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IN

LINGUISTICS

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WHERE IS THE HAWAIIAN LANGUAGE HEADED? A PHONETIC STUDY

FABIANA PICCOLO

The struggle for the revitalization of the Hawaiian language, although valuable and necessary, has so far either neglected or insufficiently taken into account one important issue: the existence of various dialects of Hawaiian. The aim of the present study is to characterize the vowels of two of these dialects, Niʻihauan and the University of Hawaiʻi (UH), on the basis of phonetic evidence. The first dialect is a natural continuation of the variety spoken on the island of Niʻihau, in that the Hawaiian language was never banned there, as opposed to the rest of the islands, where it was. The latter dialect evolved from that spoken on the Big Island. Although both dialects have native and non-native speakers, most of the speakers of UH Hawaiian are non non-native speakers whose first language is English. The present study compares the pronunciation of Hawaiian vowels by a native speaker of the Niʻihauan dialect with that of a fluent (but non-native) speaker of UH Hawaiian whose first language is English. Phonetic charts of the vowels of both varieties of the language are compared to show the possible influence of English on the UH form.

1. INTRODUCTION. The present study compares the realization of Hawaiian monophthongs and diphthongs by a native speaker of Niʻihauan Hawaiian with the realization of the same monophthongs and diphthongs by a non-native speaker of the UH variety of Hawaiian whose first language (L1) is American English. For sake of completeness, the study considers also the realization of English monophthongs and diphthongs by the same speakers, as the English phonology of the non-native speaker may influence her realization of the Hawaiian vowels. The study aims at documenting the existence of at least two dialects of Hawaiian: Niʻihauan Hawaiian and UH Hawaiian.

2. HISTORICAL BACKGROUND. Popular ideas surrounding Hawaiian consider the language to be one monolithic form of speech produced by two groups of people: native speakers and non-native speakers. As a student in Hawaiian classes at UH Mānoa, I personally witnessed this when I heard my teachers differentiate between mānaleo, ʻnative speakers of Hawaiianʼ, and non-native speakers of Hawaiian, without further distinguishing among dialects. However, the fact of the matter is more complex than this. Generally speaking, there is no such a thing as one language without variation. Rather, one form tends to be considered more prominent than others, gaining the title of “the standard” dialect and, by default, of “the language” itself. I hypothesize that for historical reasons, the Big Island dialect was considered the “real” Hawaiian language. As a result, other dialects were influenced by this form. Nowadays, although the Big Island dialect is spoken by a small number of native speakers (to my knowledge, fewer than 100), it is still considered the most desirable form of Hawaiian. In the past years a relatively new dialect of Hawaiian has been identified. NeSmith (2002) refers to this form as Neo-Hawaiian, but generally it has been called UH dialect. In the present study, this dialect will be referred to as UH Hawaiian, as it is spoken and taught at the University of Hawaiʻi – although I am aware that it is also employed elsewhere, i.e., in most of the Kindergarten through Grade 12 (K-12) immersion schools around the state. The origins of UH Hawaiian are found in the dialect spoken by Mary Kawena Pukui, a Big Islander who worked in a collaborative effort with the linguist Samuel H. Elbert. The Big Island dialect gained its prestige mainly because King Kamehameha I was a native speaker of this dialect. This dialect was also the source of modern standard reference works, i.e., *Hawaiian grammar* (Elbert and Pukui 1979) and

Hawaiian dictionary (Pukui and Elbert 1986 [1957]). Hawaiian classes were taught by both native and non-native speakers of Hawaiian up until a few decades ago. Native speakers teaching the language were outnumbered by non-native speakers right from the beginning of Hawaiian programs. This was a consequence of the banning of Hawaiian from school in previous years, which caused the average age of native speakers to rise and the numbers to fall. The L1 phonology of non-native speakers teaching the original Big Island dialect influenced the kind of language the students learned, and as a result, the UH dialect emerged. This dialect now has native speakers: in fact, a number of non-native speakers of Hawaiian who teach the language are now raising their children as bilinguals. Furthermore, children attending K-12 immersion schools are also raised as bilinguals. However, even when acquired as an L1, UH Hawaiian is likely to be somewhat different from those dialects not influenced by transfer of English phonology, syntax, etc.

The present study considers a second dialect of Hawaiian, i.e., Niʻihauan Hawaiian, which is the natural evolution of the form of Hawaiian spoken on Niʻihau. It is known that this dialect differs from the Big Island dialect, most notably in the alternation of [t] ~ [k] for the phoneme /t/. To my knowledge, so far no major study has been done on the phonetic differences between the vowel systems of any Hawaiian dialects. Although the data collected here are very limited, the aim of the present paper is to compare the pronunciation of the vowels in the UH dialect with those in the Niʻihauan dialect.

3. RELEVANT PHONOLOGY. Tables 1 and 2 show Hawaiian monophthongs (based on Pukui and Elbert 1986), while Table 3 illustrates Standard American English (SAE) monophthongs.

TABLE 1. Phonemic chart of Hawaiian short monophthongs.

	Front			Back
high	i			u
mid		e	o	
low		a		

TABLE 2. Phonemic chart of Hawaiian long monophthongs.

	Front			Back
high	iː			uː
mid		eː	oː	
low		aː		

TABLE 3. Phonemic chart of SAE monophthongs.

high	i		u
mid-high	ɪ		ʊ
mid		ə	
mid-low	ɛ		ɔ[1]
low		æ ɑ	

Hawaiian diphthongs are: /ai/, /ae/, /ao/, /au/, /ei/, /eu/, /iu/, /oi/, /ou/.

English diphthongs are: /aʊ/, /aɪ/, /eɪ/, /ɔɪ/, /oʊ/, and, as it is commonly indicated for some American English dialects, /yu/.

4. METHODS.

4.1 WORD LIST AND ELICITATION. The Hawaiian vowels were elicited as follows. The two consultants were recorded separately as they read four repetitions of nineteen sentences (5 short monophthongs + 5 long monophthongs + 9 diphthongs). The sentences were structured as follows: *ʻŌlelo mākou i ka* ____ *i ka ʻōlelo Hawaiʻi* (ʻWe say _____ in Hawaiian'). Each sentence included a word, occurring in the middle of the sentence, which contained the vowel studied. The vowel always appeared in the first syllable of a disyllabic word; i.e. in stressed position. I tried to have the second syllable consistently unstressed, but this was not always possible.

The English vowel sounds were elicited in the same fashion. Both consultants read four series of fifteen sentences (9 monophthongs + 6 diphthongs). The sentences were structured like this: "Say ____ now." Each contained a word, occurring in the middle of the sentence, in which the target vowel appeared. The vowel always occurred in the first syllable of a disyllable, and always in stressed position. The second syllable was always unstressed.

The English monophthong /ɔ/ was not elicited. For both Hawaiian and English, I looked for monophthongs appearing between fricatives or stops, as such consonants interfere much less than do sonorants with the measurements of vowels. Since /ɔ/ is present in the phonology of many native speakers of American English only when appearing before /ɹ/, or as the beginning part of the diphthong /ɔɪ/, it was not included in the present study.

[1] Many native speakers of American English produce the phoneme /ɔ/ as [ɒ]. Here, I will follow the conventional way employed by linguists to represent this sound.

TABLE 4. Hawaiian word lists.

Monophthongs

Short	Long
1. p**a**pa ‘flat surface’	1. m**ā**pu ‘fragrance’
2. p**e**pe ‘flat, as a nose’	2. p**ē**heu ‘soft, flabby’
3. p**i**pi ‘Hawaiian pearl oyster’	3. p**ī**hoi ‘disturbed, excited’
4. p**o**po ‘rot, decay’	4. p**ō**heo ‘knob’
5. p**u**pu ‘small shelter’	5. p**ū**hau ‘cool spring’

Diphthongs

1. h**ei**hei ‘race, as a competition’	6. h**ai**hai ‘wicked person’
2. h**eu**heu ‘down or fine hair’	7. haehae ‘to tear to bits’
3. h**oi**hoi ‘interesting’	8. haohao ‘iron’
4. h**ou**po ‘diaphragm’	9. hauhau ‘to beat’
5. h**ou**hou ‘to push’	10. hiuhiu ‘to pelt repeatedly’

TABLE 5. English word list.

Monophthongs		*Diphthongs*	
1. sh**ee**pish	6. h**oo**king	1. s**a**fer	6. H**ou**ston
2. h**i**ssing	7. s**u**shi	2. s**o**fa	
3. f**e**ster	8. s**u**ffer	3. h**y**phen	
4. h**a**sh it	9. s**au**sage	4. h**ou**sing	
5. h**o**ppy		5. h**oi**ster	

4.2 SPEAKERS. Both consultants are females and are similarly built, which is important for comparing vowels, since formant values are determined in part by the size of the vocal tract.

One Hawaiian native speaker of the Ni‘ihauan dialect participated in this project. She is 45 years old, was born and raised on Ni‘ihau until she was 4, then moved to Kaua‘i, but she grew up in a community of Ni‘ihauans. She currently teaches Hawaiian. She speaks American English as second language. She will be referred to as ‘A’ in the remainder of the paper.

My other consultant was a 34-year old woman, whose first language is SAE. She was born and raised in Honolulu and has spoken the Hawaiian language since the early 1990s. She has also taught Hawaiian for 10 years. She will be referred to as ‘B’ in the remainder of the paper.

4.3 RECORDINGS AND MEASUREMENTS. All recordings were made on a Sony Minidisk Recorder in a quiet room at UH Mānoa and were transferred onto a cd-rw. The data were digitized at a 11,000 Hz sampling rate using PCQuirer and Praat. For each vowel, formant[2] one (F1), formant two (F2), and duration were measured on Praat, through time-aligned spectrograms and waveforms.

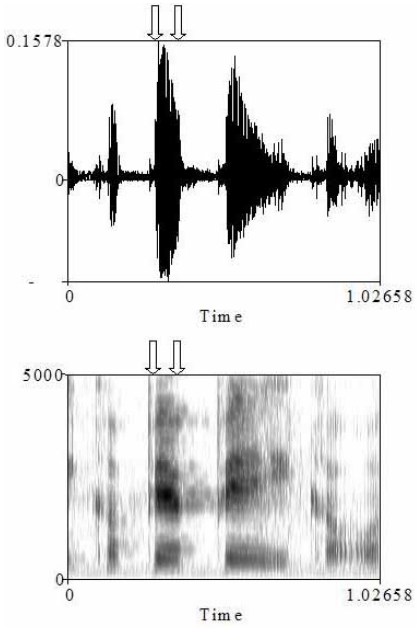
Figures 1-3 show examples of waveforms, spectrograms, and formants depicting displays from which vowel durations were measured. Arrows indicate approximate beginning and ending points for the vowel studied.

For each monophthong, formants and duration were measured as follows. Formants were measured by first isolating the target vowel studied, then finding a stable area for the formants (i.e., an area where the formants were clearly visible and formed a straight horizontal band), and finally recording the frequencies of each formant in that area. As in usual phonetic research, I created acoustic vowel charts by plotting F1 vs. F2, to analyze and compare the two speakers' vowels.

Duration was given at the bottom of each waveform and spectrogram. When isolating each vowel, I was able to measure and make a log entry of its exact duration.

For each diphthong, formants and durations were measured as follows. The onset of the diphthong was identified and its F1 and F2 were measured in the same way as for monophthongs. Then, the offset of the diphthong was isolated and its F1 and F2 were measured. Finally, the duration of each diphthong was observed at the bottom of each waveform and spectrogram, and was recorded in the same fashion as for monophthongs.

FIGURE 1. Example of a repetition of the word *pepe* 'flat, as a nose' by A, with beginning and end points for the target vowel marked.



[2] Formants are resonances that are formed in the vocal tract depending on the shape given to the vocal tract; different combinations of resonances determine different vowel qualities

FIGURE 2. Example of a repetition of the word *sausage* by A, with beginning and end points for the target vowel marked.

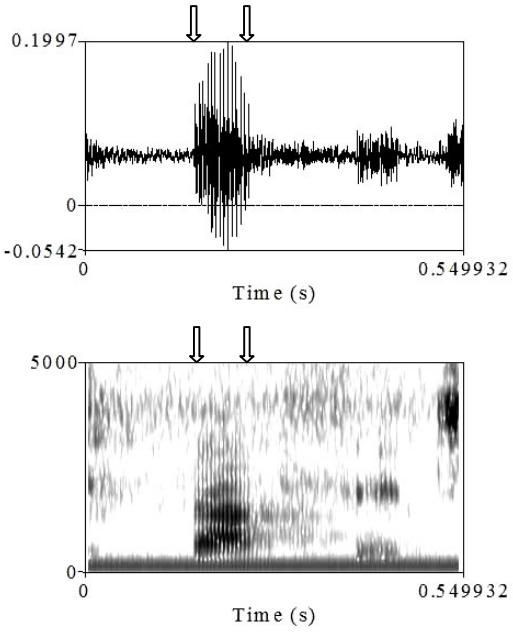
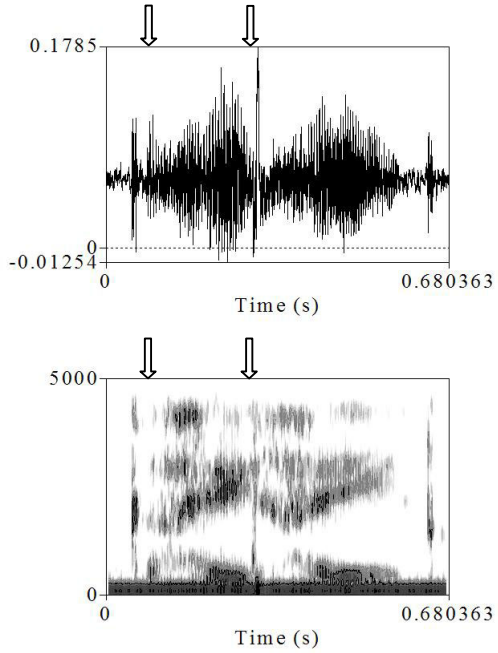


FIGURE 3. Example of a repetition of the word *haehae* 'to tear to bits' by B, with beginning and end points for the target vowel marked.



5. ANALYSIS OF VOWEL QUALITY. Vowel charts were made with the UCLA software PlotFormants. As is common in phonetic research, F1 appears on the vertical axis, F2 on the horizontal. Ellipses show one standard deviation around the mean value for each vowel. The symbol in the center of the each ellipse shows the mean value for each vowel.

I will consider two parameters when comparing vowels in the charts below: the size and the position of the areas formed by the vowels. I will look at both parameters at the same time. I will also observe the placement of each vowel area and try to provide explanations for it. Finally, as I proceed, I will attempt to draw some conclusions.

As duration did not produce any significantly statistic results, I will not include it in the discussion of the paper.

In section 7, I will move to the conclusions. A summary of results appears at the end of the present paper.

I will study monophthong areas first, then diphthong areas.

5.1 MONOPHTHONGS. I shall discuss Hawaiian monophthongs first, then English monophthongs.

5.1.1 HAWAIIAN SHORT MONOPHTHONGS. The comparison between Figures 4 and 5 (summarized in Figure 6) shows the following.

A's areas are small and distinct. On the other hand, B's realization of Hawaiian short monophthongs creates larger areas. Moreover, B's back vowel areas overlap with each other.

In terms of positioning, B's vowel space is contained within the space formed by A's vowel space. There are a few possible explanations for this finding, and I will suggest only two. A might be hyperarticulating her vowels, whereas B might not. Another possibility is that B has a slightly larger vocal tract than A.

Looking at individual monophthongs, I observe that B's front vowel areas overlap with those of A, although B's front vowels are positioned a little more toward the center of the vowel space with respect to A's. This means that B's production of front vowels is close to A's.

B's low vowel /a/ is about 150 Hz higher (on the F1 axis) and more central than A's and partly overlaps with B's back vowels. This could indicate that B is less certain in her production.

The back vowel areas for B do not match those in A's production. First of all, /o/ and /u/ overlap for B, which indicates that she does not clearly distinguish between them. B's /o/ is slightly higher and more central than A's /o/, and B's /u/ is about 100 Hz lower and a little bit more central than A's /u/. I suggest that B's production of /o/ is influenced by her English phonology and that the Hawaiian monophthong /o/ is diphthongized to some extent (in other words, she tends to say /oʊ/, rather than /o/). I was actually able to hear a slight diphthongization during B's production. Notice that this does not happen for /e/: in fact, there is no diphthongization for this monophthong, which would lead to /eɪ/.

FIGURE 4. Hawaiian short monophthongs for A.

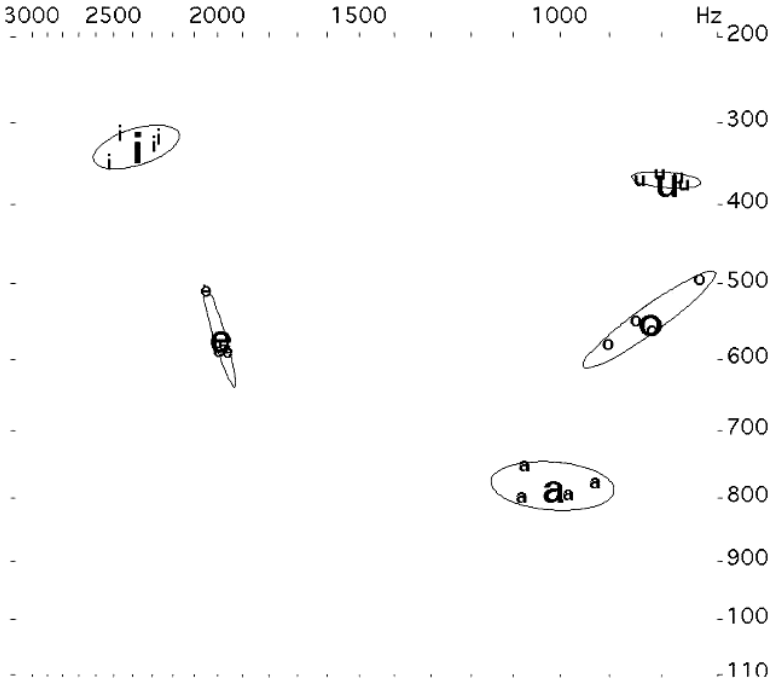


FIGURE 5. Hawaiian short monophthongs for B.

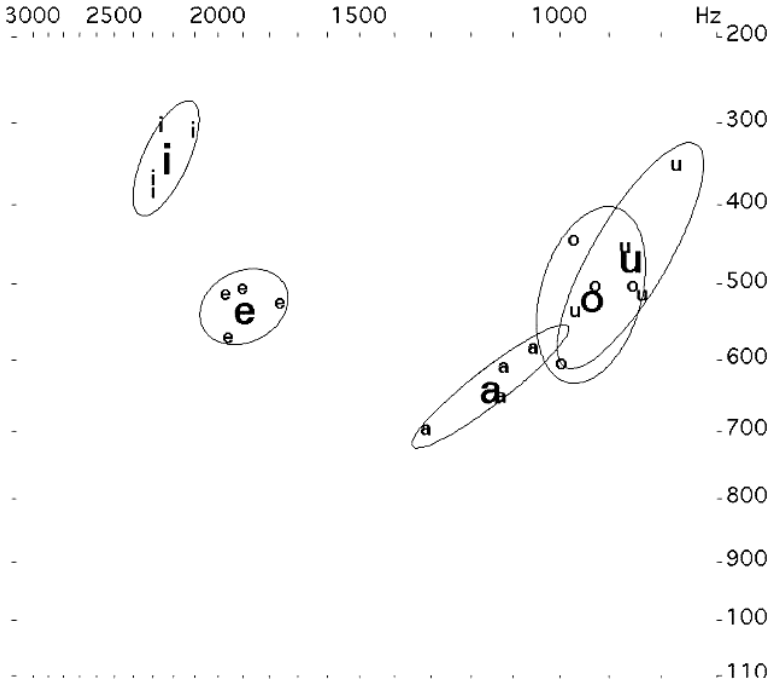
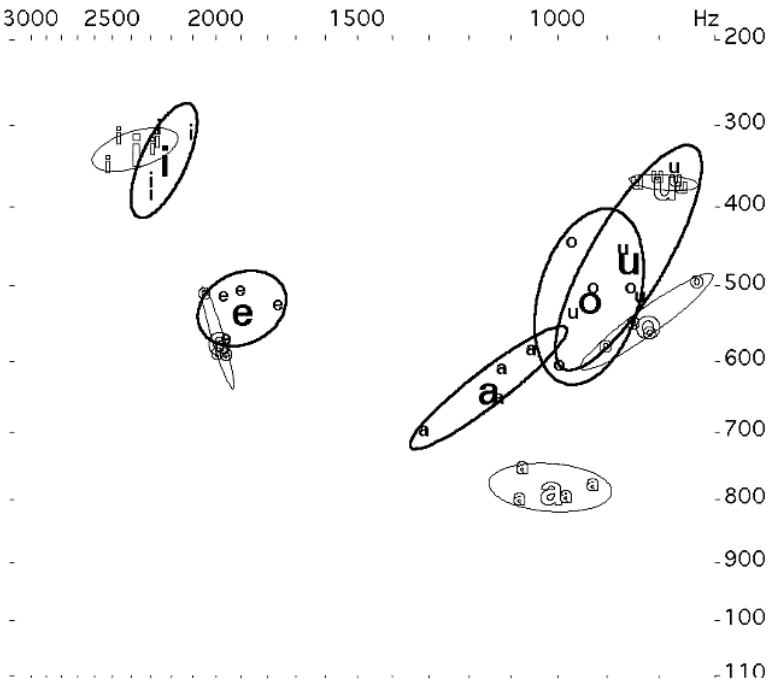


FIGURE 6. Hawaiian short monophthongs for both A and B.
A in light line ellipses and white font, B in thick ellipses and bold font.



5.1.2 HAWAIIAN LONG MONOPHTHONGS. The comparison between Figures 7 and 8 (summarized in Figure 9) shows the following.

A's long monophthongs produce very small areas. Once again, there is no overlapping of any area whatsoever for A: this indicates even more precision in the production of her long monophthongs as compared with her short monophthongs. As for B, her areas for the mid and low long monophthongs are comparable to A's, whereas B's high monophthong areas are quite a bit larger. B's back vowels /oː/ and /uː/ overlap only very slightly. As compared with B's short monophthongs, all this means that B is aiming at the same vowel targets as A's. Therefore, in general her production of long vowels more closely resembles that of the native speaker's than her production of short vowels.

Let us now look at individual monophthongs. First of all, B's /iː/ is slightly higher and a little more central than A's /iː/, but it forms a much wider area than the latter. B's /eː/ almost completely overlaps A's /eː/, thus revealing that her target is positioned in the same spot as A's. B's /aː/ partly overlaps with A's /aː/, thus showing a similar positioning of this vowel for both speakers. B's /oː/ and /uː/ form almost completely separated areas, which means that B can distinguish between them; however, both vowels show different targets from those of A (B's /oː/ is more central and lower than A's /oː/, and B's /uː/ is more central and has a wider area than B's /uː/).

FIGURE 7. Hawaiian long monophthongs for A.

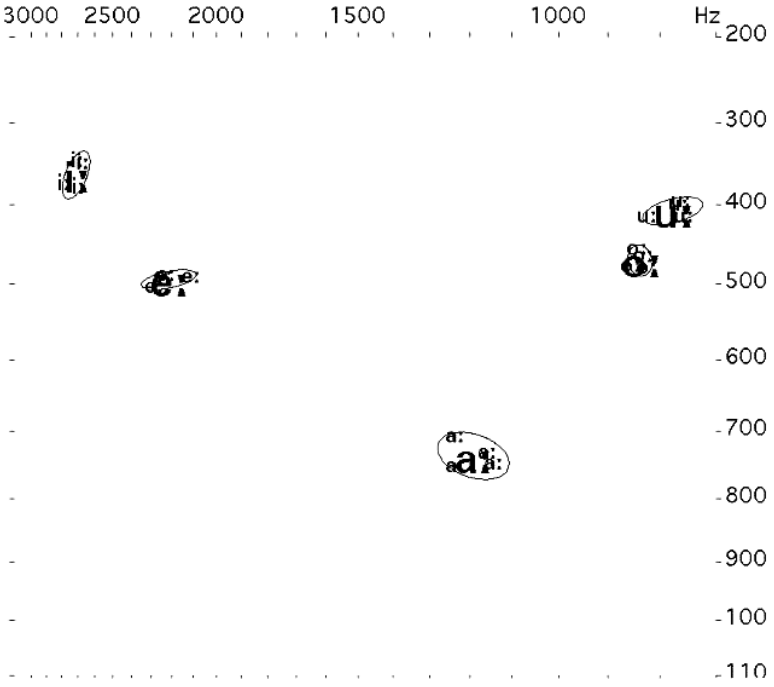


FIGURE 8. Hawaiian long monophthongs for B.

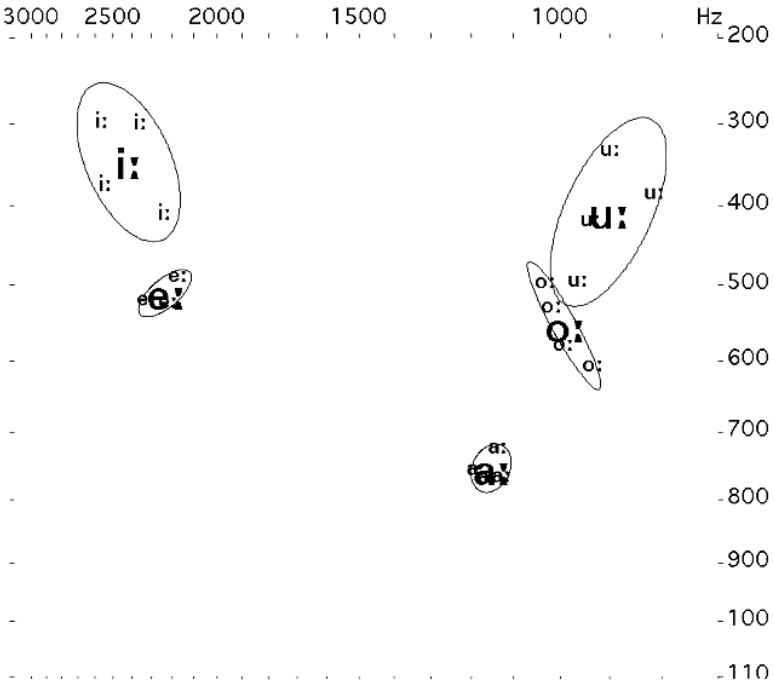
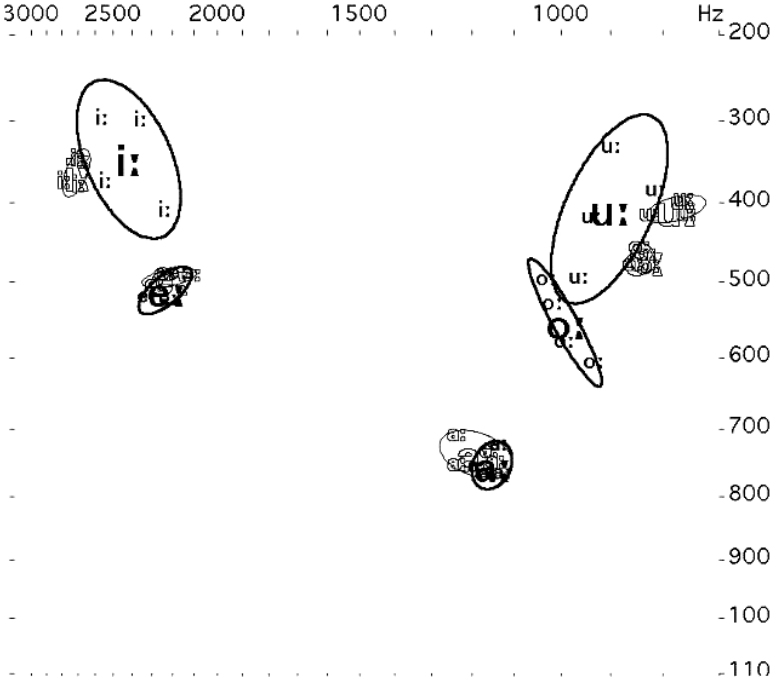


FIGURE 9. Hawaiian long monophthongs for both A and B.
A in light line ellipses and white font, B in thick line ellipses and bold font.



5.1.3 HAWAIIAN SHORT VS. LONG MONOPHTHONGS. The comparison between Hawaiian short and long monophthongs for A is shown in Figure 10. The same comparison for B is shown in Figure 11 (note: due to technical problems with PlotFormants, I was unable to plot long monophthongs with macrons when compared to short monophthongs. Instead, short monophthongs are shown as light-line ellipses and in white font, while long monophthongs are shown as dark-line ellipses and in bold font.) Let us analyze the data.

A's long monophthongs generally form smaller areas than her short monophthongs: this probably results from the fact that she has more time to realize such sounds; therefore it is easier for her to aim for her ideal targets. There is virtually no overlap between A's short and long monophthong areas. The interpretation of this fact is open to speculation: it could mean that A has separate ideal vowel quality targets for short and long monophthongs, which would contradict what was implied above; that for each long/short pair vowel she has one (not two) ideal target to aim for. But it could also mean that she actually does have one ideal target, which the long vowels implement better. If she does have separate vowel qualities in short vs. long vowels, this may mean that quality differences are serving to enhance quantity differences (this happens when *ā* or *a* is followed by *u* or *i* : short vowels raise, whereas long do not, or, at least, not much; see section 5.1.6).

B presents small areas for mid and low long monophthongs; all the other monophthongs, short and long, tend to form large areas. Finally, a general overlap for B's monophthongs is shown, with the exception of /e/ vs. /e:/, and /a/ vs. /a:/.

On the basis of my observations about the Hawaiian short and long monophthongs, I can claim that A has extremely well-defined targets in the vowel space. B lacks such precision, which is evident from the overlapping of a number of her monophthongs, and from their range of variation.

FIGURE 10. Hawaiian short monophthongs vs. long monophthongs for A.
Short monophthongs in light line ellipses and white font, long monophthongs in thick line ellipses and bold font.

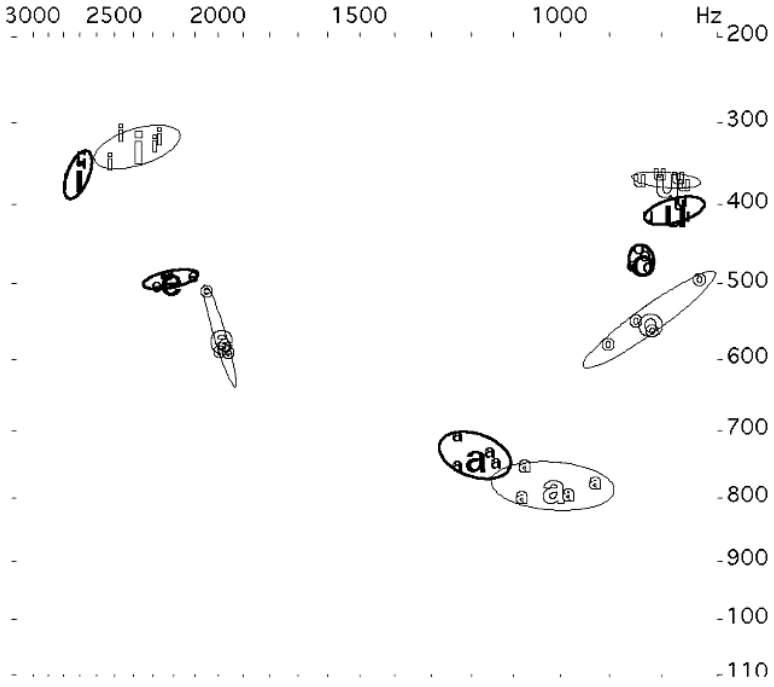
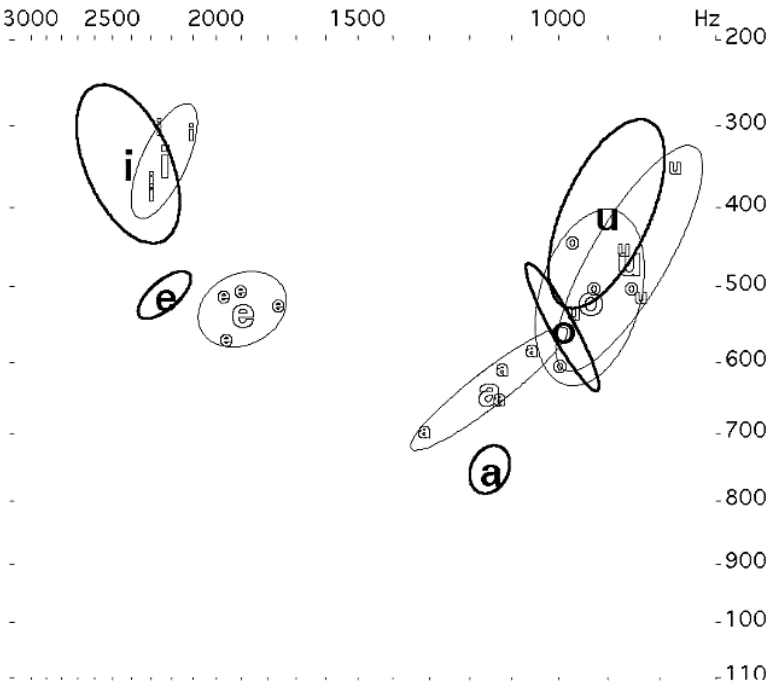


FIGURE 11. Hawaiian short monophthongs vs. long monophthongs for B.
Short monophthongs in light line ellipses and white font, long monophthongs in thick line ellipses and bold font.



Let us now look at the English monophthongs.

5.1.4 ENGLISH MONOPHTHONGS. By comparing Figures 12 and 13, which show charts for the English monophthongs respectively produced by A and B (this comparison is summarized in Figure 14), I observe the following.

A's low English monophthongs overlap: specifically /ɑ/ forms a very wide area which includes /ɒ/, /ʌ/, and /æ/. This may well be due to the influence of her native language, i.e. Hawaiian, which does not distinguish among these sounds. A's /ʊ/ also forms a fairly large area, whereas A's front and central vowels tend to form small areas.

On the other hand, B's areas are all fairly small and non-overlapping, with the exception of /ɒ/ and /ɑ/. This can be interpreted as follows: B has very small and clear targets in her native language, although she has no phonemic distinction between /ɒ/ and /ɑ/ (which is characteristic of a number of American-English dialects).

FIGURE 12. English monophthongs for A.

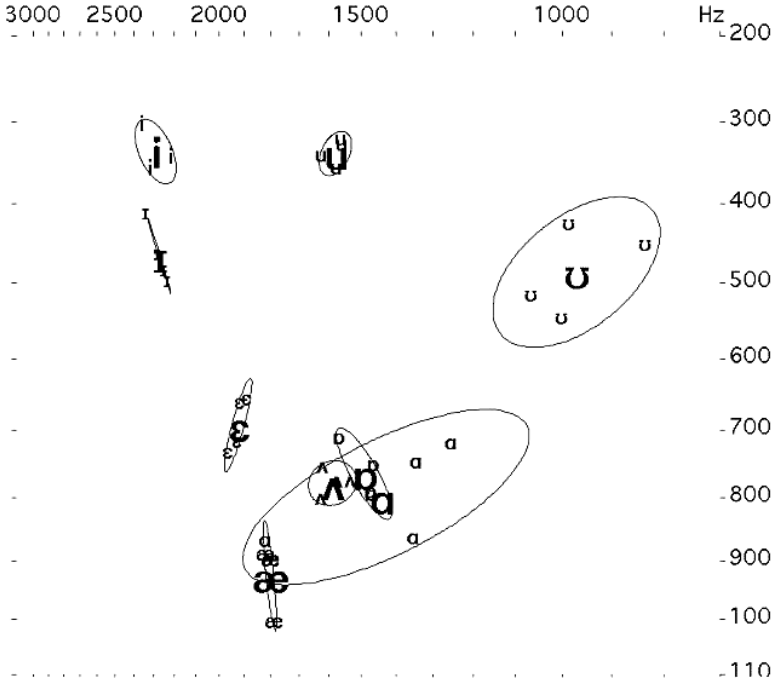


FIGURE 13. English monophthongs for B.

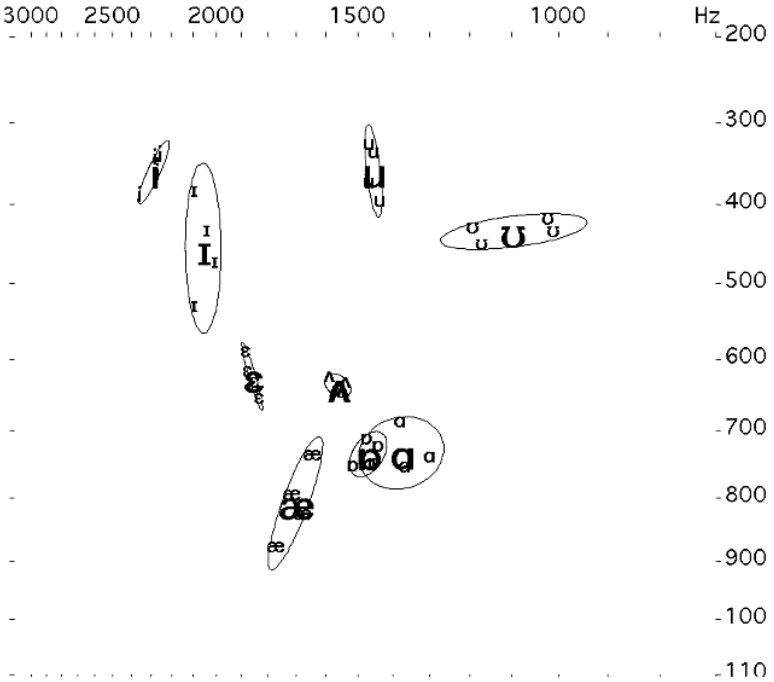
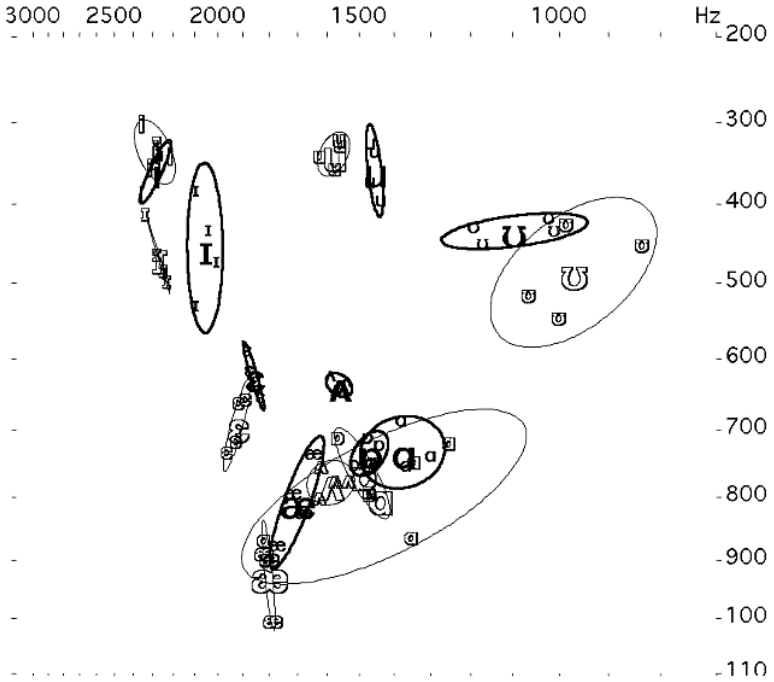


FIGURE 14. English monophthongs for A and B.
A in light line ellipses and white font, B in thick line ellipses and bold font.



Let us now compare each speaker's Hawaiian monophthongs with her English monophthongs. Since this comparison is between two languages which do not feature the same phonological vowel inventory, either in terms of quality or length (Hawaiian has both long and short monophthongs, while English has only short monophthongs), I will compare short Hawaiian monophthongs with English (solely short) monophthongs.

5.1.5 HAWAIIAN SHORT MONOPHTHONGS VS. ENGLISH MONOPHTHONGS. Figure 15 compares Hawaiian short monophthongs and English monophthongs for A. Figure 16 illustrates the same comparison for B. Let us now analyze the data, starting with A.

Generally speaking, A's monophthongs (both Hawaiian and English) tend to form small areas, with the exception of English monophthongs /ɑ/ and /ʊ/.

Looking at individual monophthongs, I observe the following. A's English low central monophthongs overlap: /ɑ/ forms an extremely wide area that encompasses /æ/, /ʌ/, and /ɒ/. This likely shows that each of the three latter sounds tends to be confused with /ɑ/, to varying degrees. I interpret such information as follows: in producing English /ɑ/, /æ/, /ʌ/, and /ɒ/, A is probably aiming for some vowel that is positioned in front of her Hawaiian /a/. Furthermore, A can distinguish between English /ɑ/ and Hawaiian /a/, although there is a slight overlapping of the areas formed by such vowels.

Furthermore, A articulates her English /ʊ/ in a large area positioned between her Hawaiian /u/ and /o/ (remember that /ʊ/ is not part of A's native phonology); similarly, she articulates her English /ɪ/ between her Hawaiian /i/ and /e/ (remember that /ɪ/ is not part of A's native phonology).

She can clearly differentiate between Hawaiian /u/ and English /u/, as these vowels are positioned well apart.

A's English and Hawaiian /i/ overlap, signaling that she patterns this vowel roughly in the same position for both languages. However, she can clearly distinguish between Hawaiian /e/ and English /ɛ/, since the areas formed by such vowels do not overlap. Furthermore, she can distinguish between these two sounds and /æ/; however the latter tends to overlap with /ɑ/.

Let us now look at B's production. B's English monophthongs form smaller areas than her Hawaiian monophthongs; furthermore, her English monophthong areas do not overlap with each other, as mentioned above. If I consider each individual sound, I observe the following.

As for the production of her front vowels, B patterns her Hawaiian /i/ just about in the same position of her English /i/ (although the former creates a larger area in the F1 dimension than the latter). Her Hawaiian /e/ is positioned between her English /ɪ/ and /ɛ/, with a little overlapping of /ɪ/ and /e/.

B produces her Hawaiian low and back vowels (/a/, /o/, and /u/) somewhere between her English /ɑ/ (which ends up slightly overlapping with Hawaiian /a/) and her English /ʊ/ (which slightly overlaps with Hawaiian /o/). Finally, she clearly distinguishes between English /u/ and Hawaiian /u/.

FIGURE 15. Hawaiian short monophthongs vs. English monophthongs for A. Hawaiian short monophthongs in light line ellipses and white font. English monophthongs in thick line ellipses and bold font.

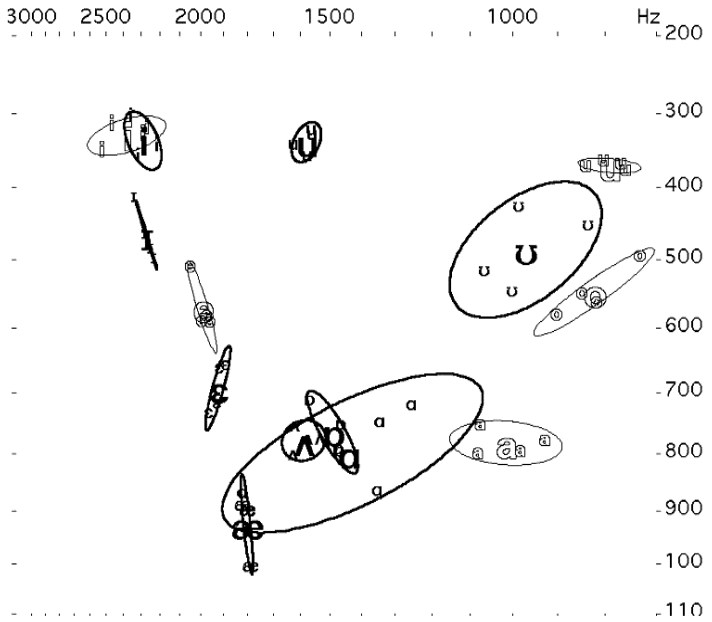
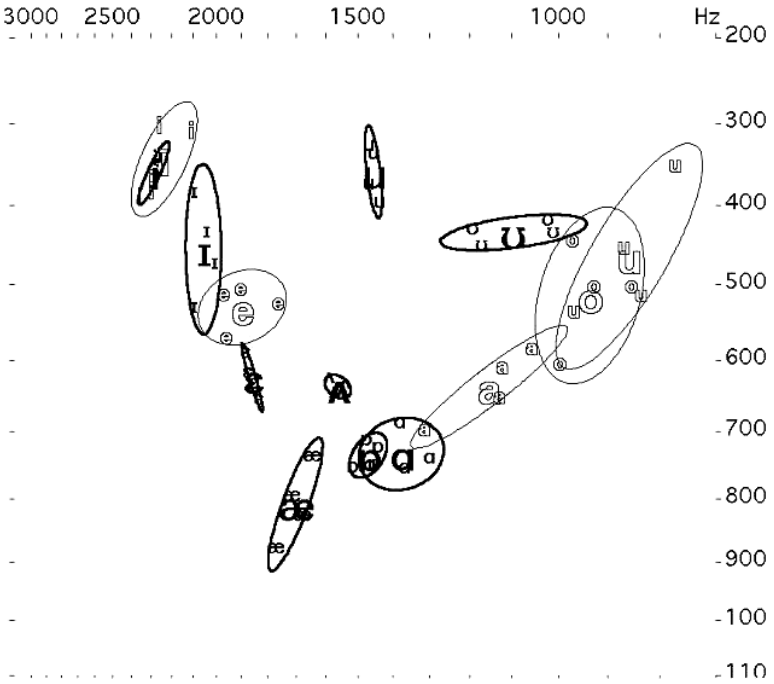


FIGURE 16. Hawaiian short monophthongs vs. English monophthongs for B. Hawaiian short monophthongs in light line ellipses and white font. English monophthongs in thick line ellipses and bold font.



In conclusion, B is aware of most differences between her native monophthongs and Hawaiian monophthongs.

At this point, I would like to suggest an explanation for B's choice of specific targets in Hawaiian. I hypothesize that whenever her native inventory lacks a Hawaiian monophthong, but offers one or more lax sounds as the closest targets (for instance: English does not have tense /e/ as a monophthong, but it has lax /ɛ/ and lax /ɪ/), she takes one sound (or the area between such sounds) as a starting point and tries to make it tenser. Thus, she takes a monophthong between lax /ɛ/ and lax /ɪ/ and tries to make it tenser in order to produce tense /e/. It is true that her /e/ does not look tenser, i.e., more peripheral than her English /ɛ/ and /ɪ/. I believe that she simply tries to do this, regardless of her accomplishment. This strategy is the same one that I adopt when speaking English. As a native speaker of Italian, I have the phonemes /e/ and /i/ in my inventory, but not /ɪ/. Therefore, when trying to produce this English sound, I consciously aim for a spot between my native /e/ and /i/ and try to make it tenser.

Let us now look at diphthongs. Once again, I shall start from Hawaiian, then look at English, next compare Hawaiian vs. English diphthongs, and finally draw some conclusions. Figures showing overlays of two charts are not included in this section.

5.1.6 HAWAIIAN DIPHTHONGS. Figure 17 illustrates the production of Hawaiian diphthongs by A. Figure 18 show the realization of the same diphthongs by B. In these figures, I use the symbol [ʌ] for the first portion of /ai/ and /au/, and [a] for the first portion of /ae/ and /ao/, for clarity. The comparison between Figures 17 and 18 shows the following.

Generally speaking, the beginning and end targets for A show less variation than B's (with the exception of /a/): this reflects what was observed for A's general small areas in her production of the Hawaiian monophthongs and B's wider areas for the same sounds.

A few diphthongs stand out and I will discuss them here. B's starting point for diphthongs /ai/ and /ae/ are overlapping, contrarily to A; however, for both speakers the starting points for /au/ and /ao/ overlap. I can interpret such observations as follows: A has two distinct starting points for diphthongs /ai/ and /ae/, but not for /au/ and /ao/. B, though, does not have such difference and patterns both beginning points in the same area.

Moreover, B's beginning and end points generally tend to fall into different positions with respect to A's: see, for instance, the end points of the diphthongs /au/ (labeled [ʌʊ]) and /ao/. In such cases, B's [ʌʊ] follows the same trajectory as for /ao/, whereas A's same diphthongs go in different directions). Therefore B might not keep these two diphthongs as separate as A seems to.

FIGURE 17. Hawaiian diphthongs for A.

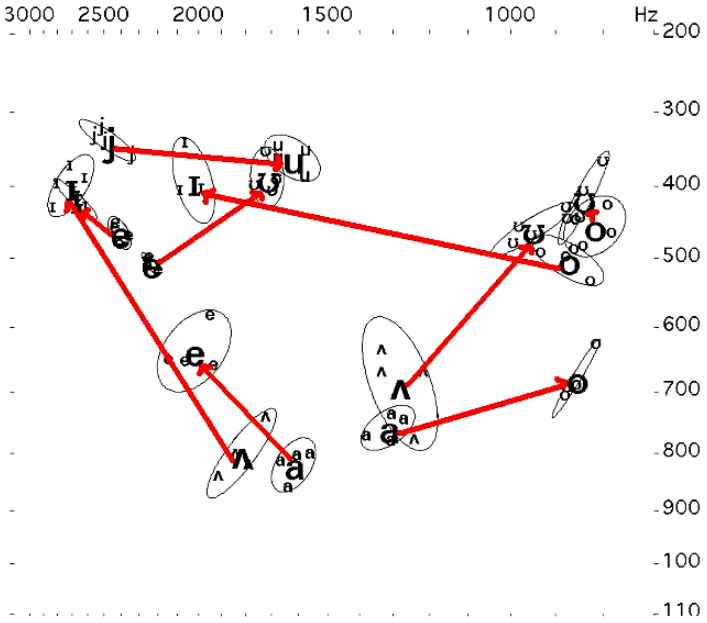
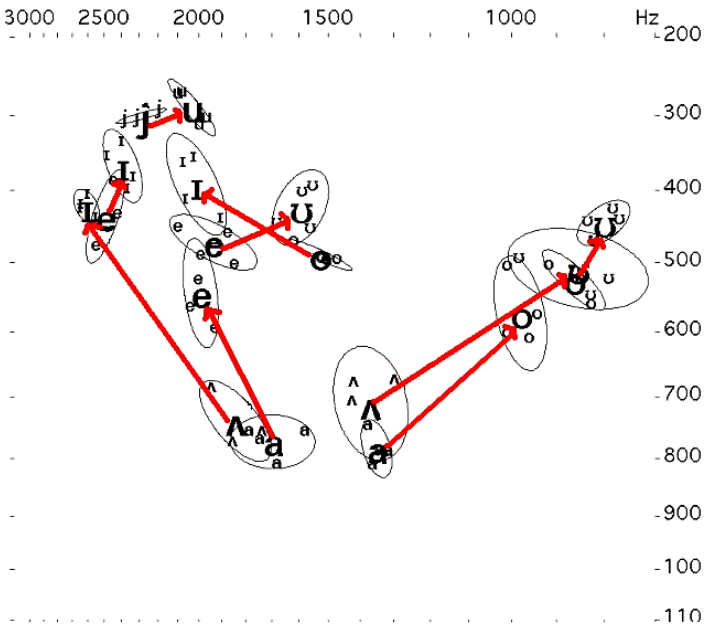


FIGURE 18. Hawaiian diphthongs for B.



5.1.7 ENGLISH DIPHTHONGS. Figures 19 and 20 show the production of English diphthongs respectively by A and B. In these figures, I use the symbol [j] for the first portion of /yu/. The comparison between such charts shows the following.

Generally speaking, both A and B tend to produce small target areas for all diphthongs, with the exception of the end point for A's /oʊ/ and the beginning point for A's /ɔɪ/. The beginning points of /aɪ/ and /aʊ/ are kept distinct by both A and B, but B produces them well

apart from one another, whereas A produces them in a very central and low position and close to each other. This results in the fact that the diphthongs' movements for B are in height only, whereas the movements for A are in both height and backness.

FIGURE 19. English diphthongs for A.

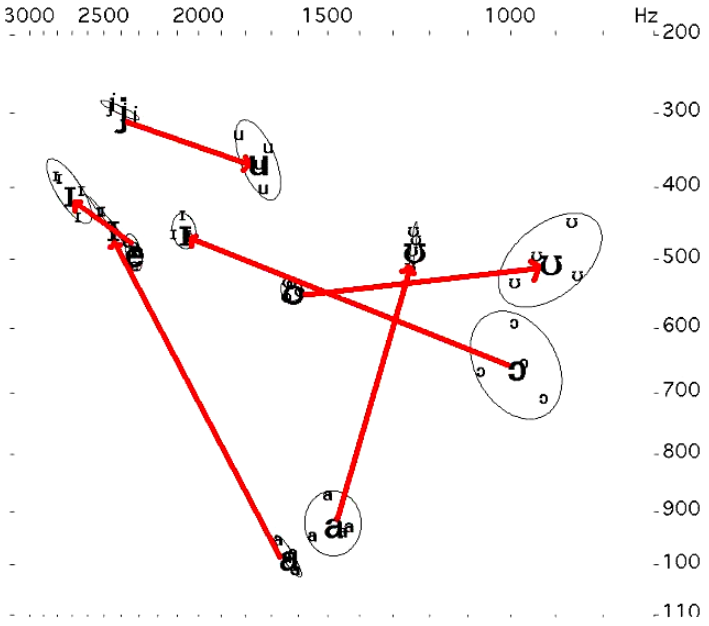
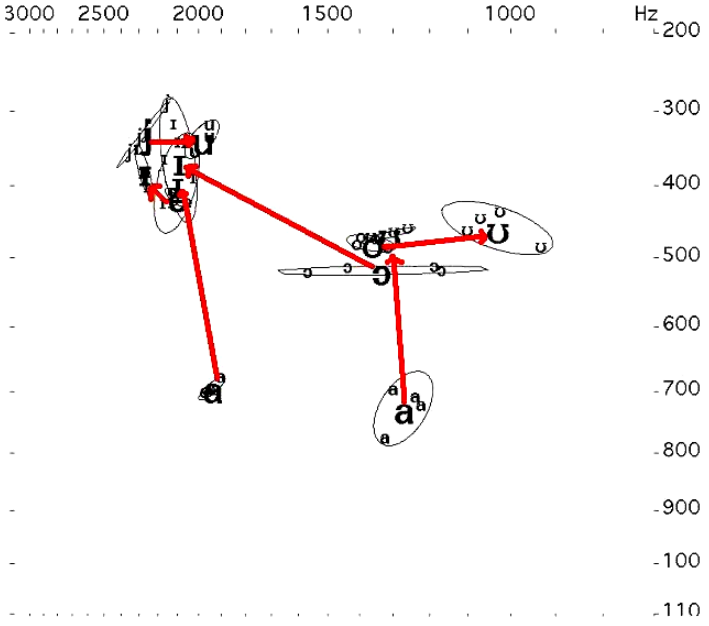


FIGURE 20. English diphthongs for B.



5.1.8 HAWAIIAN DIPHTHONGS VS. ENGLISH DIPHTHONGS. Figures 21 and 22 illustrate B's production of selected diphthongs: such diphthongs are either shared by both languages

or are Hawaiian diphthongs that are so similar to diphthongs in English that they tend to create confusion in her production of Hawaiian. I will not show comparable figures for A, because the scope of the present study is to document two Hawaiian dialects and the possible carryover of B's first language (English) phonology to Hawaiian. Therefore, it is useful to look at what B's production of Hawaiian looks like, and whether English may influence it. In contrast, A's native production of Hawaiian should not be influenced by English.

The comparison of Figures 21 and 22 (and the previous Figures showing A's production of Hawaiian and English diphthongs) shows the following.

B's Hawaiian /oi/ is clearly patterned on her English /ɔɪ/. If I look at the realization of /oi/ by A, I can see how far the beginning target of this diphthong is from the beginning of the same diphthong produced by B. A's beginning target is very peripheral and positioned in the back of the vowel space, whereas B's beginning target is very central and extremely close to the area formed by the beginning target of her English /ɔɪ/. The end targets of B's /oi/ and /ɔɪ/ overlap.

B's Hawaiian /ou/ is much more peripheral (back) than her English /oʊ/. This may indicate that she perceives a difference in the position of this diphthong in Hawaiian and English. A's realization of such diphthong partly corroborates B's production. In fact, her Hawaiian /ou/ is articulated at the very right side of the vowel space. Note also that A understands the difference in the production of this diphthong in the two languages as well, since she positions her English /oʊ/ similarly to B's English /oʊ/, with the beginning target in a very central position and the diphthong being produced to the back side to the end target.

FIGURE 21. Selected Hawaiian diphthongs for B.
Additional IPA symbols used: [ɪ] and [j] for /i/, and [ʊ] for /u/.

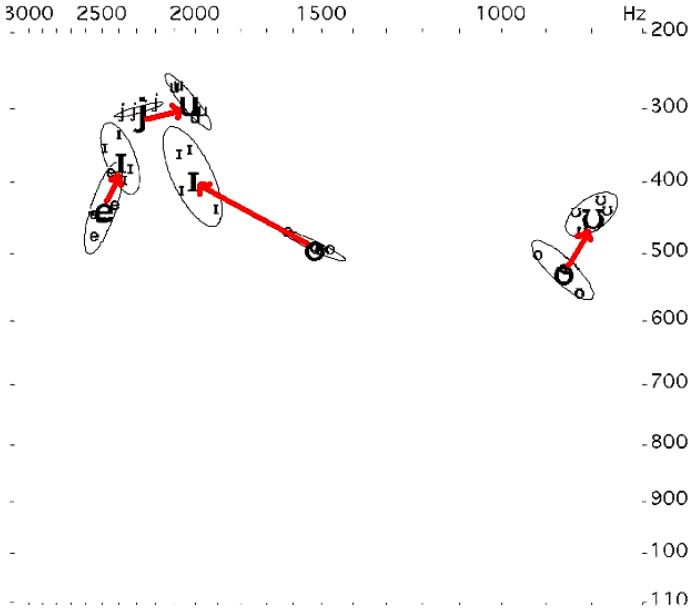
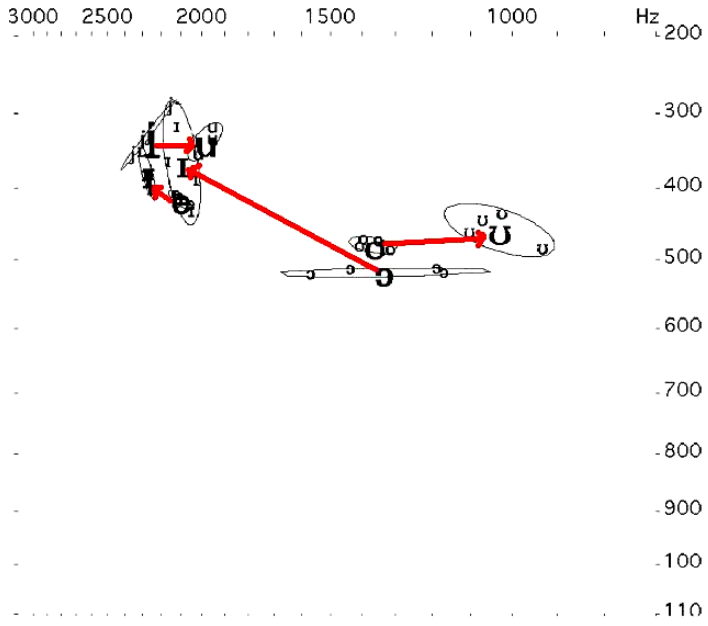


FIGURE 22. Selected English diphthongs for B.



In summary, B seems to have more problems in the production of Hawaiian diphthongs than monophthongs. She conflates target points and in some cases shows transfer of English patterns.

6. RESULTS. From the analysis of all the data above, we learn that A's realization of Hawaiian differs from B's in certain respects. B's monophthongs tend to form larger areas and her back short monophthongs tend to overlap. A few of B's diphthongs are patterned differently from A's. B's pronunciation in general does not match A's, due arguably to the influence of American English. The divergence of B's production of Hawaiian seems to be particularly heavy for diphthongs.

7. CONCLUSION. The data are few and the number of speakers extremely limited; consequently, the results are limited. Therefore, further study with a larger number of speakers is needed. However, on the basis of the phonetic data found in the present study, it is possible to show the vowel systems of two varieties of Hawaiian: the Ni'ihau dialect and the UH dialect. The following phonetic charts illustrate schematically the differences between the two speakers of the different dialects of Hawaiian.

TABLE 4. Phonetic chart of Ni‘ihauan Hawaiian short monophthongs.

high	i		u
mid	e	o	
low		a	

TABLE 5. Phonetic Chart of UH Hawaiian short monophthongs.

high	i		u~o
mid	ɪ~e~ɛ	o~u	
low		a~ɑ	

TABLE 6. Phonetic chart of Ni‘ihauan Hawaiian long monophthongs.

high	iː		uː
mid	eː	oː	
low		aː	

TABLE 7. Phonetic chart of UH Hawaiian long monophthongs.

high	iː		uː
mid	eː	oː	
low		aː	

FIGURE 23. Phonetic chart of Ni‘ihauan Hawaiian diphthongs.

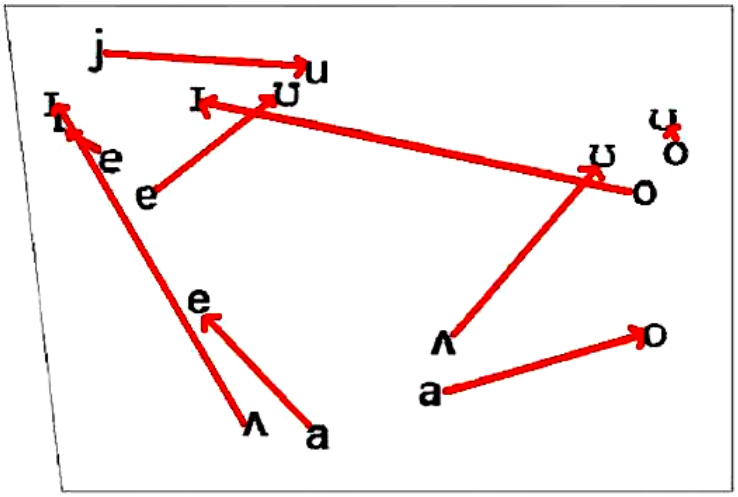
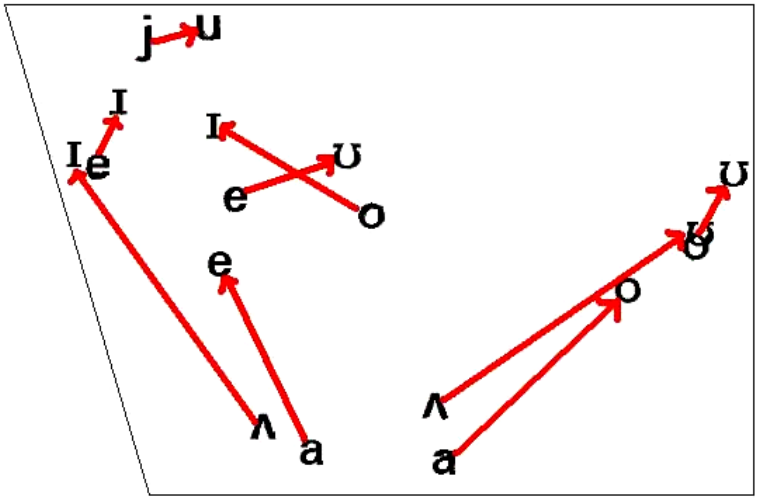


FIGURE 24. Phonetic chart of UH Hawaiian diphthongs.



The two varieties of Hawaiian have followed different paths. Ni‘ihauan Hawaiian has not been significantly influenced by American English in phonetic terms. UH Hawaiian, instead, has been, as illustrated by the results of the present study.

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