Vowel Devoicing of Ainu
-How it differs and not differs from Vowel Devoicing of Japanese-

Hidetoshi Shiraishi
University of Groningen

1 Introduction

The oldest description of Vowel Devoicing (henceforth VD) of Ainu dates back to the earliest stages of linguistic research of the language (Kindaichi 1931, Chiri 1936, 1942). Nevertheless, our knowledge of the phenomenon has not been deepened since then. For instance, we still know little about the exact phonological environment for VD to occur, or its distribution in actual speech. This situation contrasts sharply with that of Japanese, the geographic neighbor of Ainu, where VD has always been one of the most appealing phonological topics among linguists. Numerous investigations were conducted from various linguistic fields for more than a century long.

The present work is an attempt to fill this gap. It is still preliminary in nature. As a primary source, I have used sound recordings of only two speakers of a single dialect. My first task was to check VD in these recordings in order to verify whether previous works were adequate in their description. Except for a couple of recent descriptions (Tamura 1997, 1998), there were no studies that tackled this issue using sound materials in the first place. I will therefore compare the results of my investigation with those previous descriptions.

Another interesting issue is whether VD of Ainu shares characteristics with VD of Japanese. Considering those facts that 1) these two languages have

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been in contact for more than a century, 2) the Japanese dialect in contact with Ainu possibly had VD and 3) virtually all recent speakers of Ainu are bilingual with Japanese, it is hardly possible to discuss VD of Ainu without taking VD of Japanese into consideration. However, such a comparison has not been made until now.

I will therefore compare the results of my research with the characteristics of VD of Japanese described in the literature. From my investigation, it appeared that VD of Ainu has characteristics that are shared with VD of Japanese. But at the same time, it also exhibited characteristics that are unknown or rare to Japanese VD. This fact suggests that VD of Ainu might be governed by its own principles which are not necessarily shared by its affiliate in Japanese.

2 Characteristics of VD of Ainu

2.1 Previous studies

Previous studies described VD as one of the characteristics of the Ainu phonology. Both Kindaichi (1931) and Chiri (1936, 1942) reported that a vowel tends to be pronounced devoiced when flanked by voiceless consonants (V\textsuperscript{8}: devoiced vowel).\textsuperscript{1}

(1) a. çjse 'house'
   b. šjtyki 'to weave'
   c. šjtu 'root'
   d. rapšjkehe 'in the meantime'

In a more recent description, Tamura (1998) pointed out that the application of VD in actual speech might vary dramatically among speakers. She observed that one informant (MK\textsuperscript{2}) devoiced vowels as often as in the Tokyo or Hokkaido dialects of Japanese, while another informant (FH\textsuperscript{3}) hardly exhibited

\textsuperscript{1} I have slightly modified the transcription of examples from the original source in order to make it consonant to the current orthography of the language. [c] denotes an affricate [tʃ].

\textsuperscript{2} Matsuko Kawakami (1912-1987), female, born in the village of Penakori, Biratori town, Hokkaido.

\textsuperscript{3} Fujino Hatozawa (1890-1961), female, born in the village of Piraka, Monbetsu town, Hokkaido.
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devoicing. Having examined the oral recitation of folktales of the latter
informant, Tamura reported that VD,

1. Occurred only 8 times during a recording of 64 minutes.
2. Occurred only in open syllables: aunci 'my house'.
3. Exclusively targeted unaccented syllables, especially those syllables
   preceding an accent: acipékusa 'to transport—with a boat'.

On the other hand, informant MK exhibited a more frequent occurrence of
devoicing which,

1. Occurred 98 times during a recording of 29 minutes, which is about 25
times more frequent than informant FH.
2. Nearly always took place when either i or u (the high vowels of the
   language) was flanked by voiceless consonants: k, p, t, s, c.
3. Could target vowels bearing accent: kíkkik 'to beat repeatedly'.
4. Could target e: søkor 'complementizer'.
5. Could occur in consecutive syllables: ecicjñupeehe 'your tears'.
6. Could occur in closed syllables: kíkkik 'to beat repeatedly'.
7. Could occur before a pause: ayupî 'my elder brother'.
8. Hardly occurred to vowels that preceded h.

It should be noted that most of these points are reported for VD in Japanese as
well. VD in accented or closed syllables is not uncommon, as in kíshi
'knight', shíka 'dentist', kíš.sa.ten 'café' shút.to 'appearance' (Nihon Housou
Kyoukai 1985). Recent studies revealed that devoicing rates lower
dramatically when the target vowel precedes h: kuhái 'a bitter defeat' (Tsuchida
1997, Fujimoto and Kiritani 1998). In addition, Japanese VD also exhibits
great difference in its application among dialects or even among speakers of
the same dialect (Sakurai 1985, Yoshida 1996, Mimatsu et al. 1999).

In the subsequent sections, I will investigate the phonological context of VD
of Ainu using sound materials of the Saru Dialect. I will compare the results
of my investigation with that of Tamura's and check whether the above raised
points are indeed the case. Next I will point to some characteristics that are
unique to VD of Ainu by comparing them with VD of Japanese.
2.2 Method and procedure

I made use of sound materials that were recorded from two female speakers, MK and SH\(^4\) of the Saru Dialect. Speaker MK is the same person as the one that appeared in the investigation of Tamura, mentioned in the previous section. Speaker SH is a sister of FH, the first informant in the previous section. All the recordings are published material and have been recorded originally on an analogue audio-medium. Their complete bibliographical information is listed at the end of this paper.

<table>
<thead>
<tr>
<th>Sound materials of the Ainu language 1 (side A)</th>
<th>SH</th>
<th>26min.</th>
<th>Sept.1955</th>
<th>S.Tamura</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sound materials of the Ainu language 3 (2, 4)</td>
<td>SH</td>
<td>9min.</td>
<td>Sept.1955</td>
<td>S.Tamura</td>
</tr>
<tr>
<td>Sound materials of the Ainu language 3 (1-7)</td>
<td>SH</td>
<td>58min.</td>
<td>May 1958, Aug.1969</td>
<td>S.Tamura</td>
</tr>
<tr>
<td>Collection of Folktales Uepeker</td>
<td>SH</td>
<td>15min.</td>
<td>Aug.1961</td>
<td>S.Kayano</td>
</tr>
<tr>
<td>Collection of Ainu Myths 5</td>
<td>SH</td>
<td>19min.</td>
<td>Sept.1965</td>
<td>S.Kayano</td>
</tr>
<tr>
<td>Sound materials of the Ainu language 10 (1-2)</td>
<td>MK</td>
<td>79min.</td>
<td>Aug.1976</td>
<td>S.Tamura</td>
</tr>
</tbody>
</table>

Listening to these recordings, I checked each vowel in order to judge whether it was devoiced or not. In case of suspicion, I appealed to the spectrograms to make the final decision. In doing this, I made use of the acoustic-analytical program Praat (version 3.8.47, sampling rate 22050Hz) developed by Paul Boersma and David Weenink (Institute of Phonetic Sciences, University of Amsterdam). I based the devoicing-judgment on the visibility of the voice bar, following the criterion of previous studies on VD of Japanese (Han 1962, Maekawa 1983, Mimatsu et al 1999). Figures 1 and 2 are spectrograms of compound words that contain the word *cise* 'house'. The

\(^4\) Sadamo Hiraga (1895-1972), female, born in the village of Tomikawa, Monbetsu town, Hokkaido. Sister of FH.
presence/absence of the voice bar illustrates the voiced and devoiced pronunciations of the vowel \( i \), respectively.

Figure 1  Spectrogram of the Ainu word *cise ous* [cise ous] 'the space near a house'

Figure 2  Spectrogram of the Ainu word *cise tumam* [cjse tumam] 'a wall of a house'
In most of the cases, the visibility of voice bar matched my impressionistic judgments. In a few cases of contradiction, however, I gave priority to the voice bar-judgment.

2.3 Results

I obtained the following observations from the investigation.

1. Devoicing of non-high vowels (a, e, o) was extremely rare and when it occurred it was restricted to certain words (as the complementizer sekor).
2. A vowel adjacent to a voiced consonant hardly devoiced and when it devoiced it was restricted to certain words (the conjunctions akusu, kusu): kek kusu ne wa 'I will come'

The exceptional words that exhibited extraordinary VD in these contexts were exclusively function words of frequent use (complementizers, conjunctions etc.). It is therefore highly possible that VD in these words was controlled by distinct mechanisms. For this reason, I will exclude them from the considerations below.

3. VD in closed syllables was rare.
4. VD before a pause was rare (no matter of whether the target vowel was located in the middle or at the end of the sentence).
5. There were hardly cases of devoicing when the vowel preceded h.

These observations in turn indicate what a typical context for VD in Ainu is. As one may notice, it is not different from that of Japanese.

Target: high vowels i, u
Context: Ç_ÇV
(Target locates in an open syllable flanked by voiceless consonants)

Most of the cases of VD in our data occurred in this context so I will call it the devoicing context and will further investigate it in more detail.

We will now look at various phonological factors that might have influenced the actual occurrence of VD. Tables 1a-b exhibit frequencies of devoicing per vowel- and consonant (preceding) type and the percentages of speaker SH,
tables 2a-b those of speaker MK (percentages calculated only for contexts where there were enough number of tokens).

1. Among the syllables appearing in the devoicing context, si and ci were most prone to devoice.
2. There was no devoicing in the syllables tu, pi and pu.
3. There is a great difference between the devoicing rates of SH and MK, which is statistically significant ($Z = -5.206, p < 0.001$, two-tailed test, calculated from data of si and ci).

5 Since Ainu lacks the syllable ti, it is omitted from the table.
2.4 Discussion

The great difference in devoicing rates between the two speakers supports Tamura's observation made earlier. The devoicing rates above show that the application of VD can vary greatly even among the speakers of the same dialect. However, what exactly causes this variation is difficult to identify. At the same time, it should be noted that the same difficulty holds for VD of Japanese as well. Besides regional variation (dialects), we still know little about socio-linguistic factors that may influence devoicing rates.

On the other hand, both speakers exhibited greater devoicing rates for si and ci than other devoicing syllables. This is reminiscent of Japanese VD where high vowels preceded by fricatives or affricates are more prone to devoice than those preceded by plosives (Han 1962: 89, Maekawa 1983: 77).

Turning now to characteristics that were not shared with the VD of Japanese, one may point to the strong immunity of tu, pi and pu against devoicing. In the recordings, these syllables were pronounced consistently with a voiced vowel (italicized in the examples below).

(3) a. yayupareno 'carefully'
   b. awrawketupa 'to work hard at'
   c. akoheputu 'to pout'
   d. Yupet putuhu ta 'at the mouth of the river Yupet'
   e. ene an pito 'such a spirit'
   f. sapikir ne 'a family line'

These vowels occur in devoicing contexts; they locate in an open syllable flanked by voiceless consonants. Nevertheless, of the total of 120 instances in the recordings of HS and MK, none of them were pronounced devoiced. This contrasts sharply with VD of Japanese where speakers do devoice pi and pu: pi̯akiska 'in flashes', reseψo̯on 'reception' (Kawakami 1977, Nihon Housou Kyoukai 1985). How can this difference be explained?

There is one common feature that these three syllables share; they appear only marginally in the Japanese lexicon. A singleton p does not appear in the native (Yamato) vocabulary; syllables as pu and pi are restricted to loanwords

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6 In addition, these vowels do not bear accent. For correlation between accent and VD, see section 2.5.
or onomatopoeia. Tu is absent from the native lexicon at all and occurs only in recent loanwords: tudei 'today', tunaito 'tonight'. Considering the long history of language contact between the Japanese and the Ainu, and the fact that all recent speakers of Ainu are bilingual with the Japanese, one may hypothesize that tu, pi and pu have escaped from VD in Ainu because of the insufficient exposure to the corresponding syllables in Japanese, due to their marginality in the Japanese lexicon. This hypothesis presupposes that Ainu has learned VD from Japanese.

Whatever the reason for this asymmetry among the syllables appearing in the devoicing context, it should be noted that this fact is inconsistent with the view that VD occurs in demand of ease of articulation (= economy), an explanation often preferred for VD of Japanese (Akamatsu 1997: 39, Kubozono 1999: 42-43). According to this view, VD saves the vibration of vocal cords from the initial voiceless consonant through the (devoiced) vowel till the following voiceless consonant. The systematic absence of VD in tu, pi and pu in the present data shows that VD of Ainu cannot be such an automatic process. With this respect, it is interesting to investigate whether the same pattern of VD holds for the Japanese speech of these Ainu speakers, a topic which I will leave for future research.

2.5 Correlation with accent

It is a well-known fact about VD of Japanese that accented vowels tend to resist devoicing (Han 1962, Haraguchi 1977, Kawakami 1977, McCawley 1977, Yoshioka 1981, Sakurai 1985, Maekawa 1983, Vance 1987, Yoshida 1996, Akamatsu 1997 etc.). It is therefore interesting to see whether this correlation holds for VD of Ainu as well. Unfortunately, little is known about the sentence accent of Ainu, let alone in a recitation of folklore. Nevertheless, I will try to make a comparison by assuming that the accentual pattern of citation forms holds for sentences in oral recitations as well.

Word accent in Ainu is put within two syllables from the left and is quantity-sensitive; the leftmost heavy (= closed) syllable obtains accent (4a, b). In case there are no heavy syllables the second from the left obtains accent (4c) (=syllable boundary).
Table 4 compares the devoicing percentages of accented and unaccented syllables. The difference between the number of accented and unaccented devoiced vowels is statistically significant \((Z = -1.706, p < 0.05, \text{one-tailed test})\). Thus it can be seen from this table that in MK’s speech, vowels in unaccented syllables were devoiced more often than in accented syllables indeed.

\(^7\) For speaker SH there was no enough number of tokens.
Table 4 Comparison of the number of accented and unaccented devoiced vowels. The figures in brackets are frequencies of devoiced vowels.

<table>
<thead>
<tr>
<th>Accent</th>
<th>Num. of tokens</th>
<th>Percentages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accented</td>
<td>68 (21)</td>
<td>30.9%</td>
</tr>
<tr>
<td>Unaccented</td>
<td>270 (114)</td>
<td>42.2%</td>
</tr>
</tbody>
</table>

2.6 Residual issues

VD of Japanese is not a fast speech rule that applies optionally (Akamatsu 1997, Tsuchida 1997). It occurs even in slow speech. The high vowels in devoicing contexts might be pronounced voiced only in unnaturally careful speech (Kawakami 1977). It is therefore interesting to ask whether VD of Ainu follows VD of Japanese in its consistency. In the recordings, some words appeared exclusively with its high vowel in the devoicing context unpronounced. For instance, *nisike* 'a load of firewood' is a compound formed from *ni* 'wood' and *sike* 'load' but was always pronounced *niske* in the recordings of MK (Tamura 1997). It needs to be investigated whether there are more such words.\(^8\)

Another possible deviation of VD of Ainu from Japanese is devoicing before a pause. In Japanese, VD occurs word-finally before a pause (unless the target vowel bears word accent): *tanuki* 'raccoon dog', *matsu* 'pine-tree'. In the investigated recordings, there were hardly cases of VD in this environment.\(^9\) Note, however, that in Japanese it has been argued that word-final devoicing before a pause does not occur systematic as in word-medial environments (Tsuchida 1997). Further investigation is required in order to make the point clear.

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\(^8\) A related issue is whether we are dealing with devoicing and not deletion of vowels. This has often been discussed for Japanese VD as well. See Tsuchida 1997 for discussion.

\(^9\) The only recording in which pre-pausal VD occurs frequently is Tamura 1984 (side B), in which speakers were asked to translate a Japanese word list to Ainu. There we encounter with examples as *patej* 'a bowl' or *yatupoki* 'the armpits'. According to Prof. S. Tamura, who made this recording, it was the first time for her to work with this informant and she got the impression that this informant was nervous, which might have been the reason for this unusual high frequency of VD in this context (p.c. June 2000).
3 Conclusion

Comparing the VD of Ainu and Japanese, the present study revealed that at least for speaker MK, its phonological context is similar to that of Japanese. VD outside of this context was rare. It was also observed that within this context, $si$ and $ci$ were most prone to devoice, a tendency reported for VD of Japanese as well. In addition, it has been confirmed that the presence of accent works negatively to the application of VD.

On the other hand, we also observed characteristics that are rare or unknown to Japanese VD. In Ainu, VD did not occur in $tu$, $pi$ and $pu$ and hardly occurred before a pause. This deviation suggests that VD of Ainu might be governed by distinct mechanisms.

References

Kindaichi, Kyousuke. 1931. _Ainu Yukar goho tekiyo [A grammatical sketch of the_ 10

Tamura (1997) reports that it is difficult for Japanese students who learn Ainu not to devoice vowels in contexts where Ainu does not exhibit VD but Japanese does.


Department of Social Science and Humanities
Tokyo Metropolitan University
1-1 Minami-Osawa, Hachioji-shi
Tokyo 192-0397

honmat@st.rim.or.jp