicating a mid-tone. Thus Wada(1966a:28) had difficulty in determining an appropriate phonemic notation:

	H0	H1	M0	L0	L2
Suggestion #1	⌜○○○	⌜○⌝○○	⌊○⌝○○	⌊○○○	⌊○○○⌝
Suggestion #2	same	⌜○○○⌝	⌜○⌝○○	same	same

Note that Wada's initial upper and lower angles, signifying High and Low onsets, are actually somewhat redundant. Hirayama (1960) only marks an initial low onset, leaving the absence of a mark to represent a high onset (cf. p.17).

From our study, we can see that Suggestion #1 for M0 is inappropriate since M0 is clearly high-starting along with H0

and H1. We can also observe that Suggestion #2 does not capture the difference that we have discovered either. Both H1 and M0 exhibit a sharp fall somewhere near mid-word; a more important distinction is the difference in the rates of fall. While both of Wada's suggestions do make a distinction at the phonemic level, neither shows a close fit with the actual phonetic facts, which, as we have discussed above is another requirement for an optimal phonemic representation.

Yamaguchi(1975), Uwano(1985) and Sato(1985), extend the traditional system by providing a separate marker for the M0 class. In keeping with the use of the 'M0' terminology which means that there is no accent fall, no additional fall marker occurs in the word or phrase.[1]

Haraguchi

To deal with the mid-tone, Autosegmental Tonology would have to posit a third basic melody, HM in addition to the normal HL and LHL melodies which are posited in Haraguchi(1977) for the Kansai dialects.[2] One problem with positing a third melody, however, is that it is restricted in scope. While both the HL and LHL melodies in Kansai have an unaccented form (unstarred) and a form with a star, our HM exists in only one form. Furthermore, we would be hard put to say whether this is the form with the star or without since the Adult form 2.3 form does indeed have a fall in pitch, but the JHS form descends steadily from beginning to end.

An additional problem with Haraguchi's system (and with others as well) is that it cannot handle the generation of the tone contours for the the 2.2/2.3 JHS/ADULT words, in which there was an apparent 'switch over' in the perceived pitch patterns. Assuming that the adult forms for 2.2 and 2.3 nouns are as follows,

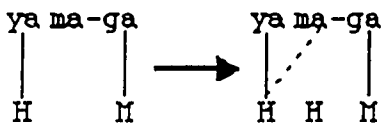
*	
hasi	yama
H L	H M

in order to generate the JHS forms, Haraguchi could use a rule such as the following for the 2.2 case:

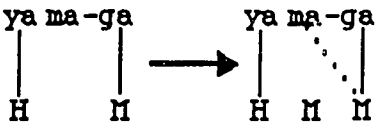
* *
[VV] --> [VV] when the tone melody is HL

The M0 case, however, is much more difficult to handle. First, there is the question of whether the M0 type has a star or not. The fact that Uwano and Sato have, as stated earlier, both chosen a notation equivalent to 'M0' indicates that they feel that there is no locus of fall within the word, i.e., that there is no star.

In the Haraguchi(1977) model, the only way that a difference can be created for a non-starred item would be to modify the rule for tone spreading. In the adult case the rule could appear thus:

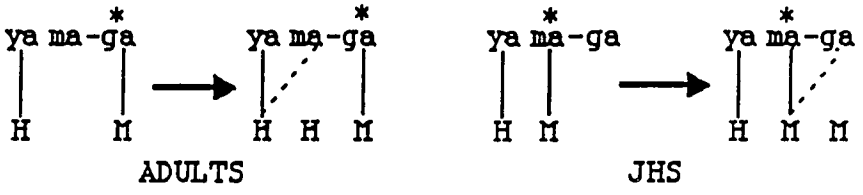


while for the JHS, the M could attach one mora earlier:



The problem with such a mechanism is, however, that tone spreading does not allow for any intermediate tones, but as we can see from the work presented in this dissertation and that by Pierrehumbert and Beckman, a continuum of intermediate values is possible. These cannot be generated within the limited mechanisms that Haraguchi provides.

Even if one does posit a star for these forms, the problem remains the same, although the derivational mechanism differs. Instead of a tone-spreading rule to match the H or M with unassigned mora, the star can be shifted to the left for the JHS form:



Pierrehumbert & Beckman

Pierrehumbert & Beckman present a system which is terse at the phonemic level. A minimum number of tones are available at the lexical level and others (boundary tones) are inserted at the phrase level. Further, in the process of tone realization a very few mechanisms come into play, namely, catathesis, declination and final lowering.

The beauty of this system is that it allows for a fine specification of the phonetic realization. This not only

permits synthesis of contours which closely approximate those observed in real speech, it also provides us with a mechanism to account for inter-speaker variability and, ultimately, language change.

At the level of phonetic realization there are numerous parameters which can vary either for the individual speaker or for the dialect as a whole:

Single Accent Phrase

height of onset (as percent of available range)
location of rise
location of fall
height of rise
length of plateau[3]
rate of rise
rate of fall

Multi-phrase sequences

deletion of end target
degree of catathesis
conditions for catathesis
rate of declination
increment/decrement in height for prominent phrases
conditions for application of focus

For each of these parameters, there is the question of whether or not it applies to all tone classes OR all tone classes of a particular type (e.g., low starting vs. high starting). We have seen, for instance, the L2 3-mora nouns are low starting, but they appear to share their final target with the M0 class, not the H1 class. We also noted in Chapter 2, however, that the JHS target for H1 coincided with that for M0, while that for L2 coincided with L0. It would thus

appear that each class has its own peak and final target which can vary independently from those of other classes.

The parameters for a single phrase can be classified into two groups according to whether the value can vary from accent class to accent class or appears to be static, at least for any given speaker:

height of onset	Constant
location of rise	Variable
location of fall	Variable
height of rise	Constant
length of plateau[4]	Variable
rate of rise	Constant
rate of fall	Constant

The 'constants' appear to vary to some extent from speaker to speaker, and particularly between the sub-groupings of the dialect (our Adult and JHS informants), but they are constant for all applicable tone classes. The variable parameters need to be specified for each tone class individually in the case of Ibuki. It may be the case, however, that in some dialects even our 'variables' have constant values. From the data in P&B, it would appear that the Tokyo is such a dialect.

Ibuki as an Example of Language Change in Progress

As discussed above, there are a number of parameters which can vary among speakers. Most of this variation is sub-phonemic. Our Ibuki data provides us with no evidence of any changes in the phonemic system, although differences in the initial onset and the locus of fall for the Adults and

JHS informants make a difference in our perception of the contours in terms of Highs and Lows. There is no evidence yet, however, that our informant groups in Ibuki perceive the differences that we have measured between the Adult-type utterances and the JHS-type utterances as actually being different to their ears.

For the speakers of this dialect, it is more likely true that they hear a "bundle of features" which taken as a group cause the words of a given utterance to be assigned to the class that this bundle of features most closely approximates. For Ibuki, the relative height of the first mora vs the second mora apparently does not play a prominent part in distinguishing classes, but the slope of the fall (High to Low for 2.2; High to Mid for 2.3) is an over-riding indicator of class membership.

This is as it should be, since language change is normally not perceptible to the population undergoing the change. It would, however, be extremely revealing to attempt a word recognition experiment on young and old Ibuki informants where, using synthesized utterances such as those used by Sugito (1983), we attempted to discover the perceptual boundaries between the 2.2 and 2.3 classes. Using a 'young voice' and and 'old voice' one could vary the locus of fall, extrapolating between the observed contours. My hypotheses would be:

1) Both old and young informants would similarly classify utterances according to similarity of slope rather than locus of fall, and

2) Both old and young informants would classify the utterances differently depending on whether the voice was young or old.

Is Ibuki a "Tone Language"?

To state our conclusion first, no, Ibuki is no more a tone language than any other Kansai dialect. McCawley(1978), in an article entitled "What is a Tone Language," discusses this very issue, coming to the conclusion that pitch-accent languages and tone languages are but two ends of a spectrum. Although not put in precisely these terms, I believe that it is an accurate summary to state that the pitch-accent<->tone language continuum contains the following elements which can vary from one language or dialect to the next:

1. The degree that tone must be specified in the lexical entry. In a pure tone language, every syllable requires specification. In a pitch accent language, there can be single specification denoting class or, equivalently, a single mark indicating the location of a change in fundamental frequency.

2. The extent to which an accent marking can effect other syllables in the accent phrase. In a tone language, there are only local sandhi (assimilation and dissimulation) effects, while in a pitch accent system the existence of a

mark can cancel any further marks on lexical items later in the same phrase. In McCawley's term this is "action at a distance."

Both of the conditions, however, can be viewed in an autosegmental framework as two manifestations of the same phenomenon. In a tone language, since each syllable is marked, autosegmental processes operate in the narrow scope of the word, while with languages that have few markings in a phrase, the scope of operation is the phrase.

It is natural that these two terms do not form a dichotomy, but rather a continuum. Languages can thus slowly shift towards one end or the other of the continuum gradually..

Haraguchi defines "a dialect like Tokyo, which makes use of a star, an accentual system" and further, he continues, "Chinese and other tone languages which do not use the star will be referred to as non-accentual languages." (p. 8) This agrees with what we have stated above — a system where every syllable is specified for tone has no need for a diacritic to indicate the locus of fall. Only when the tone is spread over two or more syllables, as in Japanese, does the star or locus of fall, whatever you may call it, become relevant.

Directions for Future Research

This study has been only a partial analysis of the accent phenomena of the Ibukijima dialect, with particular emphasis on nouns and noun phrases. Obviously much more

research needs to be done to understand the dialect as a whole, and, in particular, its relationship to other dialects and its value as evidence of the earlier structure of the Japanese pitch-accent system.

In Ibuki, much more work is required on the verbs, other parts of speech and their interaction at the phrase and higher levels. Further, the variation in the system at graded age levels requires investigation. The gross observations reported here of speakers 14 years old vs. those 70+ can only give a partial picture of the extant variation. In particular, we can ask the following questions:

1. Is there a gradual change in the parameters between those observed for the JHS and Adult speakers, or is there a clear dichotomy between the two?

2. Do young children acquire a system akin to that of JHS, or do they initially, under the influence of their parents, acquire an adult-like system which then undergoes change when in contact with older children?

3. Are the speakers on the island conscious of the fact that the children's dialect is different from that of the adults, or is this phenomenon only observed by those outside the community?

4. Given a set of synthesized utterances which systematically altered the position of accent fall and degree of slope, do both adults and children classify the synthesized phrases in the same way?

5. Further, does the age of the voice in such synthesized utterances affect the classification of the utterances?

Extending ourselves outside Ibuki, it would be extremely revealing to have detailed accounts of the tonal behavior of a set of related dialects, such as those for the Noto, Kumano-nada and Sanuki dialects presented in Kindaichi (1975).

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[1]The use of the '0' implies, however, that there might also be "M1" or "M2" accent types which this writer has not observed. Uwano does cites a few examples of 5 mora words in his prefatory material (p, 90) all of which are compound forms.

M0

merikenko (wheatflour)
komamonoya (haberdashery)

M4

oomisoka (New Year's eve)
oosetuma (reception room)
tyuuzaisyo (police box)
hototogisu (cuckoo)

It is difficult to imagine how a tone which is already gradually decending would have sufficient height remaining for there to be a locus of fall between the fourth and fifth moras. Obviously more research will have to be carried out before this issue can be resolved.

[2]Haraguchi (p. 291) does cite dialects with a **M** melody, but this is for some of the "accentless dialects" and is thus not relevant here.

[3]The length of the plateau and the rate of fall are not independent parameters since once the location of the end of the plateau is determined, the fall must apply from that point to the end of the phrase, which thereby determines the rate of fall. Nevertheless, it is conceivable that in some dialects the rate of fall is a more important factor and this will determine the length of the plateau.

[4]The length of the plateau and the rate of fall are not independent parameters since once the location of the end of the plateau is determined, the fall must apply from that point to the end of the phrase which thereby determines the rate of fall. Nevertheless, it is conceivable that in some dialects the rate of fall is more important factor and this will determine the length of the plateau.

Appendix A

Translation of Wada (1966b)

A Dialect with Five Forms for the Five Classes of 2-Mora Nouns

Minoru Wada

1. A dialect with accent classes as described in the title has been found on an island lying in Hiuchi Nada belonging to Kanonji City of Kagawa Prefecture called Ibukijima. No reliable report of the existence of this kind of accent system had been available until the publishing of Senno, 1966. In order for this society to verify this claim I will present my report along with a tape of the dialect in question.

2. Below I will present the data obtained from a fisherman, aged 70 and a youth of junior high school age.

Accent Class	Fishermen	Youth
2.1 [RJMS H H]	ō ō	ō ō ga
2.2 [RJMS H L]	ō o ō o ga	ō ò ō ō ga
2.3 [RJMS L L]	o ō o ō ga	o ō o ō ga
2.4 [RJMS L H]	o ō	o o ō ga
2.5 [RJMS L F]	o ō (either) ō o ga	o ò o o ga

Words tested in each class

	Low V in 2nd Mora	High V in 2nd Mora
2.1	AME 'candy'	USHI 'cow'
	UME 'plum'	KAKI 'persimmon'
	KAO 'face'	KIRI 'fog'
	KAZE 'wind'	KUTI 'neck'
	SAKE 'wine'	KOSHI 'back'
	SUNA 'sand'	TORI 'bird'
	TAKE 'bamboo'	KANI 'crab'
	NIWA 'garden'	**KIJI 'pheasant'
	HAKO 'box'	HASI 'edge'
	HANA 'nose'	HATI 'bee'
	HANE 'feather'	MIZU 'water'
	KAMA 'sickle'	**MUSI 'insect'
	MOMO 'peach'	
2.2	UE 'up'	ISI 'stone'
	UTA 'song'	KAMI 'paper'
	OTO 'sound'	NASHI 'pear'
	KAWA 'river'	NATU 'summer'
	HATA 'flag'	HASI'bridge'
	HITO 'man'	HIRU 'noon'
	MAGO 'grandchild'	HUYU 'winter'
	MUNE 'chest'	MATI 'town'
	MURA 'village'	YUKI 'snow'
2.3	IKE 'pond'	ASI 'leg'
	IRO 'color'	INU 'dog'
	UDE 'arm'	KAI 'shell'
	UMA 'horse'	KAMI 'hair'
	OYA 'parent'	SUMI 'coal'
	HUSA 'bunch'	TUKI 'moon'
	KUMO 'cloud'	MIMI 'ear'
	KOME 'rice'	YUBI 'finger'
	SAKA 'slope'	*KAMI 'god'
	SIMA 'island'	NAMI 'wave'
	HATO 'pigeon'	
	HANA 'flower'	
	HARA 'belly'	
	HURO 'bath'	
	MAME 'beans'	
	YAMA 'mountain'	

2.4	KAMA 'scythe'	IKI 'breath'
	ITA 'board'	**UMI 'sea'
	ITO 'thread'	OBI 'belt'
	INE 'rice'	*TITI 'father'
	SORA 'sky'	HATI 'chopsticks'
	GETA 'shoes'	HARI 'needle'
	HUNE 'boat'	MATU 'pine'
	MUGI 'wheat'	
2.5	AKA 'red'	AKI 'autumn'
	ASA 'morning'	KOI 'carp'
	ASE 'sweat'	SARU 'monkey'
	AME 'rain'	*TUYU 'dew'
	KAGE 'shadow'	TURU 'crane'
	NEKO 'cat'	HARU 'spring'
	KOE 'voice'	HEBI 'snake'
	MAE 'front'	
	MADO 'window'	

** JHS & Fisherman assigned this to a non-standard class 3. There were a number of cases where the accent patterns observed differed from those listed above. For instance, the JHS student sometimes pronounced the first mora low in type 2.1 nouns, while the fisherman sometimes pronounced type 2.5 as low following by high + falling. These, however, in no way could be considered to represent further accent classes. The above, however, should merely be considered to be respesentative of the pronunciations observed. (Incidentally, while I have separated the words in the chart above into those with a high or low vowel in the second mora, there seems to be no pitch variation related to this feature in this dialect [as is observed in some other Kagawa dialects]).

4. Accent phenomena in word combinations

All 5 classes can be distinguished by words or particles attached before or after. The following were observed from the JHS informant:

	'this X'	'exist X'	'need X'	'want X'	
2.1 (MITI)	konomiti	mitigaaru	mitigairu	mitigahosii	'road'
2.2 (HASI)	konohasi	hasigaaru	hasigairu	hasigahosii	'bridge'
2.3 (YAMA)	konoyama	yamagaaru	yamagairu	yamagahosii	'mountain'
2.4 (SUMI)	konosumi	sumigaaru	sumigairu	sumigahosii	'corner'
2.5 (IDO)	konoido	idogaaru	idogairu	idogahosii	'well'

The fisherman's pronunciation was as follows:

2.1 (NIWA)	niwa	niwaga	niwawa	niwawo	niwani	niwamo	niwae
	niwano	niwakara	niwamade	niwada	niwadesu		
2.2 (HASI)	hasi	hasiga	hasiwa	hasiwo	hasini	hasimo	hasie
	hasino	hasikara	hasimade	hasida	hasidesu		
2.3 (YAMA)	yama	yamaga	yamawa	yamawo	yamani	yamamo	yamae
	yamano	yamakara	yamamade	yamada	yamade		
2.4 (SUMI)	sumi	sumiga	sumiwa	sumiwo	sumini	sumimo	sumie
	sumino	sumikara	sumimade	sumida	sumidesu		
2.5 (IDO)	ido	idoga	idowa	idowo	idoni	ido	
	idono	idokara	idomade	idoda	idodesu		

See section 6 for comments on the notation used above.

5. The pitches for 2.2. and 2.3 for the fisherman differ only slightly from each other. For sake of illustration one could liken the differences to the DO, RE, MI of a flute, with the following correspondences:

2.1 MI MI 2.2 MI DO 2.3 MI RE 2.4 & 2.5 DO

MI{=}In type 2.3 the difference in pitch between the two moras is great while a lesser difference is observed in 2.3.

For type 2.3 "RE DO" would be just as appropriate. (With the 5 accent classes very similar to those reported in the

Ruijumyoogisho, describing 2.3 as "RE DO" makes the description that much closer to that described in the Heian period), but since the fisherman pronounces the 2.2 example above as KONOHASI and that of 2.3 as KONOYAMA, I would assign MI DO to 2.2 and MI RE to 2.3. 2.3 + GA becomes MI MI RE.

6. I have indicated the "RE" above as a series of dots "..." but I cannot say at this moment whether it is phonemically distinct from or is a variant of the high and low pitch phonemes. I have, however, grouped the "..." syllables with the low pitches in the examples in section 4.

This "RE" pitch was not observed with the junior high school student.

7. References:

Seno, Shuko. "Kagawa-ken Ibukijima no Akusento" Kokugo-kenkyu 22.22-23 (1966), Kokugakuin Daigaku

Wada, Minoru. "Dai-ichi-ji Akusento no Hakken -- Ibukijima, Kokugo-kenkyu 22.22-23 (1966), Kokugakuin Daigaku

Appendix B

Partial Translation of Uwano(1985)

Uwano gives a very detailed description of the intra-speaker variation he observed, particularly with respect to the 3 mora nouns. His discussion is quite relevant to our study since we shall be able to explain the variation he observed quite succinctly using the system developed herein.

While I have attempted to remain faithful to the original, I have had to take considerable license with the formating of examples. Uwano uses a vertical style of writing with sidelines to indicate high-pitched moras and a dotted line to indicate a mid-pitch. I have opted herein for a simple notation with H/M/L/F/R for high/mid/low/fall/rise, respectively. Lower case letters preceded by a hyphen indicate particles. I omit his listing of 4-mora noun classes.

Translation

Part 3 - Outline of the Study

Five trips were taken to the island, in July, October, and November of 1983 and in April and May of 1984 for a total of twenty days. My activities can be generally divided into two categories: 1) an investigation by age level of the retention of the Heian period accent, and 2) and in-depth study of a smaller number of informants.

This publication will be mainly concerned with the latter. The survey by age group will be reported later.

My informants were as follows: The oldest informant was born in the 34th year of Meiji (1901) and there was one other Meiji-era informant. There are 6 from the Taisho era and 23 from the Showa era for a total of 31 informants. Of the Showa group, there, were 3 of high-school age, 2 of junior high age and 2 of elementary-school age (as of 1983). Each informant was interviewed for one to two hours, but there were a few for which circumstances permitted only an abbreviated session.

The results indicate that all informants down to the youngest maintain the original 3-way distinction for 1-mora nouns and a 5-way distinction for 2-mora nouns. While there is certainly a trend, as mentioned in the earlier-cited literature for a change in the pitch shapes, and it appears that some of the words have changed classes for the younger informants all informants clearly maintain the original classes. As pointed out in Wada (1966a), the distinction is easier to perceive with the younger informants.

In parallel with the age-group study, an in-depth study was conducted primarily with two Showa-era informants, Miyoshi Nobuko (b. 1937) and Kubo Kazuko (b. 1930). This paper is a report on this section of my survey only. Considering the importance of this dialect, my survey can only be taken to be a small sampling adding somewhat to what has already been published, a sort of study of work-in-

progress. I feel, however, that this preliminary report, which outlines the basic accent system of the dialect, is a necessary predecessor to the forthcoming report by age group.

Part 4 - The Accent Patterns

This report will mainly deal with Miyoshi Nobuko (b. 1937) but also with Kubo Kazuko (b. 1930), with my oldest informant, Kubo Yoshio, Kazuko's father-in-law (b. 1901), and with Ise Masae (b. 1921), who appears to have maintained the oldest form of the accent Additional data comes from two junior high school students (b. 1979), Iwata Yuichi (male) and Goda Kei (female).

The following is an enumeration of the Miyoshi's tone pattern types. For the 1 and 2 mora nouns, (with the exception of 1.4), the leftmost number represents the number of moras and the rightmost number the traditional type. For the three mora nouns, there are cases with no straight correspondence to the traditional classes, so the traditional classes are listed afterwards where a correspondence applies. The classes are not arranged in an ideal sequence, particularly, 1.3/1.4 and 3.5./3.6 could well have been reversed, but I thought it best to put the classes in their traditional "rui"('class') order since we will need to refer to them as such. There are words which are exceptions to the traditional classes, but 3.5 in particular has no traditional corrspondences. (See section 9 for a more detailed listing of

words belonging to each class.) I omit the final juncture from these examples.

1.1	HH	HH-h or H-h	e(handle), ka(mosquito), ti(blood)
1.2	HL	HL-l or HH-l	H-l or H-f na(name), ha(leaf), hi(sun)
1.3	LH	LL-h/L-l	e(picture), te(hand), hi(fire)
1.4	HM	HH-m/H-m	sha(gauze),se(back),ro(silk gauze)
2.1	HH	HH-h	ame(candy),kaze(wind),hans(nose)
2.2	HF	HH-l	isi(rock),kawa(river),kiba(fang)
2.3	HM	HH-m	inu(dog),nomi(flea),hana(flower)
2.4	LH	LL-h	kata(shoulder),hasi(chopsticks), hune(boat)
2.5	LF	LH-f	ame(rain),saru(monkey),nabe(pot)
3.1	HHH	HHH-h	kimono,kuruma(car),sakura(cherry) (1)
3.2	HHF	HHH-l	higasi(east),mittu(three), musume(daughter) (2)
3.3	HHL	HHL-l	tikara(strength),hatati(twenty), misaki(cape) (3)
3.4	HHM	HHM-m	atama(head),otoko(man),inoti(life) (4,5)
3.5	LLF	LLH-f	sakki (before),noroma(dullard), magure(freak)
3.6	LLH	LLL-h	usagi(rabbit),kitune(fox), kujaku(peacock) (6)
3.7	LHF	LHH-l	itigo(strawberry),kabuto(helmet), kusuri(medicine)

Along with the standard patterns represented above, the following variants must also be noted.

For 2.2 (HH-l) sometimes HF-l is heard. For 3.2 HHF and 4.2 HHHF sometimes HHM and HHHM or HH-l and HHH-l are heard, respectively. For 2.5 LHF, 3.7, 4.8 and 4.9 the initial rise to a medium height rather than to a full H can easily be mistaken for L, but in careful pronunciation it is definitely H. For 2.2, when the second mora is the second half of a long

vowel or /-N/, HL is heard. In this case, if a particle is attached, a fall starts from mid-second mora. The informants, however, state that this mora is H. When a 2.4 word is said in isolation, the second mora often exhibits a slight rise on the end. Also, the second mora of 2.5 nouns shows a tendancy to fall slightly. (It sounds unnatural to informants unless there is a fall.)

Now, with the problematic 2.3 and 3.4 clases, my observations coincide with Wada's; HM and HHM are appropriate descriptions. When comparing class 2.2 /to/ ('ten') HL and class 2.3 /too/ ('pagoda') or their 3 mora counterparts, HHL and HHM (the two mora words + particle are the same), we can observe that in addition to the final morae being H and M respectively, the former is pronounced more strongly with a slightly longer duration. In addition there is only a mild fall, the first mora appears to me to be slightly lower. Cf. Wada's RE DO description. However, in careful pronunciation, this does not appear to be the case, and when /kono/, etc., is prefixed to the words, the distinction seems to disappear The informant states that this M syllable is a level mid tone, although I perceive a slight fall. When words in this class are pronounced in isolation, however, it sometimes seems that there is a slight rise at the very end, although the informant apparently perceives it as staying level. Looked at from this viewpoint, however, the contrast between the two stands out clearly.

I cannot say, however, that I have not found instances which match the observations of other scholars as well. There is variation among speakers, however; generally speaking, those born in or before the early Showa years have less of a fall from high to mid for the 2.3-type words or at least utter words with a mid-tone less frequently. This makes it even harder to differentiate from the high-level 2.1 and 3.1 types (regardless of whether 2.2 is HF or HL). However, apart from the difference of height of the last mora, there is a definite difference in the overall tonal contour which is difficult to describe in precise linguistic terms. Subjectively, however, the high-level types seem to fall gently, while the 2.3 and 3.4 types seem to be forced down. In summary, one can say that these are heard at "Mid-level." Although calling types 2.4 and 3.7 "Low-level" might be going a bit too far, these two types, as Yamaguchi suggests, are very similar to the 2.4 type observed in the Noto (Ishikawa) area. (However, Yamaguchi does not distinguish between Mid and Low. Perhaps "Non-high" would be a better description. cf. Wada's RE DO.) An accent system such as this makes it easier to understand the distribution of the neighboring Sanagi accent with its two-mora class groupings of 1+3/2/4/5 (Note that in the proximity of Ibukijima my own survey shows that 2.1 and 2.3 and 3.1 and 3.4 have merged to an HM, HHM pattern.)

With the 2.3 and 3.4-type classes, the younger the generation, the greater one notices the lowering of the final

mora, arriving at Miyoshi's pronunciation. With even younger generations, such as junior-high-school age, when words of this class are pronounced in isolation, one can observe a slight rise in the last mora, which could be transcribed thus:

H R	H M H	H M R	H H R	H H M H	H H M R
inu	inuga	inuga	atama	atamaga	atamaga

When a particle is attached, H M M H H M M inuga, atamaga is normal. (Beware, however, that the are times when a 2-mora noun plus unmarked one-mora particle behaves differently from a 3-mora noun.)

For the junior high school generation, the 2 mora noun forms for isolated utterances are

H H	H F/ H L	H R	L H	L F
kaze	isi/isi	inu	hune	saru
H H H	H H L H L L	H M R	L L H	L L F
kazega	isiga/isiga	inuga	hunega	saruga

These distinctions are slightly easier to grasp even for the non-native (See the end of section 6). Now, for 2.5 'saru-ga' (LL-f) and 3.7 'kabuto' (LLF), the second mora is even lower than it was with Miyoshi, being normally heard as LLF, but it seems a bit higher than the corresponding 2.4 and 3.6 forms 'hunega' and 'suzume.' It actually seems more like LMF then LLF.

There are individuals younger than Miyoshi who exhibit older forms, Ise Masae (1921), for one. For words of four moras or more, the number of words which do not match the

traditional classes increases. In the following, I have ignored aberrant cases. For three moras and below, however, there is a very good correspondence.

1.1	H H	H H-h	H-h
1.2*	H L	H L-l	H-l
1.3	L H	L L-h	L-h
1.4	H M	H H-m	H-m
2.1	H H	H H-h	
2.2*	H L	H L-l	
2.3	H M	H H-m	
2.4	L H	L L-h	
2.5*	L H	L H-l	
3.1	H H H	H H H-h	
3.2*	H H L	H H L-l	
3.3*	H L L	H L L-l	
3.4	H H M	H H M-m	
3.5*	L L F	L L H-l	
3.6	L L H	L L L-h	
3.7*	L H L	L H L-l	

For the classes marked with an asterisk, Miyoshi shows a tendency for the fall to occur slightly later than normal, the high extending into the following mora[1].(Seno shows these as Falling). This change does seem to be a trend over the generations studied, but when looking at individuals there are individuals born in the 1950's who maintain the old form while there are some older folk who use the new forms, or have tone contours approaching them. For example, for 2.2 we sometimes observe HF, but with a particle HL-l, or HL becoming HH-l.

For the High unaccented class, there are some people who exhibit a continuous rise from mid. If one isn't careful, these can be confused with the low-starting unaccented 2.4

and 3.6 classes. I have even be observed this with one elderly informant, Kubo Yoshio, so there does not seem to be any relationship with a particular generation.[2] For 2.5 I observe both LF and LH (Kubo Kazuko and others), but this again does not seem to have any correspondence to the age of the informant.

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[1]Concerning the phenomenon of 'late fall', see Kawakami Shigeru "Akusento-shi wo doo toraeru ka" in Nippon Gogaku, Vol. 2, No. 11. , (Nov. 1983).

[2]In Senoo (1966) the 2.2 class is given as LF, LHl. To my ears the first mora sounds more like mid, while for 2.1 I hear a comparatively higher first mora.

Appendix C

Summary of Nouns in Uwano(1985)

This is an alphabetical reorganization of the nouns surveyed in Uwano(1985) with the "Other dialects" column containing additional information culled from Martin(1988). The Martin 3-character code represents the Tokyo, Kyoto and Kagoshima classes, respectively, using a notation modified from Hirayama (1960). To save space, a '5' for 2 mora nouns represents Hirayama's 2;5 classification while a '9' for Kyoto dialect 3-mora nouns represents 1;3. The Martin data is extracted from his earlier MS, and does not reflect any changes made for the revised, published versions.

The following codes are used to summarize comments accompanying individual items.

* Rare
r Recent pronunciation, older was different
x no response/not used in Ibuki
\+ Additional accents exist
v Variant pronunication more common

Word	Kanji	Uwano	Pg	Other dialects
abu *	虻	L2	112	25
abura	油	M	118	02B
agura	胡坐	L0	119	00A
aida	間	M	119	00A
ai	藍	H0	112	25
ai	愛	H0	122	
aka	赤	L2	112	25
aka	垢	M	107	23
aki	空き	H0	122	
aki	秋	L2	112	25
akubi	欠伸	L2	119	00B
aku	灰汁	H0	103	21
amado	雨戸	H1	138	
ama *	尼	H1	110	24
ama	尼	H1	122	
amamizu	雨水	L2	x	
amari	余り	M	116	39B
ame	飴	H0	103	21
ame	雨	L2	112	25
amido	網戸	H1	138	
ami	網	M	108	23
ana	穴	L0	108	23
anata	あなた	H1	119	12A
ane	姉	H0	103	21
ani	兄	L2	112	25
aoba	青葉	H1	137	
aoi	葵	H0	113	00A
ao	青	L2	112	25
arare	霰	H0	114	01B
arasi	嵐	M	119	12A
are	あれ	H1	106	22
ari	蟻	H0	103	21
aruzi	主	H1	118	12B
asagao	朝顔	H2	x	
asahi	朝日	H1	118	12B
asa	麻	L0	108	23
asa	朝	L0	112	25
asane	朝寝	M	138	
asari	あさり	H0	138	
ase	汗	L2	112	25
asida	足駄	M	119	00B
asi	足	M	108	23
asita	明日	M	116	30B
asobi	遊び	H0	138	
asu v	明日	M	108	23
atai	値	H0	113	00A
atama	頭	M	116	32B
atari	辺り	H1	119	12A
ate	当て	H1	122	
ato	跡	L0	110	24
awabi	鮑	H1	118	12B
awa	粟	L0	111	24
awa	泡	M	108	23
aware	哀れ	H1	118	12B
awase	袷	M	116	30B
aya	綾	M	108	23
ayame	菖蒲	L0	118	01A
ayu *	鮎	L2	112	25
aza	痣	H1	106	22
azayaka	鮮やか	M	X	

Word	Kanji	Uwano	Pg	Other dialects
azi	鯵	H1	106	22
azuki	小豆	L2	116	32A
ba	場	L0	121	
baka	馬鹿	L2	132	
basyo	場所	H1	132	
bati	蜂	M	110	23
beni	紅	L0	112	24
bira	びら	L2	133	
biwa	枇杷	H0	133	
boku	僕	H1	134	
bora	ぼら	L2	135	
boosi	帽子	H1	150	
budoo	葡萄	H0	x	
buta	豚	L2	x	
byooki	病気	M	149	
daizi	大事	M	144	
dame	駄目	H1	130	
dango	団子	L0	118	
dani	だに	H1	130	
dare	誰	H0	105	21
dareka	だれか	L2	145	
dasi	出汁	M	129	
de	出	H0	121	
densya	電車	H1	145	
desi	弟子	M	109	23
dobu	溝	L2	131	
do	度	H0	121	
doko		H0	105	21
doku	毒	M	109	23
dono	どの	H0	131	
dore	どれ	H0	131	
doro	泥	H0	131	
dotti	どっち	L0	146	
doogu	道具	M	146	
ebi	海老	H0	104	21
eda	枝	H0	104	21
e	柄	H0	102	11
e	餌	H0	121	
eki	駅	H1	123	
ekubo	靨	H1	x	12A
e	絵	L0	103	14
endoo	豌豆	H1	x	
enoki	榎木	H1	139	
enpoo	遠方		x	
eri	襟	M	123	
esa	餌	H1	123	
ga	蛾	H0	121	
ga	我	H0	121	
gake	崖	L2	x	
gaman	我慢	H1	140	
gara	柄	H0	124	
gatyoo	鴉鳥	H0	139	
ge	下	H1	121	
geta	下駄	L0	111	24
giri	義理	M	x	
go x	語	1X	121	
go	五	H0	121	
go	碁	H0	121	
go	期	H0	121	
gohan	ご飯	H1	142	
goma	胡麻	H0	104	21
gomi	ごみ	H0	126	
gu	具	H0	121	
gu	愚	H1	121	
ha	派	L0	121	
hadaka	裸	L0	119	01B
hada	肌	L0	112	24
hadasi	裸足	L0	119	01B
hade	派で	H1	133	
hae	蝿	H0	105	21
hagi	萩	H1	110	23
ha	葉	H1	103	12
ha	歯	H1	103	1X
ha	刃	H1	103	1X
haha	母	M	x	
hai	灰	H0	105	21
haka	墓	M	110	23
hakama	袴	M	117	32B
hako	箱	H0	105	21
hamaguri	蛤	L33	x	
hama	浜	M	110	23
hamo	鱧	L2	113	25
hanabira	花びら	L2	x	
hanage	鼻毛	M	x	
hana	鼻	H0	105	21
hana +	花	M	110	23
hanazi	鼻血	H0	115	00A
hane	羽	H0	105	21
haniwa	埴輪	L0	115	00A
happa	葉っぱ	H2	148	
hara	腹	M	110	23
hare	晴れ	L0	110	23
hari	針	L0	112	24
haru	春	L2	113	25
hasami	挟み	M	117	39B
hasi	端	H0	105	21

Word	Kanji	Uwano	Pg	Other dialects
hasi	橋	H1	107	22
hasi	箸	L0	112	24
hasira	柱	L2	118	02B
hasu	蓮	H0	105	21
hata		H0	105	21
hata	旗	H1	107	22
hata	機	H1	107	22
hatake	畑	L2	119	09B
hatati	二十歳	H0	115	12A
hatati	二十歳	H1	119	12A
hati	蜂	H0	105	21
hati	鉢	M	110	23
hati	八	M	132	
hato	鳩	M	113	
hayasi	林	M	117	30B
haze	沙魚	L2	132	
hazi	恥	M	110	23
hazime	初め	H0	115	00A
hazure	外れ	H0	148	
hebi	蛇	L2	113	25
he	屁	L0	103	14
hera	篦	L0	112	24
heso	臍	H0	106	21
heya	部屋	M	134	
hibari	雲雀	L0	119	01B
hibasi	火箸	M	118	12B
hibiki	響き	M	117	32B
hibi	ひび	M	110	23
hibi	ひび	M	133	
hidari	左	L0	119	01B
higasi	東	H2	116	32A
hige	髭	H0	106	21
higure	日暮れ	H0	148	
hi	比	H0	122	
hi	日	H1	103	12
hi	碑	H1	121	
hihu	皮膚	L0	133	
hiiki	贔屓	H1	148	
hikari	光	M	117	32B
hi	火	L0	103	14
hima	暇	H0	106	21
hime	姫	H1	107	22
himo	紐	H0	106	21
hinoki	桧	H1	149	
hire	鰭	M	106	21
hiroba	広場	L2	149	
hirosa	広さ	L2	119	01B
hiru	昼	H1	107	22
hiru *	蛭	L2	113	25
hirune	昼寝	H0	149	
hiryoo	肥料	L0	149	
hisasi	庇	H0	115	00A
hisi v	菱	H0	106	21
hisoka		M	x	
hitai	額	H0	115	01A
hiteri?		H0	115	
hitode	ひとで	L0	149	
hitoe	一重	M	118	23B
hito	人	H1	107	22
hitoke	人気	H0	149	
hitomi	瞳	H0	149	
hitori	一人	L2	119	23B
hitotu	一つ	L2	119	23B
hitugi	棺	H0	115	00A
hituzi	羊	H0	115	00A
hiyori	日和	H0	115	00A
hiza	膝	H0	106	21
hizi	肘	H1	107	22
hiziki	ひじき	H0	148	
hodo	程	H0	113	
hogaraka	ほがらか	L2	x	
ho	帆	H0	102	11
hoho	頬	L0	x	
hoka	他	L0	112	24
hokori	誇り	H0	115	00A
ho	穂	L0	103	14
hone	骨	M	135	
honoka	ほのか	L2	x	
honoo	炎	H1	120	19B
hori	堀	M	110	23
hosi	星	H0	106	21
hotaru	蛍	L2	120	12B
hotoke	仏	M	117	03B
hotori	辺り	L2	150	
hototogisu	ほととぎ	H1	x	
hooki	箒	M	118	12B
huda	札	H0	106	21
hude	筆	H0	106	21
hue	笛	H0	106	21
huka	鱶	H0	106	21
huku	服	H1	133	
huku	福	M	133	
hukuro	袋	M	117	32B
hukuroo	梟	L2	x	
humi *	文	H1	107	22
humoto	麓	M	120	32B

Word	Kanji	Uwano	Pg	Other dialects
huna	鮒	L2	113	25
hune	船	L0	112	24
hunori		H0	115	00A
hurai	フライ	H1	x	
huroba	風呂場	M	x	
huro	風呂	M	134	
husa	房	M	110	23
husi	節	M	110	23
husuma	襖	M	117	32B
huta	蓋	H0	106	21
hutari	二人	L0	116	39A
hutatu	二つ	L0	116	33A
huti	縁	M	110	23
hutokoro	懐	H0	x	
huto		L0	x	
huton	布団	H0	x	
hutuka	二日	H0	115	00A
hutuu	普通	L0	149	
huuhu	夫婦	H1	149	
huyu	冬	H1	107	22
huzi	藤	H0	106	21
hyaku	百	M	133	
ibara	茨	L2	x	
ibiki	鼾	M	138	
ido *	井戸	L2	112	25
ie	家	M	108	23
iga	栗毬	H1	106	22
i	胃	H0	121	
i	猪	H0	121	
i	胆	H0	121	
i	萵	H0	121	
i	意	H1	121	
i	医	H1	121	
ikada	筏	H0	114	00A
ika	烏賊	H0	103	21
ikari	錨	H0	114	00A
ike	池	M	108	23
iki	生き	H1	122	
iki	息	L0	111	24
ikusa	戦	M	116	09B
ima	今	L0	113	
imo	芋	M	108	23
inabikari	稲光	H1	x	
inaka	田舎	H0	114	00A
ine	稲	L0	111	24
inemuri	居眠り	L2	x	
inori	祈り	M	116	32B
inoti	命	M	118	12B
inu	犬	M	108	23
ioo	硫黄	L0	138	
ippiki	一匹	H1	x	
iriko	いりこ	L0	x	
iro	色	M	108	23
iruka	鯆	L2	x	
isidatami	石畳	H5	x	
isi	石	H1	106	22
iso	磯	H0	123	
isu	椅子	H0	123	
isya	医者	H0	123	
itado	板戸	L0	x	
ita	板	L0	111	24
itami	痛み	M	116	30X
itami	痛み	M	138	
itati	鼬	M	116	32B
itigo	苺	L2	119	09B
iti	位置	H1	123	
iti	市	L0	111	24
itoko	従兄弟	H2	118	22B
ito	糸	L0	111	24
itoma	暇	M	116	30B
ituka	五日	M	116	32X
itu	いつ	L0	111	24
itumo	いつも	L2	138	
itutu	五つ	M	118	22B
iwa	岩	H1	106	22
iwao	巌	M	114	00A
iwasi	鰯	H0	114	00A
iya	いや	L0	123	
izumi	泉	M	120	01B
izure	孰れ	L0	118	01A
ka	科	L0	121	
ka	課	L0	121	
kaba	河馬	H1	124	
kaba	樺	H1	124	
kabane		M	114	00X
kabe	壁	H0	104	21
kabu	株	H0	104	21
kabura	蕪	L0	114	01A
kabuto	甲	L2	119	19B
kado	門	H1	107	22
kado	角	L0	111	24
kaede	楓	H0	139	
kaeru	蛙	L0	118	01B
kagami	鏡	M	116	32B
kagari	篝	H0	114	00X
kage	蔭	L2	112	25

Word	Kanji	Uwano	Pg	Other dialects
kagi	鍵	M	108	23
kago	篭	H0	104	21
kago	駕篭	H0	124	
kagu	家具	H1	124	
kagura	神楽	H1	118	12A
ka	蚊	H0	102	11
ka *	香	H0	102	11
ka	可	H0	121	
kaiko	蚕	L2	119	19B
kai	効	L0	104	21
kai *	櫂	L0	111	24
kai	貝	M	108	23
kazi	家事	H1	124	
kakasi	案山子	L0	139	
kakato	かかと	L0	139	
kaki	柿	H0	104	21
kaki	垣	H1	106	22
kaki	牡蛎	L2	112	25
kakine	垣根	M	139	
kakko	格好	H2	140	
kamado	竈	H0	114	00A
kama	釜	H0	104	21
kama	鎌	L0	111	24
kama	窯	L0	124	
kame	亀	L2	113	
kame	瓶	M	108	23
kami	紙	H1	107	22
kami	上	L0	111	24
kami *	神	M	108	23
kami	髪	M	108	23
kaminari	雷	M	x	
kamisori	剃刀	H2	x	
kamo	鴨	L2	113	
kamome	鴎	L0	118	01B
kana	仮名	H0	104	21
kanari	かなり	L2	140	
kanazuti	金槌	H2	x	
kane	金	H0	104	21
kane	鐘	H0	104	21
kani	蟹	H0	104	21
kanna	鉋	M	117	32B
kao	顔	H0	104	21
kara *	殻	L2	107	22
karasi	芥子	L2	119	09B
karasu	烏	L0	120	11B
karee	蝶	H1	118	12B
kare	彼	H1	124	
kari	狩り	H0	124	

Word	Kanji	Uwano	Pg	Other dialects
kasabuta	かさぶた	H0	x	
kasa *	瘡	H0	104	21
kasa	笠	L0	111	24
kasi	樫	H0	124	
kasi	菓子	H1	124	
kasira	頭	M	116	32B
kasiwa	柏	L2	120	09A
kasuka	糟か	L2	x	
kasu	糟	L0	111	24
kasumi	霞	H0	114	00B
kasyu	歌手	H1	124	
kata	型	H1	106	22
kata	方	H1	106	22
kataki	敵	M	117	32B
kata	肩	L0	111	24
katana	刀	M	117	32B
katate	片手	M	139	
katati	形	H1	114	00A
kati	価値	H1	124	
kati *	勝ち	M	108	23
katte	勝手	M	140	
katuo	鰹	H0	114	00A
katura	桂	L2	114	00A
kawa	川	H1	107	22
kawa +	皮	M	108	23
kawara	河原	H0	114	00A
kawara	瓦	H0	x	02B
kaya	蚊帳	H0	104	21
kayu	粥	L0	104	21
kazari	飾り	H0	114	00A
kaze	風	H0	104	21
kaze	風邪	H0	124	
kazi	舵	M	x	
kazoku	家族	H1	139	
kazu	数	L0	111	24
ke	気	L0	121	
kega	怪我	M	x	
ke	毛	H0	103	1X
kemono	獣	H0	141	
kemuri	煙	H0	114	00A
kenuki	毛抜	H0	116	09A
kesa	今朝	L0	111	24
keta	桁	L0	111	24
ketoo	毛簾	M	x	
keyaki	欅	M	141	
ki	気	H0	121	
kiba	牙	H1	107	22
kibi *	黍	L0	112	25

Word	Kanji	Uwano	Pg	Other dialects
kiboo	希望	L0	140	
kibun	気分	H0	x	
kigi	木々	M	x	
ki	黄	H0	121	
ki	生	H0	121	
kiku	菊	M	108	23
ki	木	L0	103	14
kimi	君	H1	104	21
kimo	肝	M	108	23
kimono	着物	H0	114	00A
kimoti	気持ち	H0	x	
kine	杵	L0	111	24
kinoko	茸	M	140	
kinoo	昨日	H1	117	22A
kinu	絹	L0	111	24
kippu	切符	L0	140	
kiri	桐	H0	104	21
kiri	霧	H0	104	21
kiri	錐	L0	111	24
kisetu	季節	H1	140	
kisi	岸	M	108	23
kita	北	H1	107	22
kitai	期待	L0	140	
kitte	切手	M	140	
kitune	狐	L0	118	01B
kiwa	際	M	108	23
kizi	雉	M	104	21
kizu	傷	H0	104	21
kobito	小人	H0	142	
kobusi	拳	H0	x	
kodomo	子供	H0	114	00A
koe	声	L2	112	25
kogane	黄金	H0	141	
koganemusi	黄金虫		x	
ko +	子	H0	102	11
ko	弧	H1	121	
koi	鯉	L2	112	25
koi	恋	M	109	23
koitu	こいつ	H0	141	
koke	苔	M	109	23
koko	ここ	L0	113	
kokoro	心	M	118	32B
kokumotu	穀物	H2	x	
ko	粉	L0	103	14
koma	駒	L0	104	21
kome	米	M	109	23
komo	薦	H0	104	21
komori	子守	L0	142	
komugi	小麦	H2	142	
komugi	小麦	L2	x	22A
kona	粉	L0	126	
konbu	昆布	L2	142	
kongetu	今月	L0	x	
kon	紺	H1	127	
konya	今夜	L2	142	
koori	氷	H0	114	00A
koozi	麹	H0	114	00A
kore	これ	H0	104	21
koro	頃	H1	107	22
koromo	衣	H0	114	00A
kosi	腰	H0	104	21
kotatu	炬燵	L0	142	
kote	こて	M	104	21
kotoba	言葉	M	117	32B
koto	琴	H0	112	25
koto	事	M	109	23
kotori	小鳥	H0	114	00A
kotosi	今年	H0	114	00A
koobe	頭	L0	x	
koosi	仔牛	H0	114	00A
koya	小屋	M	126	
koyama	小山	H0	114	00A
koyasi *	肥し	H0	142	
koyoi	今宵	L0	114	00A
koyomi	暦	H0	117	30B
koyubi	小指	H1	142	
koziki	乞食	M	141	
ku	苦	L0	121	
ku x	句		121	
kubi	首	H0	104	21
kuda	管	L0	111	24
kudamono	果物	M	x	
kudo	くど	L2	126	
kugi	釘	H0	104	21
ku	九	H0	121	
ku	区	H1	121	
kui	杭	H1	107	22
kuzyaku	孔雀	L0	141	
kuzi	籤	M	125	
kuki	茎	M	108	23
kuma	熊	M	108	23
kumi	組	M	108	23
kumo	蜘蛛	L2	112	25
kumo	雲	M	108	23
kuni	国	H0	104	21
kurage	くらげ	L2	141	

Word	Kanji	Uwano	Pg	Other dialects
kurai	位	H0	114	00A
kura *	鞍	M	107	22
kura	倉	M	108	23
kure	暮れ	H0	104	21
kuri	栗	M	109	23
kuro	黒	L2	112	25
kuruma	車	H0	114	00A
kurumi	胡桃	M	141	
kusa·	草	M	108	23
kusari	鎖	M	114	00A
kuse	癖	H1	125	
kusi	串	M	107	22
kusi	櫛	M	108	23
kuso	糞	M	108	23
kusuri	薬	L2	119	09B
kutibasi	啄	H3	x	
kutibiru	唇	M	x	
kuti	口	H0	104	21
kutu	靴	M	108	23
kutuwa	轡	M	114	00B
kuwa	鍬	H0	104	21
kuwa	桑	M	109	23
kuzira	鯨	L2	119	09B
kuzu	屑	L0	111	24
kyoo	今日	L0	111	24
kyuuri	胡瓜	M	118	12B
mado	窓	L2	113	25
mae	前	L2	113	25
mago	孫	H1	110	23
maguro	鮪	L0	150	
mai	舞	H0	106	21
makoto	誠	L0	119	01B
maku	幕	H1	110	23
makura	枕	M	118	12B
mame	豆	M	110	23
mamusi	蝮	H0	150	
manaita	まな板	H0	x	
manako	眼	H1	118	12B
mane	真似	H0	106	21
mankai	満開		x	
mari	鞠	M	110	23
masu	升	M	110	23
mata	股	M	110	23
mati	町	H1	107	22
mato	的	H0	106	21
matuge	睫	L2	150	
matu	松	L0	112	24
mawari	回り	H2	150	

Word	Kanji	Uwano	Pg	Other dialects
mayu *	繭	H0	113	25
mayu	眉	L2	113	25
medo	目処	H1	x	
megane	眼鏡	H1	151	
mei	姪	H0	110	23
mekura	盲	M	120	39B
mekuso	目くそ	M	151	
me	目	L0	103	14
me	芽	L0	103	14
mesi	飯	M	x	
mesu	雌	H1	135	
meyani	目脂	M	151	
midori	緑	L2	119	19B
migi	右	H0	106	21
mikado	御門	H0	115	00A
mikata	見方	H0	115	00B
mikka	三日	H0	115	C0A
mikosi	御輿	L2	120	02X
mi	箕	L0	103	14
mimiaka	耳垢	H3	x	
mimikuso	耳糞	L2	x	
mimi	耳	M	110	23
mimizu	蚯蚓	L0	119	01B
minami	南	H2	120	02A
minasiko	孤児	L2	x	
minato	港	H0	115	00A
mine	蜂	H0	106	21
minna	皆	H2	151	
mino	蓑	L0	112	24
misaki	岬	H1	x	00B
misaki	岬	H1	150	
misao		H0	115	00A
mise	店	M	110	23
miso	味噌	L0	112	24
miti	道	H0	106	21
mittu	三つ	H2	116	33A
miya	宮	H0	106	21
miyako	都	H0	115	00A
miyama		H0	115	00A
mizore		L0	115	00A
mizu	水	H0	106	21
mizukara	自ら	H2	x	
mogura	もぐら	L0	151	
mogusa	もぐさ	H2	151	
mo	藻	H1	103	12
momi	籾	H0	106	21
momi	籾	H1	136	
momizi	紅葉	H2	118	12B

Word	Kanji	Uwano	Pg	Other dialects
momo	桃	H0	106	21
momo	腿	L0	113	25
monaka	もなか	L2	x	
mon	紋	L0	136	
mon	門	M	136	
mono	物	M	110	23
mori	森	H0	106	21
mori	銛	M	136	
mosi	もし	H1	x	
moto	本	M	113	
moto	元	M	113	
moto	許	M	113	
motto	もっと	H2	151	
moya	靄	L0	136	
mugi	麦	L0	112	24
muika	六日	H0	115	00A
mukade	百足	L0	151	
mukade	百足	L2	x	09A
mukai	向い	L0	151	
mukasi	昔	L0	115	01A
muki	向き	H1	135	
muko	婿	L2	113	25
mukoo	向こう	H1	119	02A
muku	椋	H1	x	
mune	棟	H0	106	21
mune	胸	H1	107	22
mura	村	H1	107	22
muro	室	M	110	23
musi	虫	M	106	21
musiro	むしろ	H1	151	
musiro	席	M	117	32B
musuko	息子	H0	115	00A
musume	娘	H2	116	32A
muttu	六つ	H2	116	33A
myaku	脈	H1	x	
nabe	鍋	L2	113	25
nae	苗	L0	111	24
nagare	流れ	M	117	32B
nagasa	長さ	L2	119	11B
nageki	嘆き	M	117	30B
nagi	凪	H1	131	
nagisa	渚	M	117	32B
na	名	H1	103	12
naka	中	L0	111	24
nakama	仲間	M	120	39B
na	菜	L0	103	14
namae	名前	H0	115	00A
namako	なまこ	H1	146	
nama	生	L2	131	
namari	鉛	L2	119	09B
namasu	なます	M	146	
namazu	鯰	M	117	02B
namekuzi	蛞	M	x	
namida	涙	M	118	12B
nami	波	M	109	23
nana	七	H1	131	
naname	斜め	M	120	23B
nanatu	七つ	M	146	
nani	何	L0	111	24
nanoka	七日	M	117	32X
nanzi	何時	H1	146	
nara	楢	H0	132	
nasake	情け	M	118	32B
nasi	梨	H1	107	22
nasubi	茄子	L0	118	12B
nasu	茄	H1	131	
nata	鉈	H0	131	
natu	夏	H1	107	22
natukasi	懐かしい	H	x	
nawa	縄	M	109	23
naze	何故	L0	131	
nazo	謎	L2	131	
negai	願い	M	117	22B
negi	葱	L2	132	
negoto	寝言	H0	115	00A
ne	子	H0	121	
ne	音	H0	121	
ne	寝	H0	121	
ne	値	H1	121	
neiki	寝息	H0	147	
neko	猫	L2	132	
ne	根	L0	103	14
nemoto	根元		x	
neuti	値打	H0	147	
nezi	ねじ	H1	132	
nezumi	鼠	L0	119	01B
ni	二	L0	121	
nigate	苦手	M	147	
nikawa	膠	H0	115	00A
niku	肉	H1	132	
ni	荷	L0	103	14
nimotu	荷物	H1	x	
ninniku	ににんく	H3	x	
nioi	臭い	M	117	22B
nira	韮	M	132	
nire	楡	M	132	

Word	Kanji	Uwano	Pg	Other dialects
nisi	西	H0	105	21
nisiki	錦	H1	118	12B
niwa *	庭	H0	105	21
nizi	虹	M	107	22
nobori	上り	H0	115	00A
noki	軒	H0	105	21
nokogiri	鋸	L2	x	
nokori	残り	M	147	
no *	野	L0	103	14
nomi	鑿	L0	112	24
nomi	蚤	M	110	23
nori	海苔	M	110	23
nori	糊	M	132	
nosi	熨斗	M	109	23
noti	後	M	109	23
nozomi	望み	H0	115	00A
nuime	縫目	M	117	32B
nuka	糠	M	109	23
numa	沼	H1	132	
nuno *	布	H0	105	21
nusi	主	L2	111	24
nusubito	盗人	H23	x	
oba	伯母	H0	x	
obi	帯	L0	111	24
odori	踊り	H0	114	00A
ogi	荻	H1	x	
o	緒	H0	102	11
oi	甥	H0	104	21
oi	老い	H0	123	
oka	丘	H0	104	21
oke	桶	L2	112	25
oki	沖	M	113	
okina	翁	H1	120	00A
oku	奥	L0	113	
o	尾	L0	103	14
omoi	思い	M	116	22B
omo	主	L2	123	
omosi	重石	H0	139	
omote	表	M	116	32B
onazi	同じ	L0	139	
oni	鬼	M	108	23
onna	女	H1	116	32A
ono	斧	H0	123	
onore	己	H0	114	00B
oogi	扇	M	116	32B
oosama	王様		x	
ore	俺	H0	123	
ori	織り	H0	123	

Word	Kanji	Uwano	Pg	Other dialects
osi	唖	H0	123	
osi	押し	H0	123	
osore	恐れ	M	116	32B
osu	雄	H1	123	
oto	音	H1	106	22
otoko	男	M	116	32B
otona	大人	L0	118	01B
otori	囮	L0	139	
otto	夫	H0	114	00A
otuyu	おつゆ	L2	139	
owari	終わり	H0	114	00A
oyako	親子	L0	118	11B
oya	親	M	108	23
pan	パン	H1	x	
rippa	立派		x	
roo	蝋	M	137	
roosoku	蝋燭	H2	x	
ryokoo	旅行	L0	152	
sa	差	L0	121	
saba	鯖	H0	104	21
sabi	錆	M	109	23
sadame	定め	M	117	32B
sagi *	鷺	H1	104	21
sakai	境	L0	117	22B
saka	坂	M	109	23
sakana	魚	H0	114	00A
sakari	盛り	H0	114	00A
sakazuki	杯	L2	x	
sake	酒	H0	104	21
saki +	先	H0	104	21
sakura	桜	H0	114	00A
sama	様	H0	127	
same	鮫	H0	105	25
san	三	H0	127	
sanma	さんま	H0	142	
sanpo	散歩	H0	142	
sao	竿	M	109	23
sara	皿	H0	105	21
saru	猿	L2	112	25
sasa	笹	H0	104	21
sasimi	刺身	H1	x	
sasori	さそり	M	142	
sato *	里	H0	104	21
satori	悟り	H0	114	00A
satoo	砂糖	H0	142	
sawari	障り	H0	114	00A
saya	鞘	L0	111	24
sayori	さより	L2	142	

Word	Kanji	Uwano	Pg	Other dialects
sazae	栄螺	L2	120	12B
sazi	匙	M	x	
seetaa			x	
se +	瀬	H0	102	11
se +	背	H0	103	1X
seito	生徒	L0	144	
seki	席	M	129	
senaka	背中	H0	118	01B
senbei	煎餅	H2	x	
senryoo	染料	H2	x	
sensei	先生	H1	x	
seri	芹	M	109	23
serori	セロリ	M?	x	
si	四	L0	121	
siba	芝	H0	105	24
sibahu	芝生	L0	143	
sida	歯朶	H0	x	
sigoto	仕事	H0	143	
si	死	H0	121	
si	市	H1	121	
si	詩	H1	121	
si	氏	H1	121	
si	師	H1	121	
sii	椎	H1	127	
sika	鹿	M	127	
sikata	仕方	H0	143	
sima	島	M	109	23
sima	縞	M	128	
sime x	標	M	109	23
simezi	しめじ	H0	143	
simi	染み	H0	128	
simo	下	H1	107	22
simo	霜	M	109	23
sina	品	H0	105	21
sio	塩	M	109	23
sio	潮	M	109	23
siraga	白髪	H1	117	32B
sirami	虱	L0	118	01B
siri	尻	M	109	23
siro	城	H0	105	21
siro	白	L2	112	25
siru	汁	L0	111	24
sirusi	印	H0	114	00A
sitagi	下着	H2	143	
sita	下	H1	113	
siti	七	M	127	
siwa	皺	H0	105	22
siwaza	仕業	H0	114	00B
sizuka	静	L2	x	
soba	側	L0	111	24
soba	蕎麦	L0	129	
sode	袖	H0	105	21
soko	底	H0	105	21
soko	そこ	L0	113	
sonna	そんな	L0	144	
sora	空	L0	111	24
sore			x	
sore		H0	105	21
sori	鬻	M	x	
soto	外	L0	111	24
soozi	掃除	L0	144	
subako	巣箱	L0	144	
subete	全て	H1	144	
sudare	簾	H1	118	02B
sude	素手	L2	x	
sue	末	H0	105	21
sugata	姿	M	118	12B
sugi	杉	H0	105	21
su	巣	H0	103	1X
su	簾	H0	121	
su	簀	H0	121	
su	鬆	H0	121	
suki	鋤	H0	105	21
sukima	隙間	H0	144	
sukoyaga	すこやか	M	x	
su	酢	L0	103	14
sumai	住まい	H1	117	22B
sumika	住処	H1	117	22B
sumi	隅	L0	111	24
sumi	炭	M	109	23
sumi	墨	M	109	23
sumire	すみれ	L0	144	
sumomo	李	L0	118	01B
sumoo	相撲	H0	115	00A
suna	砂	H0	129	
sune	脛	M	109	23
sunoko	簀の子	M	144	
surume	するめ	H0	144	
susi	鮨	M	109	23
suso	裾	H0	105	21
susuki	芒	H0	118	01B
susu	煤	L2	x	
suzi	筋	L0	111	24
suzu	鈴	H0	105	21
suzuki	鱸	H0	114	00A
suzume	雀	L0	118	01B

Word	Kanji	Uwano	Pg	Other dialects
suzuri	硯	M	117	32B
syake	鮭	L2	112	25
sya	紗	L0	121	
syo	書	H1	121	
syu x	種		121	
syoozi	障子	H0	114	00A
syu	朱	H0	121	
syu	主	H1	121	
syu	州	H0	121	
syurui	種類	H1	143	
syuu	週	H1	129	
syuuto	姑	H0	114	00A
syuzin	主人	M	x	
ta *	他	L0	121	
taba	束	L0	130	
tabi	度	H1	107	22
tabi	旅	H1	107	22
tabi	足袋	L0	113	25
tadati	ただち	L2	x	
tade *	蓼	H0	105	24
tagai	違い	H0	145	
taga	箍	M	129	
tagui	類	M	117	00B
tai	鯛	M	109	23
taka	鷹	H0	105	21
takara	宝	M	117	32B
takasa	高さ	L2	118	01B
take	竹	H0	105	21
take	丈	M	109	23
takigi	薪	H0	115	00A
taki	滝	H0	105	23
tako	蛸	M	113	
tako	凧	M	129	
ta	田	L0	103	14
tamago	卵	L2	119	09B
tamaki	粽	H0	115	12X
tama	玉	L0	109	23
tamasii	魂	H2	x	
tame	為	H1	107	22
tamesi	試し	M	117	32B
tamoto	袂	M	117	39B
tana	棚	H0	105	21
tanbo	田圃	L0	118	
tane	種	L0	111	24
tani	谷	M	109	23
tanima	谷間	M	117	30B
tanomi	頼み	M	117	32B
tanuki	狸	L2	120	19B
tarai	盥	L2	119	09B
tara	鱈	L2	130	
tare	たれ	H1	130	
taru	樽	H1	130	
tasuke	助け	M	117	30B
tasuki	襷	L2	118	32B
tatami	畳	H0	115	00A
tate	縦	L2	113	25
tatibana	橘	L2	x	
tati *	太刀	H1	109	23
tawara	俵	M	117	32B
tawasi	束子	L2	145	
tayori	便り	L2	119	19A
tayori	頼り	L2	145	
teasi	手足	M	145	
tegami	手紙	M	145	
teki	敵	H0	130	
te	手	L0	103	14
temoto	手元	M	x	
tenki	天気	H1	145	
tera	寺	H1	131	
ti	地	L0	121	
ti *	乳	L0	121	
tidori	千鳥	L2	119	19B
ti	血	H0	102	11
tikaku	近く	L0	145	
tikara	力	H1	119	00A
tiri	塵	H0	105	21
titi	父	L0	111	24
titi	乳	L0	111	24
tizu	地図	H1	130	
tobi	鳶	L2	131	
tobira	扉	L2	x	09A
tobira	扉	L2	146	
toga *	咎	M	111	24
toge	刺	M	x	
to	戸	H0	102	11
to	都	H1	121	
toi	樋	L2	131	
toisi	砥石	M	146	
tokage	蜥蜴	L2	120	09A
tokei	時計	H0	146	
toki	時	M	109	23
tokiwa	常盤	M	115	00X
toko	床	H0	105	21
tokoro	所	H0	119	00A
to x	砥	L0	103	21
tomari	泊まり	H0	115	00A

Word	Kanji	Uwano	Pg	Other dialects
tomo +	友	H0	105	22
tomo *	共	H1	113	
tonari	隣	H0	115	00A
tonbi *	鳶	L2	146	
tonbo	とんぼ	L0	146	
tooge	峠	L0	117	31B
tooka	十日	H0	146	
toori	通り	M	146	
tora +	虎	H0	105	21
tori	鳥	H0	105	21
torii	鳥居	H0	146	
toriko	虜	H0	117	32A
tosi	年	M	109	23
totyuu	途中	L2	146	
toohu	豆腐	M	146	
too	十	H1	131	
too +	籐	L0	131	
too	塔	M	109	23
tu x	津		121	
tubaki	椿	L0	117	32X
tubaki	椿	L2	119	19B
tuba	鍔	L0	111	24
tubame	燕	L2	119	01B
tubasa	翼	L2	120	09B
tubo	壷	H0	105	21
tubo	坪	H0	130	
tubomi	つぼみ	H0	145	
tubu	粒	L0	111	24
tue	杖	L0	111	24
tugi	次	H1	107	22
tuide	序	H0	115	00A
tuini	隊	H1	145	
tukai	使い	H0	115	00A
tuka	塚	M	107	22
tuka	柄	M	109	23
tuki	月	M	109	23
tukue	机	H0	115	00A
tuma	妻	H1	107	22
tuma	褄	H1	107	22
tume	爪	H0	105	21
tumi	罪	L0	111	24
tumugi	つむぎ	M	145	
tumuzikaze	つむじ風	H2	x	
tuna	綱	M	109	23
tuno	角	M	109	23
tura	面	M	109	23
turi	釣り	H0	105	21
turube	釣瓶	H0	120	09A
turugi	剣	M	117	32A
turu	弦	H1	107	22
turu	鶴	L2	113	25
tuta +	蔦	M	107	22
tuti	槌	L0	111	24
tuti	土	M	109	23
tutome	勤め	M	117	32B
tutu	筒	H0	105	21
tutumi	堤	M	117	32B
tutuzi	つつじ	L2	145	
tuya	艶	H0	105	22
tuyu	梅雨	H0	130	
tuyu	露	L2	113	25
tuyu	汁	L2	130	
tuzumi	鼓	L0	117	32B
tya	茶	L0	121	
tyairo	茶色	L0	145	
tyotto	ちょっと	H2	145	
tyoosi	調子	H0	145	
tyuui	注意	H1	145	
uba	乳母	H1	123	
ude	腕	M	108	23
ue	上	H1	113	
ugai	穿い	M	114	00A
uguisu	鶯	H23	x	
u	卯	H0	121	
u	鵜	H1	103	12
uma	馬	M	108	23
umaya	厩	M	116	02X
ume	梅	H0	104	21
umi	海	L0	111	24
umi	膿	M	108	23
unagi	鰻	L0	118	01B
unazi	項	M	116	00B
une *	畝	M	108	23
uo	魚	H0	103	21
ura	裏	M	108	23
urami	恨み	M	116	32B
uri	瓜	H0	111	24
uroko	鱗	M	x	
urusi	漆	H0	114	00A
usagi	兎	L0	118	01B
usi	牛	H0	104	21
usio	潮	H0	116	00B
usiro	後ろ	L2	119	09B
uso	嘘	H1	123	
usu	臼	L0	111	24
uta	歌	H1	106	22

Word	Kanji	Uwano	Pg	Other dialects
uti	うち	H1	113	
utiwa	団扇	M	116	22B
uwagi	上着	H2	139	
uzi	蛆	L2	108	23
uzu	渦	H1	123	
uzura	鶉	H1	116	02B
wabi *	詫び	L0	137	
waga	我が	L0	137	
wagaya	わが家	L2	152	
wakare	別れ	L2	117	32B
waki	脇	M	110	23
waki	腋	M	110	23
waku	枠	M	110	23
wana	罠	L0	112	24
wani	鰐	H1	110	23
warabe	童	H1	x	
warabi	蕨	H1	120	12B
waragutu	藁靴	L0	x	
wara	藁	L0	112	24
warazi	草鞋	M	119	00B
ware	我	L0	112	24
waru	悪	L2	137	
wasabi	山葵	H1	118	12B
wasi	鷲	H1	137	
wasi	和紙	L0	137	
wata	綿	M	110	23
wata	腸	M	137	
watari	渡り	H0	116	00B
watasi	私	H0	152	
waza	技	H1	107	22
wazuka	わずか	L2	152	
ya	屋	14	122	
yabu	薮	H0	106	21
yado	宿	L2	112	24
yae	八重	H1	107	22
ya	矢	H1	103	12
yakara	族	H0	117	10X
ya	夜	L0	103	14
yamabato	山鳩	H23	x	
yamabusa	山房	L2	x	
yamai	病	L2	x	
yamaimo	山芋	L0	x	
yama	山	M	110	23
yami	闇	M	110	23
yamome		L0	116	01B
yamori	家守	L2	x	
yana			x	
yanagi	柳	H0	115	00A
yane	屋根	L0	136	
yani	脂	M	110	23
yari	槍	H0	106	21
yasiro	社	H1	120	12B
yasuri	やすり	H0	151	
yattu	八つ	H2	116	32A
yatuko		H0	115	00B
yatu	奴	M	136	
yaziri		M	115	00A
yodare		H0	116	00A
yo +	世	H0	103	1X
yoi	宵	H0	106	21
yokka	四日	H0	116	00A
yoko	横	H0	106	21
yome	嫁	H0	106	21
yomogi	蓬	L0	119	01B
yooka	八日	H0	116	00A
yori	寄り	H0	137	
yoroi	鎧	H0	116	00A
yoru	夜	L0	113	
yoso	余所	H1	107	22
yottu	四つ	H2	116	32A
yotu	四つ	H1	137	
yubi	指	M	110	23
yue	故	H1	107	22
yuka	床	L0	106	21
yuki	雪	H1	107	22
yu	湯	L0	103	14
yu	輸	L0	103	14
yumi	弓	M	110	23
yuri	百合	H0	106	21
yuube	夕べ	L0	116	31B
yuzu	柚子	M	136	
za	座	L0	121	
zakuro	榴	H0	118	12B
zasiki	座敷	M	142	
zemi r	蝉	H1	107	22
zenbu	全部	H1	144	
zeni	銭	L0	111	24
zi	辞	L0	121	
zi	字	L0	121	
zi	地	L0	121	
zi	痔	H0	121	
zibun	自分	L0	x	
zidai	時代	H0	143	
zikan	時間	H1	143	
ziko	事故	H1	127	
zya	蛇	H0	121	

Word	Kanji	Uwano	Pg	Other dialects	Word	Kanji	Uwano	Pg	Other dialects
zyama	邪魔	H0	129						
zyoozu	上手	M	143						
zyuu	十	L0	129						
zyuusyo	住所	H1	143						
zu	図	H0	121						
zu	頭	H0	121						

Appendix D

Summary of Verbs in Uwano(1985)

In a similar manner to the noun summary in Appendix C, this is an alphabetical reorganization of the verbs surveyed in Uwano(1985) with the "Other dialects" column containing additional information culled from Martin(1988). The Martin 2-character code represents the Tokyo/Kyoto and Kagoshima classes of the verbs. Other codes are the same as Appendix C.

Word	Kanji	Uwano	Pg	Other dialects
abaku	発ばく	H	158	0B
abareru	暴れる	M	166	0A
abiru	浴びる	H	163	1A
aburu	焙る	H	164	0B
aeru	和える	H	156	1B
agameru	崇める	H	161	0A
agaru	上がる	M	157	0A
ageru	上げる	M	156	0A
ahureru	溢れる	H	161	0A
akasu	明かす	M	157	0A
akeru	明ける	M	156	0A
akireru	呆れる	M	161	0A
akiru	飽きる	H	163	1B
aku	明く	M	153	0A
aku	飽く	L	155	-
amaeru	甘える	M	166	0A
amaru	余る	H	158	0B
amasu	余す	H	158	0B
amayakasu	甘やかす	H	171	0A
amu	編む	L	155	1B
aogu	扇ぐ	H	158	0B
aogu	仰ぐ	H	164	0B
aoru	煽る	H	164	0A
arasou	争う	H	168	0A
arasu	荒らす	M	157	0A
aratamaru	改まる	M	171	0B
arau	洗う	M	157	0A
arawasu	表す	H	168	0A
areru	荒れる	M	156	0A
aru	有る	L	155	1B
aruku	歩く	L3	161	1B
asebamu	汗ばむ	H	168	1B
aseru	褪せる	H	163	1A
aseru	焦る	H	164	0B
asobu	遊ぶ	M	157	1A
ataeru	与える	M	161	0A
ataru	当たる	M	157	0A
atatamaru*	暖まる	H	171	0B
ategau	宛がう	M	168	0A
ateru	当てる	M	156	0A
atukau	扱う	M	168	0A
atumaru	集まる	H	168	0B
atumeru	集める	H	161	0B
au	合う	L	155	1B
awasaru*	合わる	H	168	0B
awaseru	合わせる	H	161	0B
awatatu	泡立つ	H	168	0B
awateru	慌てる	M	161	0A
ayabumu	危ぶむ	H	168	0A
ayakaru	あやかる	H	168	0A
ayamaru	謝る	H	168	0B
ayamaru	誤る	H	168	0B
ayasimu	怪しむ	H	168	0A
ayasu	あやす	H	164	0A
ayumu	歩む	H	158	0B
aziwau	味わう	M	168	0A
azukaru	預かる	H	168	0B
azukeru	預ける	H	161	0B
bakeru	化ける	H	157	1B
baramaku	ばらまく	L	170	1B
barasu	ばらす	H	165	1A
bareru	ばれる	H	163	1A
betatuku	べたつく	M	170	0A
bokasu	ぼかす	H	166	0A
bokeru	ぼける	H	157	1A
boyakeru	ぼやける	M	167	0A
boyaku	ぼやく	M	166	0A
burakomu	ぶら込む	L	170	
buratuku	ぶらつく	M	170	0A
buttoosu	ぶっ通す	L	171	1B

Word	Kanji	Uwano	Pg	Other dialects
butu	打つ	L	163	1B
butukaru	ぶつかる	L	170	1B
butukeru	ぶつける	L	167	1B
daburu	だぶる	M	165	0A
daku	抱く	M	163	0A
damakasu	騙かす	H	169	0B
damaru	黙る	L	165	0A
damasu	騙す	H	165	0B
dasu	出す	L	163	1B
dearuku	出歩く	M	169	0B
deau	出合う	M	165	0B
dekakeru	出掛ける	M	167	0B
dekiru	出来る	M	163	0B
deru	出る	M	153	1B
desugiru	出過ぎる	M	167	0B
desyabaru	でしゃばる	M	169	0A
doku	退く	M	163	0A
domoru	吃る	H	165	0B
donaru	怒鳴る	M	165	0B
egaku	描く	H	159	0B
erabu	選ぶ	H	159	0B
eru *	得る	L	153	0A
ganbaru	頑張る	M	169	0B
gatatuku	がたつく	M	168	0A
gomakasu	ごまかす	M	169	0A
gureru	ぐれる	H	163	
guzuru	ぐずる	H	164	0A
habuku*	省く	M	165	0B
haeru	生える	H	163	1B
haeru	映える	H	163	1B
hagasu	剥がす	H	165	1B
hagemasu	励ます	H	170	0B
hagemu	励む	H	160	0B
hageru	禿げる	H	163	1B
hageru	剥げる	H	163	1B
hagu *	接ぐ	M	163	1A
hagu	剥ぐ	L	155	1B
hairu	入る	L	161	1B
hakadoru	捗る	H	170	0B
hakaru	計る	H	160	0B
hakaru	謀る	H	160	0B
hakobu	運ぶ	M	158	0A
haku	吐く	L	155	1B
haku	掃く	L	155	1B
haku	履く	M	154	0B
hamaru	嵌まる	?	x	0A
hameru	填める	H	163	0A
hamukau	はむかう	M	170	0B

Word	Kanji	Uwano	Pg	Other dialects
hanareru	離れる	H	162	0B
hanasu	放す	H	160	0B
hanasu	話す	H	165	0B
hanasu	放す	H	165	0B
hanemawaru	跳ね回る	H	171	1A
haneru	跳ねる	H	157	1A
haramu	孕む	H	160	0B
harasu	晴らす	H	165	0A
harau	払う	H	160	0B
hareru	腫れる	M	156	0A
hareru	晴れる	H	157	1B
haru	貼る	M	154	0A
haru	張る	M	154	0A
harumeku	春めく	H	170	1B
hasamaru	挟まる	H	170	0B
hasamu	挟む	H	160	0B
hasiru	走る	H	160	0B
hataku	叩く	H	165	0B
hataraku	働く	M	170	0A
hatasu	果たす	H	160	0A
hateru	果てる	H	157	1B
hau	這う	L	155	1B
hayaru	流行る	H	165	0B
hayasu	生やす	H	165	0B
hazikeru	弾ける	H	167	0B
haziku	弾く	H	160	0B
hazimaru	始まる	M	170	0A
hazimeru	始める	M	161	0A
haziru	恥じる	H	157	0B
hazumu	弾む	M	165	0A
hazureru	外れる	M	161	0A
hazusu	外す	M	158	0A
hebaru*	へばる	M	166	0A
hedateru	隔てる	H	162	0A
hegu	剥ぐ	L	163	1B
hekomasu	凹ます	M	170	0A
heru *	経る	M	153	0A
heru	減る	M	163	0A
hibiku	響く	H	160	0B
hieru	冷える	H	163	1B
higamu	僻む	H	160	0B
hikaru	光る	H	160	0B
hikerakasu	ひけらかす	M	171	0A
hikeru	引ける	M	163	0A
hikkakeru	引っ掛ける	H	171	1A
hiku	引く	M	154	0A
hiku	弾く	M	154	0A
hiku	退く	M	154	0A

Word	Kanji	Uwano	Pg	Other dialects
hinekuru	捻くる	H	170	0B
hineru	捻る	H	160	0B
hinikuru	皮肉る	H	170	0B
hirakeru	開ける	H	162	0B
hiraku	開く	H	160	0B
hirameku	閃く	H	170	0A
hirogaru	広がる	M	170	0A
hirogeru	広げる	M	161	0A
hiromaru	広まる	M	170	0A
hiromeru	弘める	H	162	0B
hirou	拾う	M	158	1A
hirumu	ひるむ	H	160	0B
hisomeru	顰める	?	x	0B
hisyageru	拉げる	M	167	0A
hitasu	浸す	H	160	0B
hiyakasu	冷やかす	H	170	0B
hiyasu	冷やす	H	165	0B
hodokeru	解ける	H	167	0B
hodokosu	施す	M	170	0A
hodoku	解く	H	166	0B
hoeru	吠える	H	157	1B
hogusu	ほぐす	M	166	0A
hokoru	誇る	M	158	0A
homeru	誉める	H	157	1B
honomekasu	仄めかす	M	172	0A
horeru	惚れる	M	156	1A
horeru	掘れる	H	164	1A
horobiru	亡びる	M	161	0A
horobu	滅ぶ	M	166	0A
horu	掘る	L	155	1B
horu	彫る	L	155	1B
hosigaru	欲しがる	H	170	
hosu	干す	L	155	1B
hoteru	火照る	H	166	0B
hooziru	焙じる	H	167	0A
hozikuru	ほじくる	H	170	1B
hoziru	ほじる	H	166	0B
hubuku	吹雪く	H	166	0B
hueru	殖える	H	164	1B
hukasu	蒸す	H	166	0B
hukeru	更ける	H	157	1B
hukeru	耽る	H	160	0B
hukeru	老ける	H	164	1B
huku	吹く	L	155	1B
huku	葺く	M	154	0B
huku	拭く	M	154	0A
hukumeru	含める	H	167	0B
hukumu	含む	H	160	0B
hukuramasu	膨らます	H	171	0A
hukuramu	脹らむ	M	170	0A
hukureru	脹れる	M	161	0A
humu	踏む	M	154	0A
hunbaru	踏ん張る	M	170	0A
huratuku	ふらつく	M	170	0A
huru	降る	L	155	1B
huru	振る	M	154	0A
hurueru	震える	M	167	0A
huruu	振う	M	158	0A
huruu	奮う	M	158	0A
huruwasu	震わす	M	170	0A
husagaru	塞がる	M	170	0A
husagu	塞ぐ	M	158	0A
husegu	防ぐ	H	160	0A
huseru	伏せる	H	157	1B
husu	伏す	L	155	1B
hutoru	肥る	H	160	0B
huyakeru	ふやける	M	167	0A
huzakeru	ふざける	H	167	0A
ibaru	威張る	H	164	0B
iburu	燻る	H	164	0A
idomu	挑む	H	159	0A
ieru	癒える	H	156	0A
iiharu	言い張る	M	168	0A
ikasu	生かす	H	164	0B
ikeru	行ける	M	163	0A
ikeru	埋ける	H	163	1B
ikiau	行き会う	M	168	0A
ikigomu	意気込む	H	168	0B
ikiru	生きる	H	156	1B
ikou *	憩う	M	159	0A
inaoru	居直る	M	168	0A
inoru	祈る	M	159	0B
inu	往ぬ	M	153	
iradatu	苛立つ	H	168	0B
ireru	入れる	M	156	0A
irikomu	入り込む	M	168	0A
irozuku	色付く	H	168	0B
iru *	居る	M1	153	0A
iru	入る	M	154	0A
iru	煎る	L	162	1B
iru *	鋳る	L1	162	0A
iru	射る	L	162	0A
iru	要る	M	162	0A
isamu	勇む	M	157	0B
isogu	急ぐ	H	159	0B
itadaku	戴く	M	168	0A

Word	Kanji	Uwano	Pg	Other dialects
itameru	炒める	H	166	0B
itameru	痛める	H	166	0B
itamiiru	痛み入る	M	171	0B
itamu	痛む	H	159	0B
itaru	至る	M	157	0A
itasu	致す	M	157	0A
itawaru	労る	H	168	0A
itou	厭う	H	159	0A
ituku	居着く	M	164	0A
ituwaru	偽る	H	168	0B
iu	言う	M	153	0A
iwau	祝う	H	159	0B
iyagaru	嫌がる	H	168	0A
iyasu	癒す	H	159	0A
izikuru	弄くる	H	168	0B
izimeru	苛める	H	166	0A
iziru	弄る	H	164	0B
kabau	庇う	M	164	0B
kabiru*	黴びる	M	163	0A
kabureru	被れる	L	166	
kaburituku	噛りつく	M	171	0A
kaburu	被る	L	159	0B
kabusaru	被さる	H	168	0B
kabuseru	被せる	H	161	0B
kaeru	帰る	H	159	0B
kaeru	買える	M	163	0A
kaeru	替える	M	156	0A
kaeru	孵える	H	159	0B
kaesu	返す	H	159	0B
kagameru	屈める	H	166	0A
kagamu	屈む	M	157	0A
kagayakasu	輝かす	H	171	0A
kagayaku-	輝く	?	x	0A
kageru	陰る	H	164	0A
kagiru	限る	H	159	0B
kagu	嗅ぐ	M	154	1A
kakaeru	抱える	L	162	1B
kakaru	懸かる	H	159	0B
kakeru	掛ける	H	156	1B
kakeru	欠ける	M	156	0A
kakeru	書ける	H	163	1B
kakiotosu	書き落とす	L	171	
kakitoru	書き取る	L	168	1B
kakkizuku	活気付く	L	171	1B
kakomau	囲まう	H	168	
kakomu	囲む	M	157	0A
kakou	囲う	M	157	0A
kaku	書く	L	155	1B
kaku	欠く	L	154	1A
kaku	掻く	L	155	1B
kakureru	隠れる	L	162	1B
kakusu	隠す	L	161	1B
kamau	構う	M	159	0B
kameru	構える	H	161	
kamiau	噛み合う	L	169	1B
kamu	噛む	L	155	1B
kamu	かむ(鼻)	M	162	0B?
kanaderu	奏でる	H	161	0A
kanaeru	叶える	H	161	0A
kanasimu	悲しむ	H	168	0A
kanau	叶う	H	159	0A
kanduku	感づく	L	169	0A
kaneru*	兼ねる	H	156	1A
kanziru	感じる	H	166	0A
kaoru	香る	M	157	0A
kapparau	かっぱらう	L	171	1B
karageru	絡げる	HL	161	0B
karamaru	絡まる	H	169	0A
karamu	絡む	H	159	0A
karasu	枯らす	M	157	0A
kareru	枯れる	M	156	0A
kariru*	借りる	M	156	0A
karu	狩る	M	162	0A
karu	刈る	M	154	0A
kasabaru	嵩張る	M	168	0A
kasanaru	重なる	M	168	0A
kasaneru	重ねる	M	161	0A
kasegu	稼ぐ	H	159	0B
kasigu	炊ぐ	H	159	
kasikomaru	畏まる	M	171	0B
kasu	貸す	M	154	0A
kasumeru *	掠める	M	161	0B
kasumu	霞む	M	164	0BA
katamaru	固まる	M	168	0A
katameru	固める	M	161	0A
katamuku	傾く	H	168	0B
kataru	語る	M	157	0A
katayoru	偏る	H	168	0B
katazuku	片付く	H	168	0B
katinuku	勝抜く	L	168	1B
katu	勝つ	L	155	1B
katugu	担ぐ	H	159	0B
kau	買う	M	154	0A
kau	飼う	L	155	1A
kau	支う	L	162	1A
kawakasu	乾かす	H	169	0A

Word	Kanji	Uwano	Pg	Other dialects
kawaku	乾く	H	159	0A
kawaru	代わる	M	157	0A
kayou	通う	M	157	0A
kazaru	飾る	M	157	0A
kaziru	噛る	H	164	0B
kazoeru	数える	?	x	0B
kegareru	汚れる	H	161	0B
kem(>b)uru	煙る	M	164	0A
keru	蹴る	M	162	0B
kesu	消す	M	154	0A
ketobasu	蹴飛ばす	M	169	0B
kettobasu	蹴っ飛ばす	H	171	0B
ketumazuku	蹴つまずく	H	171	0B
kibamu	黄ばむ	M	164	0A
kidoru	気取る	M	164	0A
kieru	消える	M	156	0A
kieru	消える	M	158	0A
kigaeru	着替える	M	166	0A
kikazaru	着飾る	M	169	0A
kikitoru	聞き取る	M	169	0A
kikoeru	聞こえる	M	161	0A
kikomu	着込む	M	164	0A
kiku	聞く	M	154	0A
kiku	利く	M	162	0A
kimaru	決まる	H	164	0A
kimeru	決める	M	163	0A
kirasu	切らす	H	164	0B
kirau	嫌う	M	157	0A
kiridasu	切り出す	L	169	1B
kiru	着る	M	153	0A
kiru	切る	L	155	1B
kiseru	着せる	M	156	0A
kisiru	軋しる	H	159	0B
kisou*	競う	M	159	0A
kitaeru	鍛える	M	166	0A
kitasu	来す	M	157	0A
kiwameru	極める	H	161	0B
kiyomeru	清める	H	161	0B
kizamu	刻む	M	157	0A
kizuku	気付く	M	164	0A
kizutuku	傷付く	M	169	0A
koboreru	零れる	H	161	0B
kobosu	溢す	H	159	0B
kodawaru	こだわる	L	169	1A
koeru	越える	M	156	0A
koeru	肥える	H	156	1B
kogasu	焦がす	H	164	0A
kogeru	焦げる	H	163	1A
kogu	漕ぐ	L	155	1B
koku	扱く	L	155	
komaru	困る	H	164	0B
komeru	篭める	H	156	1B
komoru	篭る	H	159	0B
komu	込す	L	163	1B
konomu	好む	H	159	0B
kooru	凍る	M	164	0A
koraeru	堪える	L	166	1B
korasu*	凝らす	H	158	0B
korasu*	懲らす	H	159	0B
koriru	懲りる	H	163	1B
korobu	転ぶ	M	164	0A
korogaru	転がる	M	169	0A
korogasu	転がす	M	169	0A
korosu	殺す	M	158	0A
koru	凝る	L	163	1A
kosaeru	拵える	M	166	0A
kosu	越す	M	154	0A
kosu	漉す	M	163	0A
kosuru	擦る	M	164	0B
kotaeru	答える	H	161	1B
kotawaru	こだわる	L	169	
kotowaru	断る	H	169	0B
kowagaru	怖がる	H	169	
kowareru	毀れる	H	161	0B
kowasu	壊す	H	164	0B
koyasu	肥やす	H	164	0B
kozireru	拗れる	M	166	
kubaru	配る	H	164	0B
kuberu	くべる	M	163	0A
kubireru *	括れる	H	166	0B
kubomu	窪む	M	157	0A
kudakeru	砕ける	H	166	0B
kudaku	砕く	H	159	0B
kudaru	下る	M	157	0A
kudasu	下す	M	157	0A
kudoku	口説く	H	159	0B
kueru	食える	H	163	1B
kugiru	区切る	H	164	0B
kuguru	潜る	H	159	0B
kuikomu	食い込む	L	169	1B
kuisagaru	食い下がる	L	171	1B
kukuru	括る	M	157	0B
kumoru	曇る	H	159	0B
kumu	汲む	M	154	0A
kumu	組む	L	155	1B
kuraberu	比べる	M	161	0A

Word	Kanji	Uwano	Pg	Other dialects
kurasu	暮らす	M	157	0A
kurau	食らう	M	157	0A
kureru	呉れる	M	156	0A
kureru	暮れる	M	156	0A
kurozumu	黒ずむ	H	169	1B
kuru	来る	M	153	1B
kuru	繰る	L	155	1B
kurumu	包む	H	164	0A
kurusigaru	苦しがる	H	171	
kurusimu	苦しむ	H	169	0B
kuruu	狂う	H	159	0B
kusaru	腐る	H	164	0B
kusuburu	くすぶる	H	169	0B
kutabaru	くたばる	M	169	0A
kutibasiru	口走る	H	171	0A
kutiru	朽ちる	H	156	1B
kuttuku	くっつく	L	169	1B
kuu	食う	L	155	1B
kuwaeru	加える	H	166	1B
kuwaeru	銜える	L	166	
kuwaseru	食わせる	H	166	1B
kuyamu	悔む	H	164	0B
kuzikeru	挫ける	H	166	0B
kuziku	挫く	H	159	0B
kuziru	抉る	H	159	
kuzureru	崩れる	H	161	0B
kuzusu	崩す	H	159	0B
mabiku	間引く	H	166	0B
mabusu	塗す	HM	166	0A
madou*	惑う	H	160	0A
magaru	曲がる	H	158	0A
mageru	曲げる	M	156	0A
magireru	紛れる	H	162	0B
magotuku	まごつく	M	170	0A
mairu	参る	L	161	1B
makanau	賄う	HM	170	0B
makaru*	負かる	M	166	0A
makaseru	委せる	M	162	0A
makeru	負ける	M	156	0A
maku	巻く	M	154	0A
maku	蒔く	L	155	1B
maku	撒く	L	155	1B
makureru	捲れる	M	167	0A
makuru	捲る	M	166	0A
mamoru	守る	H	160	0A
manabu	学ぶ	M	158	0A
maneku	招く	H	160	0A
maneru	真似る	H	164	0A
maniau	間に合う	HL	170	
marumeru	丸める	M	167	0A
masaru	勝る	H	158	0A
maseru	ませる	H	164	1A
masu	増す	M	154	1A
matagaru	跨る	H	170	0B
mataku	跨ぐ	H	166	0B
materu	待てる	H	164	1B
materu	待てる	H	164	1B
matigau	間違う	M	170	0B
matomeru	纏める	M	161	0A
matu	待つ	L	155	1B
maturu	祭る	M	158	0A
matuwaru *	纏わる	M	170	0A
mau	舞う	M	154	0A
mawaru	回る	M	166	0A
mawasu	回す	M	166	0A
mayou	迷う	H	160	0A
mazaru	混ざる	H	166	0B
mazeru	混ぜる	H	164	1B
mazieru	交える	H	162	0A
maziru	交じる	H	160	0B
medatu	目立つ	H	166	1B
megumu	恵む	H	160	0B
megurasu *	巡らす	H	170	0A
meguru	巡る	M	158	0A
meiru	滅入る	H	166	1A
meiziru	命じる	H	167	0A
mekasu	めかす	H	166	1A
mekuru	めくる	M	166	0A
mezameru	目覚める	H	167	0B
mezasu	目指す	H	166	0B
miageru	見上げる	M	167	0B
miakiru	見飽きる	M	167	0B
miataru	見当たる	M	170	0B
midareru	乱れる	M	162	0B
midasu	乱す	M	166	0B
mieru	見える	H	157	1B
migaku	磨く	M	158	0A
mikomu	見込む	M	166	0B
minuku	見抜く	M	166	0B
miokuru	見送る	M	170	0B
miotosu	見落とす	M	170	0B
miru	見る	L	153	1B
miseru	見せる	H	157	1B
mitibiku	導く	M	170	0A
mitiru	満ちる	H	164	1B
mitomeru	認める	M	167	1B

Word	Kanji	Uwano	Pg	Other dialects
mitoosu	見通す	M	170	0B
mitukeru	見付ける	M	167	0B
miusinau	見失う	H	172	0B
modoru	戻る	H	160	0B
modosu	戻す	H	166	0B
moeru	燃える	M	156	0A
moeru	萌える	M	164	0A
mogeru	もげる	H	164	0A
mogitoru	もぎ取る	L	170	0A
mogu	もぐ	L	163	0A
moguru	潜る	M	166	0B
momeru	揉める	M	164	0A
momu	揉む	M	154	0A
moosu	申す	H	160	0B
moraeru	貰える	M	167	0A
morasu	漏らす	H	160	0B
morau	貰う	M	158	0A
moreru	漏れる	H	157	1B
moriageru	盛り上げる	H	172	0A
moru	盛る	M	154	0A
moru	漏る	L	155	1B
motarasu	もたらす	H	170	0B
motiiru	用いる	L	167	1B
motiyoru	持ち寄る	L	170	1B
motomeru	求める	H	162	0B
motozuku	基づく	H	170	0B
mookaru	儲かる	H	170	0B
mookeru	設ける	H	162	0B
mookeru	儲ける	H	162	0B
moyasu	燃やす	M	166	0A
moyoosu	催す	H	170	0A
mukaeru	迎える	M	161	0A
mukau	向かう	M	158	0A
mukeru	向ける	M	164	0A
mukeru	剥ける	M	164	0A
mukiau	向き合う	M	170	0A
muku	向く	M	154	0A
muku	剥く	M	163	0A
mukuiru	報いる	M	161	0B
mukureru	むくれる	M	167	0A
murasu*	蒸らす	H	166	1B
musebu*	咽ぶ	M	158	0A
museru	咽せる	M	156	1A
musiru	毟る	M	158	0A
musu	蒸す	L	155	1B
musubu	結ぶ	M	158	0A
muzukaru	むづかる	H	170	0A
nabiku	靡く	H	160	0B
naburu	甚ぶる	H	160	0B
nadameru	宥める	H	162	0B
naderu	撫でる	H	157	1B
nagabiku	長引く	H	169	0A
nagameru	眺める	H	167	0B
nagareru	流れる	H	162	0B
nagasu	流す	H	160	0B
nageku	歎く	H	160	0B
nageru	投げる	H	157	1B
naguru	殴る	H	165	0B
naku	泣く	M	154	0A
naku	鳴く	M	154	0A
namakeru	怠ける	M	167	0A
namaru	訛る	H	165	0B
nameru	舐める	H	157	1B
namesu	鞣す	H	165	0B
namidagumu	涙ぐむ	M	171	0B
nanoru	名乗る	M	158	0A
naoru	直る	H	160	0B
naosu	直す	H	160	0B
naraberu	並べる	M	161	0A
narabu	並ぶ	M	158	0A
narasu	鳴らす	M	158	0A
narasu	慣らす	H	165	1B
narau	習う	H	160	0B
nareru	馴れる	H	157	1B
naru	成る	L	155	1B
naru	鳴る	M	154	0A
naru	生る	L	155	1B
nasu	為す	L	155	1B
natukasimu	懐しむ	M	171	0A
natuku	懐く	M	160	0A
nau	綯う	L	155	1B
nayamasu	悩ます	H	170	0B
nayamu	悩む	H	160	0B
nazimu	馴染む	M	165	0A
naziru	詰る	H	160	0B
nebaru	粘る	H	165	0B
nebokeru	寝惚ける	M	167	0A
negau	願う	H	160	0B
negiru	値切る	M	165	0B
nekaseru	寝かせる	H	167	0A
nemureru	眠れる	M	167	0A
nemuru	眠る	M	158	0A
neru	寝る	M	153	0A
neru	練る	L	155	1B
nesugosu	寝過ごす	M	170	0A
netamu	嫉む	H	160	0B

Word	Kanji	Uwano	Pg	Other dialects
nezuku	根付く	ML3	165	0B
nezuku	寝付く	M	165	0B
niau	似合う	M	165	0A
niburu	鈍る	H	165	0B
nidatu	煮立つ	M	165	0A
nieru	煮える	M	163	0A
nigasu	逃がす	H	165	0B
nigeru	逃げる	H	157	1B
nigiru	握る	M	158	0A
nigoru	濁る	H	160	0B
nigosu	濁す	H	165	0B
nikumu	憎む	H	160	0B
ninau	担う	H	160	0A
niou	匂う	H	160	0B
niowasu	匂わす	H	170	0B
niramu	睨む	H	160	0B
niru	似る	M	153	0A
niru *	煮る	M	153	0A
nitateru	煮立てる	M	167	0A
nobasu	延ばす	H	160	0B
noberu	述べる	H	157	1B
noberu	延べる	H	163	1B
nobiru	延びる	H	157	1B
noboru	昇る	M	158	0A
nokoru	残る	H	160	0B
nokosu	残す	H	160	0A
nomu	飲む	L	155	1B
noreru	乗れる	M	163	0A
norokeru	のろける	M	167	0A
noru	乗る	M	154	0A
nosabaru	のさばる	H	170	0A
noseru	載せる	M	156	0A
nosu	のす	L	155	0AB
nozoku	覗く	M	158	0A
nozoku	除く	H	165	0A
nozomu	望む	H	158	0A
nozomu	臨む	H	158	0A
nugeru	脱げる	H	163	1B
nugu	脱ぐ	L	155	1B
nuguu	拭う	H	160	0B
nukeru	抜ける	M	156	0A
nuku	抜く	M	154	0B
nurasu	濡らす	M	158	0A
nureru	濡れる	M	156	0A
nuru	塗る	M	154	0A
nurumu	温む	H	165	0B
nusumu	盗む	H	160	0B
nuu	縫う	L	155	1B
oboeru	覚える	H	161	0B
oboreru	溺れる	M	166	0A
obueru*	負ぶえる	H	166	1A?
obusaru*	負ぶさる	H	168	1A
odateru	煽てる	M	166	0A
odokasu	嚇かす	M	168	0A
odorokasu	驚かす	H	171	0A
odoroku	驚く	M	168	0A
odoru	躍る	M	157	0A
odoru	踊る	M	157	0A
odosu	威す	M	157	0A
oeru	終える	M	156	0A
ogamu	拝む	H	159	0B
oginau	補う	H	168	0A
oikosu	追い越す	M	168	0A
oiru *	老いる	H	156	0A
okaru*	怒かる	M	157	
okasu	犯す	M	157	0A
okiru	起きる	H	156	1B
okonau	行う	H	168	0A
okoru	起こる	H	159	0A
okoru	怒る	H	164	0A
okoru	熾る	H	164	0A
okosu	起こす	H	159	0BA
oku	置く	M	154	0A
okumaru	奥まる	H	168	0B
okureru	送れる	M	166	
okureru	後れる	M	161	0A
okuru	送る	M	157	0A
okuru	贈る	M	157	0A
omoeru	思える	H	166	0B
omoidasu	思い出す	M	171	0B
omotetatu	表立つ	M	171	0B
omou	思う	H	159	0B
oreru	折れる	H	163	1B
oriru	下りる	H	156	1B
orosu	下ろす	H	159	0B
oru	織る	M	154	1B
oru	折る	L	155	1B
oru	居る	H	155	0A
osaeru	抑える	M	161	0A
osamaru	収まる	H	168	0B
osameru	納める	H	161	0B
osameru	修める	H	161	0B
osieru	教える	M	161	0A
osieru	教える	H	161	0A
osikomu	押し込む	M	168	0A
osimu	惜しむ	H	159	0B

Word	Kanji	Uwano	Pg	Other dialects
osoreiru	恐れ入る	H	171	0B
osoreru	恐れる	H	161	0B
osowaru	教わる	M	168	0A
osu	押す	M	154	0A
otiru	落ちる	H	156	1B
otituku	落ち着く	L	168	1B
otoru	劣る	H	164	0A
otosu	落とす	H	159	0B
ou	負う	L	162	1A
ou	追う	M	154	0A
owaru	終わる	M	157	0A
oyobu	及ぶ	M	157	0A
oyogeru	泳げる	H	166	0B?
oyogu	泳ぐ	H	159	0B
oziru*	応じる	H	166	0A
rikimu	力む	H	166	0B
sabaku	裁く	H	164	0B
sabireru	寂れる	H	167	0B
sabiru	錆びる	H	163	1B
saboru	さぼる	M	164	0A
sadameru	定める	H	161	0B
saeru	冴える	H	156	1A
sagaru	下がる	H	159	0B
sagasu	捜す	M	158	0A
sageru	下げる	H	163	1B
sakaeru	栄える	M	167	0A
sakanoboru	遡る	H	171	0B
sakarau	逆らう	H	169	0A
sakebu*	叫ぶ	M	164	0B
sakeru	裂ける	H	163	1A
sakeru	避ける	H	163	1A
sakidatu	先立つ	M	169	0A
saku	咲く	M	154	0B
saku	裂く	L	155	1A
samasu	覚ます	H	164	0B
samayou	さ迷う	H	169	0A
sameru	覚める	H	156	1B
samugaru	寒がる	H	169	
sarasu	晒す	M	158	0A
sarau	さらう	H	165	0A
saru	去る	M	154	1A
sasaeru	支える	L	162	1A
sasageru	捧げる	H	162	0A
sasaru	刺さる	H	164	0A
sasayaku	囁やく	HL4	169	0A
sasou	誘う	M	164	0A
sasu	刺す	L	155	1B
sasu	指す	L	155	1B
satoru	悟る	M	158	0A
satosu	諭す	M	158	0A
sawagu	騒ぐ	H	159	0A
sawaru	触る	M	158	0A
sazukeru	授ける	H	161	0B
sebameru	狭める	H	167	0B
segamu	せがむ	H	165	0B
sekasu	急かす	H	165	0B
sekikomu	咳込む	L	169	1B
seku	堰く	L	155	
seku	急く	L	163	1B
semaru	迫る	H	159	0B
semeru	攻める	H	156	1B
senziru	煎じる	H	167	0B
siagaru	仕上がる	M	169	0A
siageru	仕上げる	M	167	0A
sibaru	縛る	H	159	0B
sibireru	痺れる	H	161	0B
sibomu	萎む	M	165	0A
siboru	絞る	H	159	0B
sidekasu	しでかす	M	169	0A
siiru*	強いる	H	156	0A
sikakeru	仕掛ける	M	167	0A
sikameru	しかめる	M	167	0A
sikaru	叱る	M	165	0B
sikomu	仕込む	M	165	0A
siku	敷く	M	154	0A
sikuziru	しくじる	M	169	0A
simaru	締まる	H	165	0B
simau	仕舞う	M	165	0B
simekiru	締め切る	L	169	1B
simeru	占める	H	156	1A
simeru	締める	H	156	1B
simesu	示す	H	165	0A
simesu	湿す	H	165	0B
simiru*	染みる	M	156	0A
simiru	凍みる	M	163	0A
sinabiru	萎びる	H	167	0A
sinau*	撓なう	H	159	0A
sinobu	忍ぶ	M	158	0B
sinogu	凌ぐ	H	159	0B
sinu	死ぬ	M	154	0A
sioreru	萎れる	H	161	0A
siraberu	調べる	H	161	0B
siru	知る	M	154	0A
sirusu	印す	M	158	0A
sitagau	従う	M	169	0A
sitateru	仕立てる	M	167	0A

Word	Kanji	Uwano	Pg	Other dialects
sitau	慕う	M	158	0A
sizumaru	静まる	H	169	0A
sizumeru	鎮める	H	161	0A
sizumeru	沈める	M	167	0A
sizumu	沈む	M	158	0A
sodateru	育てる	H	167	0B
sodatu	育つ	H	159	0B
soeru	添える	M	156	0A
sogu	削ぐ	L	163	1A
sokoneru	損ねる	H	167	0A
somaru	染まる	M	165	0A
someru	染める	M	156	0A
somuku	背く	M	159	0B
sonaeru	備える	H	167	0B
sonaeru	供える	H	162	0B
sonsuru	損する	H	167	0A
sonziru	損じる	H	167	0A
sorasu	逸らす	H	165	1A
sorasu	反らす	H	165	1A
soreru	逸れる	H	163	1A
sorikaeru	反り返る	L	171	1A
soroeru	揃える	H	167	0B
sorou	揃う	H	165	0B
soru	剃る	L	155	1B
soru	反る	L	163	1A
sosogu	注ぐ	M	158	0A
sosonckasu	エす	ML	171	0A
sou *	添う	M	154	1A
suberu	滑る	H	159	0B
subomeru	窄める	M	167	0B
sudatu	巣立つ	H	165	0B
sueru	据える	M	156	0A
sugiru	過ぎる	H	156	1B
sugosu	過ごす	H	159	0A
sugureru	勝れる	H	161	0A
sukeru	助ける	M	156	0A
suku	鋤く	M	154	0A
suku	透く	M	154	0A
suku	漉く	M	163	0A
sukumu	竦くむ	M	158	0A
sukuu	掬う	M	158	0A
sumasu	すます	H	159	0B
sumasu	住む	L	155	1B
sumu	澄む	L	155	1B
sumu	摩れる	H	163	1B
sureru	擦る	L	155	1B
suru	為る	M	153	0A
suru	荒ぶ	M	158	0A
susabu	濯ぐ	M	158	0A
susugu	煤ける	M	167	0B
susukeru	勧める	M	161	0A
susumeru	進む	M	158	0A
susumu	啜る	M	158	0A
susuru	廃れる	M	161	0B
sutareru	捨てる	M	156	1A
suteru	すっとばす	L	171	1B
suttopasu	吸う	M	154	0A
suu	座る	M	165	0A
suwaru	しゃべる	H	165	2A
syaberu	しゃがむ	M	165	0A
syagamu	信じる	H	167	0A
syinziru	白ける	M	167	0A
syirakeru *	生じる	H	167	1A
syooziru *	束ねる	H	162	0A
tabaneru	食べる	H	163	1A
taberu	爛れる	M	161	0A
tadareru	正す	H	159	0B
tadasu	耐える	H	156	1B
taeru	絶える	H	156	1B
taeru	違う	H	159	
tagau	耕す	M	169	0A
tagayasu	手繰る	M	159	0A
taguru	高まる	H	169	0B
takamaru	高める	H	167	0B
takameru	炊ける	M	163	0A
takeru	焚く	M	154	0A
taku	魂消る	H	167	0B
tamageru *	溜まる	M	165	0A
tamaru	給う	M?	160	
tamau*	ためらう	H	169	0A
tamerau	溜める	M	163	0A
tameru	試す	H	165	0B
tamesu	頼む	H	159	0B
tanomu	楽しむ	H	169	0B
tanosimu	倒れる	H	162	0B
taoreru	倒す	H	159	0B
taosu	垂らす	H	165	0B
tarasu	垂れる	H	157	1B
tareru	足りる	M	163	0A
tariru	足る	M	163	
taru	足す	M	154	0A
tasu	助かる	H	169	0B
tasukaru	助ける	H	162	0B
tasukeru				

Word	Kanji	Uwano	Pg	Other dialects
tataeru	湛える	M	162	1A
tatakau	戦う	M	169	0A
tataku	叩く	H	159	0B
tatamu	畳む	M	158	0A
tataru	祟る	M	165	0A
tateru	建てる	H	157	1B
tateru	立てる	H	163	1B
tatiyoru	立ち寄る	L	169	1B
tatoeru	譬える	H	162	0B
tatu	立つ	L	155	1B
tatu	断つ	L	155	1B
tatu	絶つ	L	155	1B
tayoru	頼る	H	165	0A
tayumu*	弛む	M?	160	0B
tazuneru	尋ねる	H	162	0B
tegakeru	手掛ける	H	167	0B
terasu	照らす	H	165	0B
tereru	てれる	H	163	1A
teru	照る	L	155	1B
tetudau	手伝う	H	169	0A
tewatasu	手渡す	H	169	0B
tigau	違う	M	158	0A
tigireru	千切れる	H	167	1B
tikaduku	近付く	H	169	0B
tikau	誓う	M	158	0A
timayou	血迷う	H	169	0A
tirabaru	散らばる	M	169	0A
tirakaru	散らかる	M	169	0A
tirakasu	散らかす	M	169	0A
tirasu	散らす	M	158	0A
tiru	散る	M	154	0A
tizikamu	縮かむ	M	169	0A
tizikomaru	縮こまる	H	171	0B
tizimaru	縮まる	M	169	0A
tizimeru	縮める	M	167	0A
tizimu	縮む	M	165	0A
tizireru	縮れる	M	167	0A
tobasu	飛ばす	M	158	0A
tobokeru	惚ける	M	167	0A
tobu	飛ぶ	M	154	0A
todokeru	届ける	H	167	0B
todokooru	滞る	M	171	0A
todoku	届く	H	160	0B
todomaru	止まる	H	169	0A
todomeru	留める	H	161	0A
togameru	咎める	H	162	0B
togaru	尖る	H	160	0B
togeru	遂げる	H	157	1A
togu	研ぐ	L	155	1B
tokasu	溶かす	H	165	0B
tokeru	解ける	H	157	0A
toku	解く	L	155	1B
tomaru	止まる	M	165	0A
tomaru	泊まる	M	165	0A
tomeru	止める	M	163	0A
tomeru	泊める	M	163	0A
tomonau	伴う	H	169	0A
tongaru	尖がる	H	169	0B
tooru	通る	H	160	0B
tooru	透る	H	160	0B
toraeru	捕らえる	L	162	1A
toreru	取れる	H	163	1B
toridasu	取り出す	L	169	1B
toru	取る	L	155	1B
totugu	嫁ぐ	H	165	0A
tou	問う	M	154	0B
tozasu	閉ざす	H	165	0A
toziru	閉じる	H	157	1B
tubomaru *	窄まる	M	169	0A
tubureru	潰れる	M	167	0A
tubusu	潰す	M	165	0A
tubuyaku	呟やく	L	169	0A
tudou*	集う	H	160	0A
tuduku	続く	M	158	0A
tugeru*	告げる	M	156	0A
tugu	継ぐ	M	154	0A
tukaeru	仕える	M	161	1A
tukaeru	使える	M	167	0A
tukaeru	支える	M	167	1A
tukaikomu	使い棒	H	171	0A
tukamaru	捕まる	L	169	1B
tukamu	摑む	H	160	1B
tukareru	疲れる	M	162	0A
tukareru	憑れる	H	167	0A
tukau	使う	M	158	0A
tukeru	漬ける	M	156	0A
tukeru	付ける	H	163	1B
tukeru	掲ける	H	163	1B
tukiau	付き合う	L	169	1A
tukiru	尽きる	H	156	1B
tuku	着く	L	155	1B
tuku	突く	M	154	0A
tuku	附く	L	155	0A
tuku	掲く	L	155	1B
tukuru	作る	H	160	1B
tukusu	尽くす	M	158	0A

Word	Kanji	Uwano	Pg	Other dialects
tumaru	詰る	H	165	0B
tumazuku	躓ずく	H	169	0B
tumeru	詰める	H	157	1B
tumoru	積る	M	158	0A
tumu	積む	M	154	0A
tumu	摘む	M	154	0A
tumugu	紡ぐ	H	160	0B
tunagaru	繋がる	M	169	0A
tunagu	繋ぐ	M	158	0A
tunoru	募る	M	160	0A
tureru	釣れる	M	163	0A
turu	釣る	M	154	0A
turusu	吊す	M	165	0A
tutawaru	伝わる	M	169	1A
tutomaru	勤まる	H	169	0B
tutomeru	務める	H	162	0B
tuttuku	つっつく	L	169	1A
tutuku	突つく	H	165	0A
tutumu	包む	H	160	0B
tutusimu	慎む	H	169	0B
tuuziru	通じる	ML4	167	1A
tuyomeru	強める	H	167	0B
tuzukeru	続ける	M	167	0A
tuzuru	綴る	M	165	0B
tyongiru	ちょん切る	H	169	1A
ubau	奪う	M	159	0A
ueru	植える	M	156	1A
ueru *	飢える	M	156	1A
ugatu	穿つ	H	159	1A
ugokasu	動かす	H	168	0B
ugoku	動く	H	159	0B
ukaberu*	浮かべる	M	161	0A
ukabu	浮かぶ	M	157	0A
ukagau*	伺う	M	168	0A
ukagau	窺う	M	168	0A
ukaru	受かる	H	164	0B
ukeru	受ける	H	156	1B
uketoru	受け取る	L	168	1B
uku	浮く	M	162	0A
umareru	生まれる	M	161	0A
umaru	埋まる	M	164	1A
umeru	埋める	M	156	1A
umidasu	生み出す	L	168	0A
umoreru	埋もれる	H	166	1A
umu	産む	L	154	0A
umu	膿む	L	155	1B
unaru	唸る	H	164	0B
unaru	鳴る	H	164	0B
unazuku	頷く	H	168	0B
uragiru	裏切る	H	168	0B
uramu	恨む	H	159	0B
uranau	占う	H	168	0B
urayamu	羨む	H	168	0B
ureeru	憂える	H	161	0B
ureru	売れる	M	163	0A
ureru	熟れる	M	163	1A
uridasu	売り出す	M	168	0A
uritobasu	売り飛ばす	H	171	0A
urotuku	うろつく	M	168	0A
uru	売る	M	154	0A
urumu	潤む	H	159	0A
uruou	潤う	H	168	0A
useru	失せる	M	156	1A
usinau	失う	M	168	0A
usumeru	薄める	H	166	1A
usureru	薄れる	H	166	0A
utagau	疑う	M	168	0A
utaguru	疑る	M	168	0A
utau	歌う	M	157	0A
utikomu	打ち込む	L	168	1B
utu	打つ	L	155	1B
utu	討つ	L	155	1B
uturu	移る	H	159	0B
utusu	移す	H	159	0B
uzukumaru	うずくまる	M	171	0A
uzumaru	埋まる	H	168	1A
uzumeru	埋める	H	161	1A
wabiru	詫びる	x	156	1A
wabiru	詫びる	H	164	1A
wakareru	別れる	H	162	0B
wakaru	分かる	H	166	0B
wakasu	沸かす	M	158	0A
wakatu	分かつ	H	161	0B
wakeru	分ける	H	157	1B
wakideru	湧き出る	M	168	0A
waku	沸く	M	154	0A
waku	湧く	M	154	0A
wameku	喚めく	H	166	0B
warau	笑う	M	158	0A
wareru	割れる	M	164	0A
warikiru	割り切る	M	170	0A
waru	割る	M	154	0A
wasureru	忘れる	M	161	0A
watasu	渡す	M	158	0A
yabureru	破れる	H	162	1B
yaburu	破る	H	160	1B

Word	Kanji	Uwano	Pg	Other dialects
yadoru	宿る	H	160	0A
yakeru	焼ける	M	164	0A
yaku	焼く	M	154	0A
yakudatu	役立つ	H	170	0B
yakusu	訳す	H	166	0B
yameru	止める	M	156	0A
yamu	止む	M	154	0A
yamu	病む	L	155	0A
yarakasu	やらかす	M	170	0A
yarareru	やられる	M	168	0A
yaraseru	やらせる	M	167	0A
yareru	やれる	M	164	0A
yareru	破れる	H	164	0A
yarikaesu	やり返す	H	172	0A
yarinaosu	やり直す	H	172	0A
yaru	遣る	M	154	0A
yaseru	痩せる	M	156	0A
yasinau	養う	M	170	0A
yasumaru	休まる	H	170	0B
yasumeru	休める	H	167	0B
yasumu	休む	H	160	0B
yatou	雇う	H	160	0A
yatureru	窶れる	M	167	0B
yatusu	窶す	M	160	0B
yaziru	野次る	H	166	0B
yobu	呼ぶ	M	154	0A
yogoreru	汚れる	M	168	0A
yogosu	汚す	M	166	0A
yokeru	避ける	H	164	1B
yokogiru	横切る	M	170	0A
yokosu	寄越す	M	166	0A
yokotawaru	横たわる	H	172	0A
yokubaru	欲張る	H	170	0B
yomeru	読める	H	164	1B
yomu	読む	L	155	1B
yopparau	酔っ払う	L	172	1B
yoreru	縒れる	H	164	1B
yorokobasu	喜ばす	M	172	0B
yorokobu	喜ぶ	H	170	0B
yoromeku	よろめく	H	170	0A
yoru	寄る	M	154	0A
yoru	依る	M	154	0A
yoru	縒る	L	155	1B
yoru	選る	L	163	1B
yoseru	寄せる	M	156	0A
yosou	装う	H	161	0A
yosu	止す	L	163	0B
you	酔う	L	155	1B
yowamaru	弱まる	H	170	0B
yowaru	弱る	H	166	0B
yoziru	捩じる	H	166	1B
yudaru	茹だる	H	166	0B
yuderu	茹でる	H	157	1B
yugamu	歪む	M	158	0A
yuku	行く	M	154	0A
yureru	揺れる	M	158	0A
yureru	揺れる	M	164	0A
yuru	揺る	M	163	0A
yurumeru	緩める	H	168	0B
yurumu	弛む	H	161	0B
yurusu	許す	H	160	0B
yusaburu	揺さぶる	M	170	0A
yusugu	濯ぐ	M	166	0A
yuu	結う	M	154	0A
yuwaeru	結わえる	M	168	0A
yuzuru	譲る	M	158	0A
zaratuku	ざらつく	M	169	0A
zawameku	騒めく	H	169	0A
zindoru	陣取る	H	169	0B
zirasu	焦らす	H	165	0A
zurasu	ずらす	H	165	0A
zureru	ずれる	H	163	1A
zyareru	じゃれる	M	163	1A
zyukusu	熟す	H	165	0B

Appendix E

Description of the Pitch Extractor

Since no pitch extractor was available for the NEC PC9801 computer, and the determination of the F_0 contours from spectrograms was not feasible considering the amount of data to be analyzed, I programmed by own extractor in Turbo Pascal. A brief description of its major features follows.

The extractor is heuristic in nature attempting to determine the F_0 through a peak-picking algorithm. It thus does not rely on Fourier analysis or linear predictive coding.

Following a brief summary of Gold & Rabiner (1969) found in Witten(1982) the program was designed so that it maintains a matrix of 6 x 6 measurements. The first dimension contains the following six variables, where P represents peak energy values in the waveform and V ("valley") represents the strongest negative values:

1. P to P (peak to peak)
2. P to V (peak to valley)
3. V to V (valley to valley)
4. V to P (valley to peak)
5. P to P ONLY if P > P
6. V to V ONLY if V< V

The second dimension takes into account the fact that the currently selected point or a previously one might have

been spuriously selected. Therefore, previously selected points are also taken into consideration:

1. P <--> P	4. P <--> P
2. P <--> P	5. P <--> P
3. P <--> P	6. P <--> P

Each time that a candidate peak or valley is found, its distance from the previous peak or valley is then checked to make certain that it is in the range of possible points. If so, it is then entered into the above matrix and an estimated F_0 determined by an averaging process which scans the current 36 values in the matrix for a maximum cluster of values within a specific frequency range. The range parameter can be varied but is currently set at 40hz. The F_0 trace produced is accompanied by a set of figures along the bottom, as follows:

Row 1 -- Average F_0 determined at most recent peak

Row 2 -- Average F determined at most recent valley

Rows 3-5 Current P' <-->P measurements

Other filters reject averaged F_0 values which fall outside the current window of acceptable values.

The contours produced have been checked directly against peak to peak measurements of the waveform as well as other pitch extractors and found to be accurate[1]. When errors do occur they are usually obvious, such as values which are either half of or double the actual fundamental frequency.

One virtue of this program over others commercially available is its batching function. Any number of utterances

may be extracted continuously once they have been digitized and stored on disk. This feature greatly eased the preliminary data analysis procedure.

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[1]Comparisons were made with sample utterances a Kay Sonograph Model 5500-1 and an NEC PC9801 using the SoundMaster software and A/D board of the Canopus Company (Nada-ku, Kobe). In each case, our pitch extractor proved equal or superior.

Appendix F

Phrase Sets

"Ano hako" phrases used in 2-Mora elicitations

2.1		
	ano **hako** wa omoi	That box is heavy.
2.2		
	ano **oto** wa urusai	That noise is loud.
	ano **hata** wa akai	That flag is red.
2.3		
	ano **koto** wa wasureta	I forgot that fact/event.

"Tera ni" set used in 2-Mora elicitations

2.1		
	tora ni osowareta	attacked by a tiger
2.2		
	tera ni mairu	visit a temple
2.3		
	hara ni tamaru	get fed up with something
	niwa no hana ga akai	The flower in the garden is red.
2.4		
	wara ni tukamaru	clutch at straws
2.5		
	mado ni noboru	climb on the window

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