Meron o Mayroon: An Exploratory Study on Hiligaynon and Tagalog "Diphthongs"

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ABSTRACT
The vocoid sequences /aj/, /uj/, /aw/, and /iw/ are observed to be widely present in most Philippine-type languages and is considered by most historical linguists, like Blust and Ross, as diphthongs. They, however, behave rather differently from the common diphthongs as they do not behave as a unit but as two separate entities. The paper sides with Clynes' proposition and argues against the analysis of these vocoid sequences as diphthongs. Departing from his study, the phonetic and phonological nature of these sequences are explored by plotting and analyzing the changes in formant frequencies of data from two specific Philippine-type languages, Tagalog and Hiligaynon.

General Terms
Languages, Documentation

Keywords
Diphthongs, Acoustic Phonetics, Hiligaynon, Tagalog

1. INTRODUCTION
The problem of deciding what counts as a diphthong is an ongoing debate among linguistic communities. This is because of the behavior of the said component. Typically, a diphthong has two phonetic units: a vowel and a glide (y or w) but in normal speech, we see both these phonetic units acting as one. The figure below shows the complexity of a sequence with a vowel and a glide (will be called vocoid sequences from here on). Their behavior is very different from other phonetic units like stops (see Figure 7) in that these units are easily isolatable.

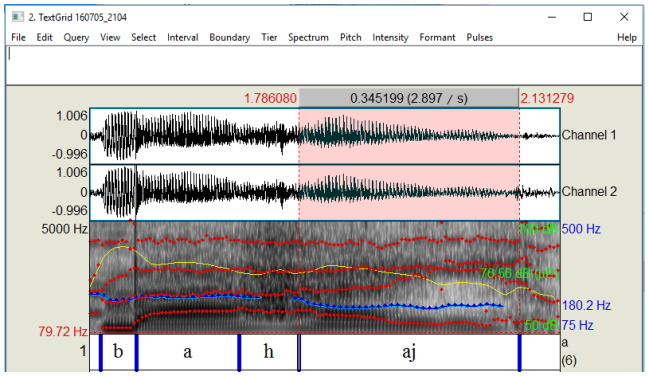

Figure 1. Phonetic behavior of vowel and glide

Diphthongs in Philippine-type languages are analyzed in relation to its role in the reconstruction of Proto-Austronesian phonetic inventory. The vocoid sequences /aj/, /aw/, /uj/, and /iw/, for example, were reconstructed as diphthongs. Clynes (1997), however, argues that they should be analyzed as sequences of two independently reconstructed phonemes, a vowel followed by consonant. He further elaborates this by giving synchronic and diachronic evidence. Firstly, he discussed the difference in the syllabification of English *my* and Tagalog *may* (both pronounced as /maj/). In *my*, the sequence /aj/ is both the nucleus of the syllable. In *may*, the sequence /aj/ are separated, wherein a is the syllable's nucleus and j the syllable's coda (See Figure 1.a). As such, he says that there is a substantial difference between both sequences, concluding that Tagalog's /aj/ is not a diphthong.

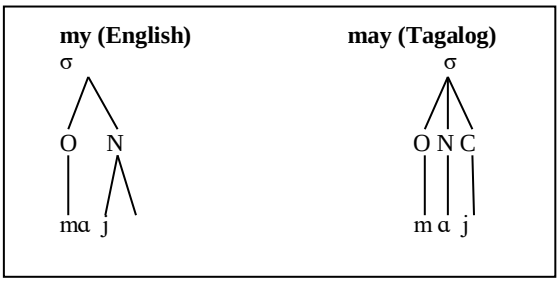

Figure 2. Syllabification of my and may

Secondly, verb root affixation in Tagalog shows that words ending in /aj/ has a vowel-consonant structure. Therefore, /w/ and /j/ whose phonetic characteristics are glides behave as consonants in the language because of its phonemic system. *Gawa* becomes *gawin* while *bukas* becomes *buksan* and *lagay* becomes *lagyan* (Clynes, 1997).

We can also see this behavior in certain words which undergo reduplication. The morpheme added to the reduplicated word depends on the final phoneme and in the case of bahay-bahayan, the behavior of /j/ is similar to that of consonants than vowels.

1. Vowels:	hila	hila-hilahan
2. Consonants:	habol	habol-habolan
3. Semi-vowels:	bahay	bahay-bahayan

Lastly, he used diachronic or historical evidence where the earlier reconstructed form of the word was CVCV and later changed to CVC. Since Austronesian languages (Philippine-type languages included) tend to follow a regular pattern, we can therefore say that the last syllable of vocoid sequences behave more like consonants than vowel.

There is, therefore, a need to further reanalyze our conception of the vocoid sequences (/aj/, /uj/, /aw/, and /iw/). How should we define diphthongs? Do we have diphthongs in Philippine

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languages and how does the affixation in the reduplication of words characterize the vocoid sequences above?

Miret (1998) argues that the prominence of the definition of English diphthong, wherein the sequence /aj/ functions as one unit, pushes other vocoid sequences out of the category. The study, on the other hand, will focus on the acoustic description of the sequences and how that could shed some light on the definition and categorization of /aj/, /aw/, /iw/ and /uj/.

2. ACOUSTIC DESCRIPTION OF VOCOID-VOCOID SEQUENCE

Although /aj/, /aw/, /uj/ and /iw/'s morphophonemic processes show that they behave as consonant, its acoustic description shows likewise. Both /j/ and /w/ falls under the category semi-vowel and have the same acoustic characteristics as that of a vowel, in terms of its sonority, height, frontness, backness, and duration.

Traditionally, diphthongs are described as tautosyllabic with maximal differentiation between the members. This means that both vocoid units must be in the same syllable and must be distinct by having a wider vowel space. According to Stampe's theory of diphthongization, an optimal diphthong must be on opposite ends of vowel space (difference in height or frontness and backness) for easier perception (Miret, 1998). This explains the phenomenon in Tagalog where:

kaʔɪʔlan→kajlan→kɛlan

In slow, careful speech, Tagalog speakers use the first part while ordinary and casual speech uses the second and third, respectively. This shows the differences speakers tend to make to differentiate two vowels and agrees with Face & Alvord's recent study, which says acoustic nature is an important factor in the perception of diphthong against hiatus contrast in Spanish-speaking listeners (Face & Alvord, 2004). The study, however, specified the importance of the duration of the sequence in perceiving it.

In discussing the syllabification of diphthongs, the tendency is to find a nucleus whose element has the highest degree of sonority (Miret, 1998). The phonetic unit /a/, for example, very easily pairs with /j/ or /w/ since it is the most sonorous of all the vowels. This is also the reason why these two sequences are the most common type of sequences. Units /e/ and /o/ on the other hand, are allophonic variations of the /i/ and /u/ in Philippine-type languages and affects the changes in the formants of the vocoid sequences.

3. VOWEL SPACE

In a previous study (Manzano &Sadural, 2015), Hiligaynon and Tagalog vowels were mapped. This is essential to this study as it will give us the location of the first unit (which is a vowel) and the final unit (glide) and the location of the behavior of the sequence.

3.1 Hiligaynon

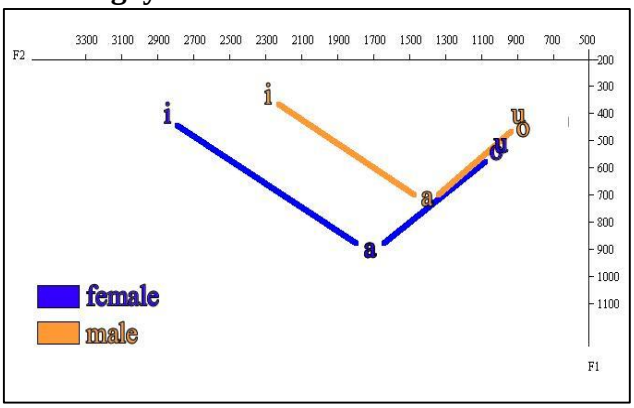

Figure 3. Hiligaynon Vowel Space

In Figure 1, the difference between the three vowels (a, i and u) in Hiligaynon are evident. The vowels o and u, however, overlaps with each other, leading to the conclusion that these two vowels do not have a phonetic distinction. This also seems to be the case for the male counterpart. There are one to two outliers that overlap with vowel a. The majority of instances, however, are overlaps between o and u means. The vowel i, on the other hand, is at the farther end of the figure which clearly distinguishes it from the other three vowels.

There is enough evidence to prove allophonic variation of vowels *o* and *u* in Hiligaynon, but a description of the environment to which such variation occurs calls for another study.

Overall, the female's vowel space is bigger than the male's, but the female's tongue height in all vowels are lower.

3.2 Tagalog

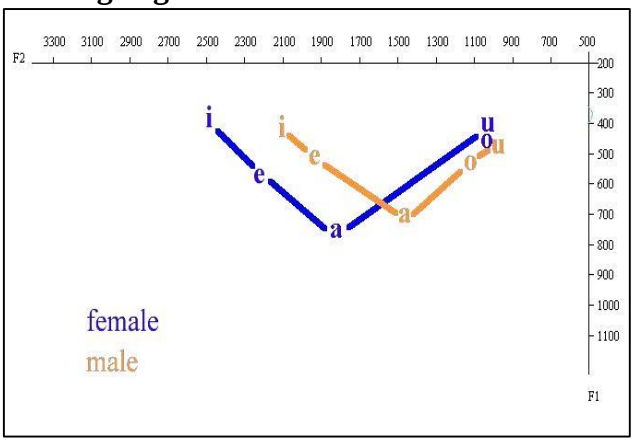

Figure 4. Tagalog Vowel Space

In comparison to Hiligaynon, the vowel means for both Tagalog speakers are distinct from each other. As seen in Figure 2, both Tagalog male and female vowel spacing are in the same tongue forward/backness range. The female's tongue height, however, is lower than that of the male. Occurrences of /e/ in Tagalog are usually found in borrowed words, while the /o/ sounds in Hiligaynon are usually found in Tagalog-borrowed words.

While there is no doubt that educated Manila Tagalog now has five vowel phonemes, the lack of phonemic distinction between /i/ and /e/, and between /u/ and /o/ is still apparent. There are still many instances of interchangeability between these pairs of phonemes (Schachter&Otanes, 1983), perhaps due to the closeness of the phonemes in the vowel chart, but also because the speakers fit the borrowed words into a closer vowel registry to keep up with the rest of the language.

It was also noted that the study supports the claim that in most cases, /u/ and /o/ sounds represent the same vowel (Bolton & Butler, 2009), and spelling convention places <o> in the final syllable of a word and <u> elsewhere, as noticed in Hiligaynon (McFarland, 2009).

3.3 English

The vowel map of male and female English speakers was taken from the study of Peterson and Barney (Hillenbrand, Getty, Clark, & Wheeler, 1995).

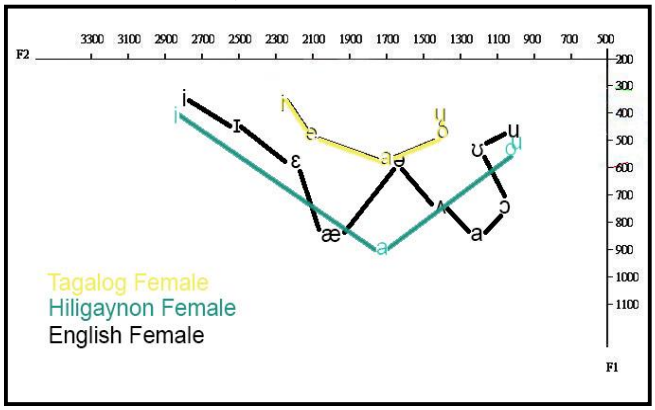

Figure 5. Vowel Chart Comparison (Female)

Comparing all three languages, Figure 8 shows that Hiligaynon's three-vowel system (a, i and u) are almost the same as that of English's lowest a, highest /i/ and highest /u/, while Tagalog exhibits a smaller vowel space. Tagalog's a sound is situated in English's highest a /ə/, or also known as the English schwa.

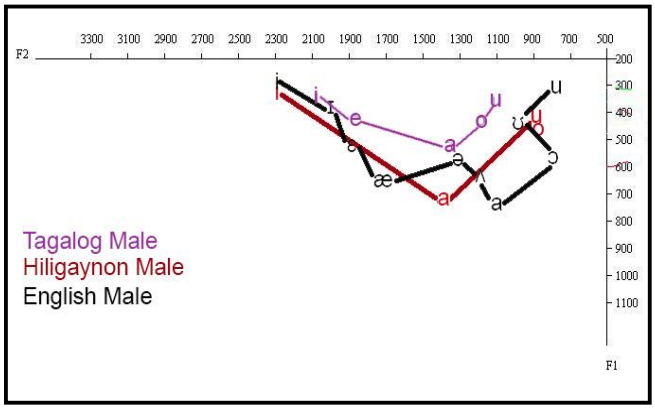

Figure 6. Vowel Chart Comparison (Male)

As with its female counterpart, Tagalog male's vowel space is tighter, and its a sound is still close to the English schwa /ə/. Hiligaynon's u sound, however, is situated at the English's lower u sounds /ʊ/. In terms of tongue height, however, the males' range is around the same area, compared to the females'.

In conclusion, our languages, with the need to keep up to fill the gaps in our vocabulary, became productive and borrowed from the English language (McFarland, 2009). It seems that, however, the phonotactics of the Philippine languages, as evidenced by Tagalog and Hiligaynon speakers, takes precedence over the English conventions.

It was also noted that the study supports the claim that in most cases, /u/ and /o/ sounds represent the same vowel (Bolton & Butler, 2009), and spelling convention places <o> in the final syllable of a word and <u> elsewhere, as noticed in Hiligaynon (McFarland, 2009).

4. DIPHTHONGS IN SPEECH AND LANGUAGE PROCESSING

Diphthongs are shown to correlate with longer duration and varying format trajectories, in contrast to monophthongs. (Yang, 2010) While much research has been conducted on the acoustic characteristics of diphthongs, studies that specifically describe classification experiments are rare. It is also of note that most studies are centered on the English language.

Overall, speech recognition applications are reliant on the successful description and modeling of each vocal tract element. For example, classification of diphthongs, as part of a distinctive feature-based speech recognition system, produced a balanced error rate of 17.8% for 2-way diphthong classification on the TIMIT database. (Lee & Choi, 2013) This study also obtained error rates of 32.9%, 29.9%, and 20.2% for /aw/, /aj/, and /oj/ 4-way classifications.

5. THE STUDY

The study aims to phonetically and phonologically describe the /aj/, /aw/ and /oj/ vocoid sequences in two specific Philippine-type languages, Tagalog and Hiligaynon. These vocoid sequences are widely accepted as diphthongs in the Philippines. For comparison, the study also analyzes /ja/, /wa/ and /jo/ vocoid sequences. Due to the limited data, the researchers are unable to analyze the /iw/ and /uj/ vocoid sequences, but did add some special tri-vowel sequences found in words *niya*, and other like sequences.

In this light, the study is exploratory in nature, given its small data set. The authors would like to first scrutinize the issue of whether diphthongs exist at all. This paper that started with the question, "Are the vocoid sequences in Philippine-type languages really diphthongs?" It is submitted as a requirement to the authors' Phonology master class, taught by Prof. Ricardo Nolasco. It is of note that this study is a first in a series, given the authors' intention of furthering the research.

5.1 Methodology

Four sets of recordings are used for the study, most of which are spontaneous utterances from the speakers. These recordings are mined from Prof. Nolasco's personal database.

The speakers for the Hiligaynon recording set are Mr. ErinMartir and Ms. Tel Chu Santos. Mr. Edwin Notales and Ms. Sarah Nobato, both undergraduate students at the time, are the speakers for the Tagalog recording set. They are aged 19 and 20, respectively.

Both Hiligaynon and Tagalog male and female speakers are asked to describe the "Pear Story", a 6-minute silent film made at the University of California at Berkeley in 1975, in their own words. Due to the limited "diphthongs" uttered in the Hiligaynon Pear Story set, additional word lists were acquired by the authors to augment the study. Each recording was about 2 to 4 minutes long with only specific instances of vocoid sequences extracted for the study.

These four sets of recordings for male and female speakers in each language were rendered using Praat. Out of an average of 200 different phonological environments, an average of 10 instances per vocoid sequence was extracted, totaling to 71 vocoid sequences. Each sequence's first (F1) and second formant (F2) frequencies were recorded per language, totaling to 284 format frequencies. These formant frequencies were then plotted using the program JPlot Formants. The mean of each vowel's formant frequencies were then plotted and compared from each other.

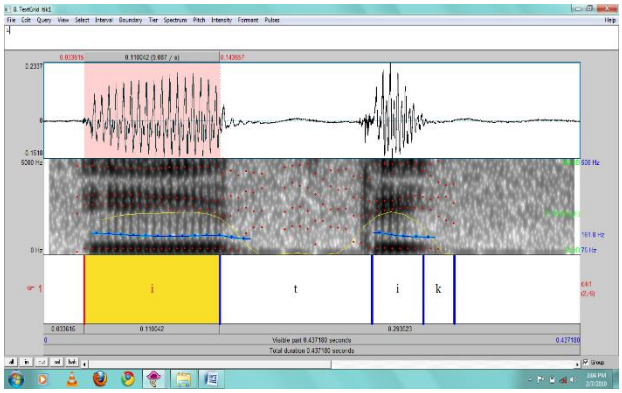

Figure 7. Annotation of the word '*i.tik*'duck' through PraatTextGrid

The study is limited to /aj/, /aw/, /ja/ and /wa/ vocoid sequences used in Tagalog and Hiligaynon. /ja/ and /wa/ are both used as control sets in order to see how different the supposed diphthongs are from other sequences phonetically and phonologically. Some tri-vowel sequences are included for comparison. In the current data set, /oj/ and /jo/ sequences are found only in the Hiligaynon data set, but are both included in the analysis for further study. The phonological environments considered in the study were before and after stops, fricatives, laterals, nasals and taps. Some words were also omitted because of problems with sound clarity and its corresponding consequences to the mapping of formant frequencies.

6. RESULTS AND DISCUSSION

Using the aforementioned method, the differences in the tongue height (F1) and the tongue backness or forwardness (F2) for each language vocoid sequence are distinguished below.

6.1 Hiligaynon

Hiligaynon is spoken in the central Philippines and is the lingua franca for much of the western Visayas. It is noted that no consonant cluster occur in syllable initial position in native Hiligaynon words (Wolfenden, 1971).

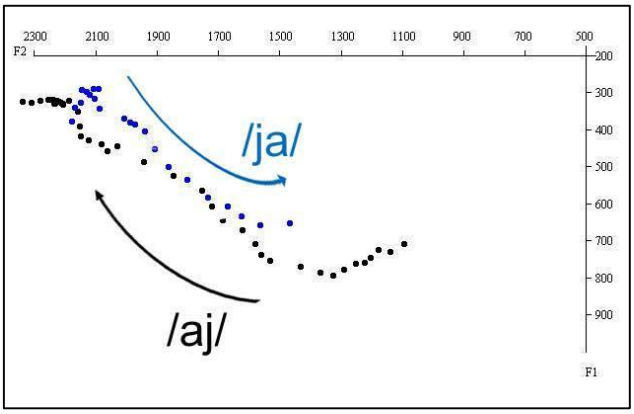

Figure 8. Hiligaynon Male /aj/ and /ja/

In Figure 3, the formants of Hiligaynon male /aj/ and /ja/ vocoid sequences are evidently almost the same, with tongue height being the only factor different. However, both are not on the opposite sides of its vowel space. It, rather, curves along from its initial sound and glides upward (in the case of /aj/ to the /i/ sound level.

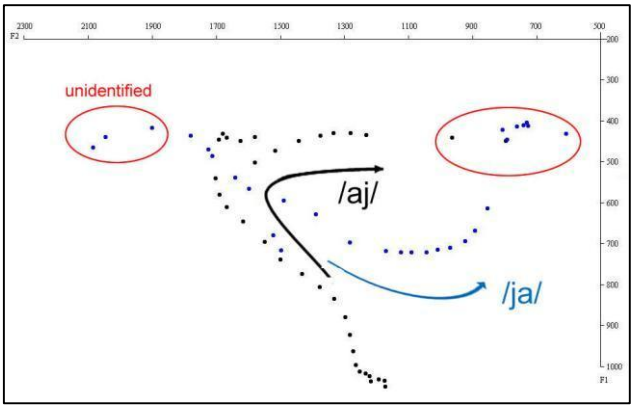

Figure 9. Hiligaynon Female /aj/ and /ja/

The Hiligaynon female's /aj/ and /ja/ are remarkably different from its male counterpart, with /aj/ following almost the same path as its male counterpart. The /ja/ sequence, however, crosses and curves from one side to the other, thus ending in a /u/

position. The initial and end sound of /j/ in both /aj/ and /ja/ are notably of the same tongue height. Some unidentified spots are noted, and further study is needed to see what caused them.

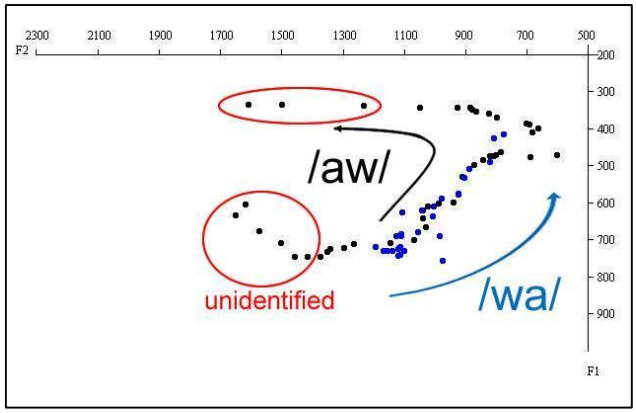

Figure 10. Hiligaynon Male /aw/ and /wa/

As for Hiligaynon Male /aw/ and /wa/ sequences, Figure 5 showcases the formants for both sequences curving back towards the middle, pertaining to the unique rounding quality of the /ʊ/ sound. For the /aw/ sequence, albeit the initial sound being high, the formants curved down then up towards the /u/ sound, rounding up to the /ʊ/ sound. The same cannot be completely said of the /wa/ sound, but a certain type of roundedness is evident.

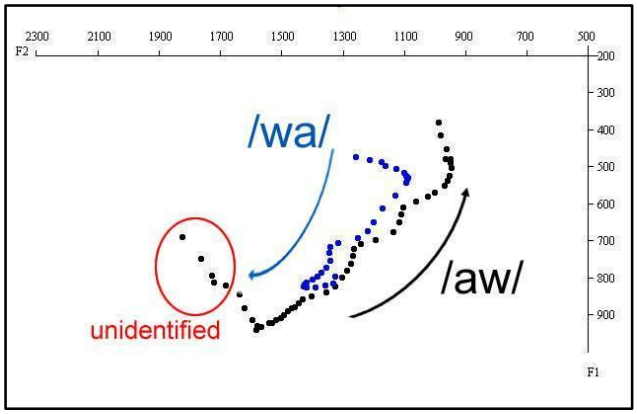

Figure 11. Hiligaynon Female /aw/ and /wa/

One can also see the roundness of the /ʊ/ sound due to the /w/ sound in Figure 6. In /wa/ sound, however, the initial sound starts particularly high, then curving to /u/ sound around the same tongue height of its initial sound. The /aw/ sound is reminiscent of those in its male counterpart.

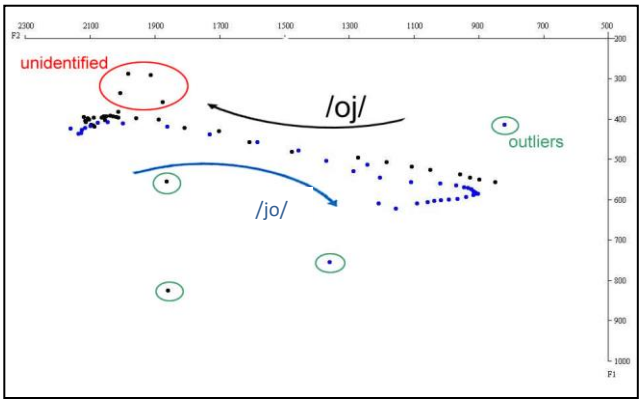

Figure 12. Hiligaynon female /oj/ and /jo/

The /oj/ and /jo/ sequence is only found in the Hiligaynon female data set. In Figure 7, the two sequences mirror each other, with /oj/ initial sound ending around /jo/ ending sound, and vice versa.

6.2 Tagalog

Tagalog is perhaps the best known Philippine language, with it being one of the two largest Philippine languages along with Cebuano (Himmelmann, 2005). It is also the one that has been studied most intensively and that has had the greatest influence in linguistics.

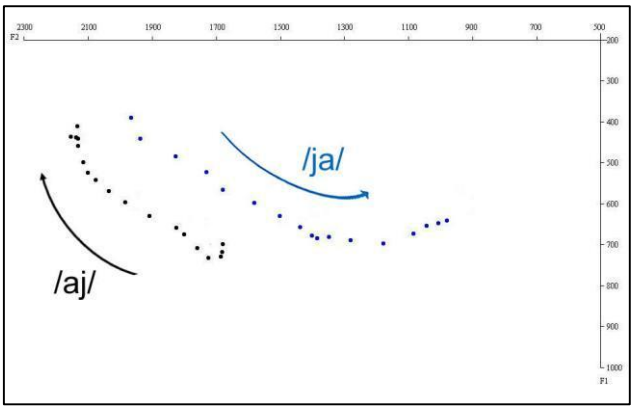

Figure 1 Tagalog Male /aj/ and /ja/

In Figure 8, the Tagalog Male /aj/ and /ja/ are relatively alike, with /aj/ having a smaller vowel space. As with Hiligaynon, the initial sound for/ja/ is around the same height as that of /aj/'s ending sound.

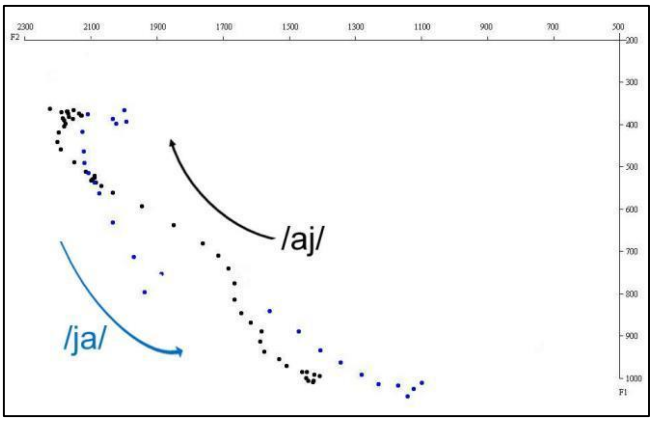

Figure 2 Tagalog Female /aj/ and /ja/

For Tagalog Female /aj/ and /ja/, the two sequences are also alike, with no apparent distinction of its vowel space. Both are also relatively in the high front position of the tongue.

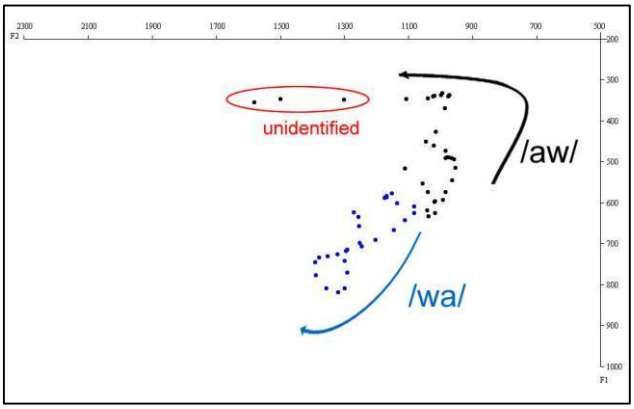

Figure 3 Tagalog Male /aw/ and /wa/

As for the Tagalog /aw/ and /wa/ sequences, the male sounds are mirroring each other, with /wa/ having a higher tongue height than that of /aw/. The roundedness of the /w/ glide is still evident.

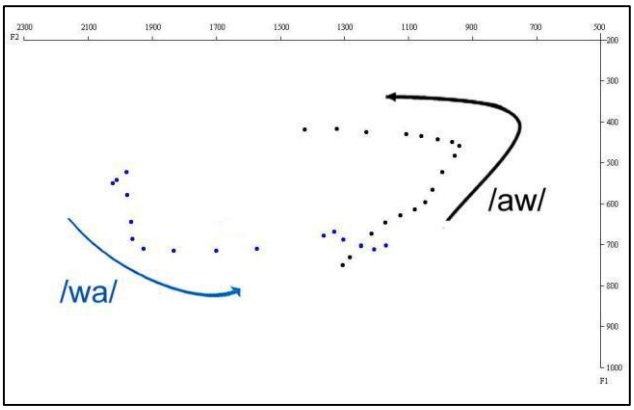

Figure 4 Tagalog Female /aw/ and /wa/

As with Hiligaynon, Figure 11 showcases a mirror of the two sequences, with their /a/ sounds overlapping at some point.

6.3 Summary of Phonetic Description and Evidence

Following Stampe's theory of diphthongization, an optimal diphthong must be on opposite ends of vowel space (Miret, 1998). In this case, the vocoid sequence is /aj/ or its counterpart /ja/ is not on the opposite ends of the vowel space, but rather, for /aj/, starts at the /a/ sound and curves up to the /i/ sound. While it is hard to differentiate the /a/ sound to the /i/ sound in the /aj/ vocoid sequence, it is relatively easy for a native speaker to segment them when a suffix is added. Therefore, in comparing and contrasting /aj/, /uj/, /aw/, and /iw/ to their mirror sequence /ja/, /ju/, /wa/, and /wi/, no particular phonetic difference can be seen. The movements of both sequences are similar and therefore how they are articulated in the mouth of the native speaker is also similar. Interestingly, linguists analyze /aj/, /uj/, /aw/, and /iw/ as diphthongs and not their counterpart even though there's no phonetic difference between both sequences. This can be taken both ways: we include their counterpart in the diphthong inventory of the language or we exclude both of them. Before deciding this, the phonetic description should be cross-referenced with the phonological data as systematic differences in languages occur because of the differences in a speaker's mental representation of the sound inventory.

Miret (1998) elaborated this by discussing opposing views on diphthongs. Different linguistic literatures have different criterion by which vowel + glide sequence can be categorized. Some linguists would argue that a "true" diphthong would have falling prosody and "false" diphthong would have rising prosody (See Table 1). Sequences /aj/, /uj/, /aw/, and /iw/ are falling diphthongs in that we see how the vowel moves to the glide while /ja/ and /wa/ moves opposite. This can be seen in the plotted formants of diphthongs (rising and falling depend on the tongue height and frontness and backness of the vowel and glide; See discussion above). Miret, however, concludes, that the criterion discusses only the prototypical diphthong and further states that other sequences can still be considered diphthong. Considering the phonetic qualities of diphthongs and vocoids sequences then gives us the physical characteristics of the vowels and glides but not the full extent of the structure and how it is applied to languages. We agree to an extent to Miret's conclusion in that we see the similarities in the phonetic qualities of the rising and falling diphthongs and that there's no perceptual difference between the two. However, phonemic evidence supplies a greater weight in considering the unity of the vocoid sequences.

Table 1. Classifications of "true" and "false" diphthong (Miret, 1998)

Author	Criterion	True Diphthong	False Diphthong
Sievers	Auditory impression	Unity [aj, ej, aʊ]	Sequence [iə, uə]
Jespersen	Tradition	Falling	Rising
Donogan	Prosody	Falling	Rising
Marotta	Syllabic structure	Branching nuclei	Onset+nucleus, Nucleus+coda
Dutch diphthongs	Phonotactics	VV	VC
Lehiste and Peterson	acoustics	Dipthongs [aj, aʊ. əj]	Glides [ej, oʊ,ɘ]

In both Tagalog and Hiligaynon, it can be argued that glides /j/ and /w/ work as both semi-vowel and semi-consonant depending on the need of the language to fulfill its syllable type. For this language, the most common syllable types are CV and CVC, indicating the lack of vowel initial syllables (Himmelmann, 2005). The /j/ and /w/ sounds as semi-consonant is evident when suffixes are added to words ending in vocoid sequences, such *bahay* to *bahayan*, with the /a/ sound serving as the coda and /j/as the onset. Once the vocoid sequence such as /aj/ is at the end of the word, it cannot be stated that /a/ in /aj/ becomes the nucleus as the word glides through, /j/ having a semi-vowel characteristics. This means it has sonority and has no obstruction of air when it comes to producing such a sound (Paz, Hernandez and Peneyra, 2010).

6.4 Summary of Phonological Evidence

The system of the language accounts for the differences in structure and how the meaning changes based on the said structure. The physical characteristics of sound, then, are not enough to conclude whether or not the vocoid sequences can be analyzed as diphthongs or not.

Phonemes differ per language as they constitute the systematic difference between each sound and how such difference translates to meaning differences. For example, there are 10 distinct, phonemic vowels in English which if given specific environments have different meanings (see figure three.

Let's take for example the /i/ and /ɪ/. The meaning changes if you put it in the phonetic environment /b/ + /vowel/ +/ʧ/. Therefore, /biʧ/ would mean beach as in the place with sand at an edge of the sea while /bɪʧ/ would mean a female dog. Therefore, the systematic differences of languages accounts for their meaning-making differences.

As discussed earlier, vocoid sequence in Tagalog can be omitted depending on the type of speech. In normal, everyday conversation, we would normally use a *meron* while in formal situations like written works (tula, dula, etc.), a speaker would use a *mayroon* instead. The /e/ and /aj/ interchanges without any particular difference with the meaning. This can also be seen in the words /kaʔɪʔlan/, /kajlan/, and /kɛlan/. The speakers will say that any of the above could mean when.

However, this is not the case in English. /bɛjl/ (bail) is different from /bajl/ (bile) and from /bɛl/ (bell). A difference in the height of tongue, the forwardness and backness of articulation, the laxness or tenseness of the muscle accounts for the difference in meaning. We can, therefore, say that the diphthong /aj/ is a phoneme in English.

But we cannot reach the same conclusion for Tagalog and other Philippine languages. Below is the summary of the characteristics of Tagalog and Hiligaynon's vocoid sequences based on the study and how these fit the criterion established by different linguists.

Table 2. Vocoid sequences from Tagalog and Hiligaynon and characteristics based on Miret's study (1998)

Author	Criterion	Tag and Hil's /aj/, /uj/, /aw/, /iw/	Tag and Hil's /ja/, /ju/, /wa/, /wi/
Sievers	Auditory impression	sequence	sequence
Jespersen	Tradition	falling	rising
Donogan	Prosody	falling	Rising
Marotta	Syllabic structure	Branching nuclei	Branching Nuclei
Dutch diphthongs	Phonotactics	VC	CV
Lehiste and Peterson	Acoustics	glides	glides

As seen in the table above, four out of six criterion tell us that both sequences are not diphthongs. Jespersen and Donogan's criterion falling and rising diphthongs are both based on the structure of English phonetic qualities and do not account for differences in other languages. Evidence, therefore, suggests that /aj/, /uj/, /aw/, /iw/ are not diphthongs and should be treated as separate units.

7. RECOMMENDATION

On the whole, it might be pointed out that while the data obtained in this study have supported Clynes' claim that there are no diphthongs in Philippine languages, there is a need to further expand and explore the other vocoid sequences /iw/ and /uj/, with its /wi/ and /ju/ counterparts. Further studies with a larger phonological environment and higher diphthong instances can be conducted.

A larger scope of the study is also recommended by adding in more free utterances with the /aj/ and /aw/ vocoid sequences. Analyzing other Philippine languages such as Pangasinense and Cebuano is also recommended.

The need to clearly define certain terms are also raised in the process of making this paper, most notably that of the term diphthongs, semi-vowel and semi-consonant. While these terms are taught in college (speech classes, phonology classes) the need for the linguistic community to come up with the appropriate

description for these terms is timely and would entail a deeper study and analysis.

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