

Phonetic Features of a Laminal Vowel in Tarama-Miyako Ryukyuan

Hayato Aoi^{1,2*}

¹Research Institute for Languages and Cultures of Asia and Africa, Japan

²National Institute for Japanese Languages and Linguistics, Japan

Abstract

In this paper, I report phonetic details of a laminal vowel in the Tarama variety of Miyako Ryukyuan. The laminal vowel in Tarama-Miyako Ryukyuan is articulated with not only the back of the tongue but also the blade, i.e., it is a laminal-dorsal vocoid. While such vowels have been reported before, previous cases were allophonic, whereas the Tarama-Miyako Ryukyuan vowel is phonemic. This paper presents both acoustic (spectrographic) and articulatory (palatographic and linguographic) details of this vowel.

Keywords: Tarama-Miyako ryukyuan; Laminal vowel; Phonetic details; Acoustic analysis; Static palatography

Introduction

This paper reports the phonetic details of a laminal vowel in the Tarama variety of Miyako Ryukyuan (henceforth Tarama Ryukyuan). In general, vowel articulation is determined by the position of the back of the tongue (dorsality) and roundness of the lips (labiality). However, a laminal vowel is articulated with not only the back of the tongue but also the blade, thereby constituting a laminal-dorsal vocoid [1]. Laver commented (1:319) that laminal-dorsal vocoid segments are relatively rare in the languages of the world and gave examples of a few languages having them, such as Mandarin Chinese and Swedish. In all four cases that he illustrated, however, the segment's phonological status is allophonic, not phonemic. In contrast, the laminal vowel in Tarama Ryukyuan is a phoneme, that can occur following all consonants but /d/ and /h/, e.g., pidar 'left', kiiru 'yellow', miiji 'right (direction)' [2].

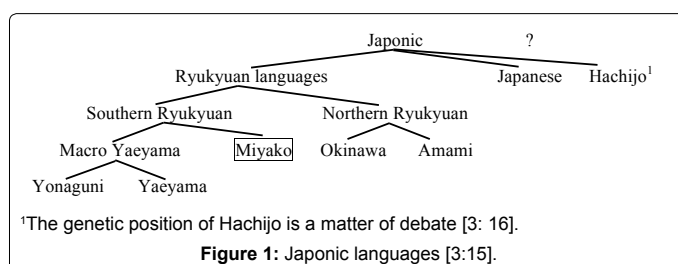
This short paper is organized as follows. Tarama Ryukyuan is briefly introduced in Section 2. Section 3 describes the methods employed. Sections 4 and 5 present the results of my field phonetic research: The acoustic-auditory details of the vowel are presented in Section 4 and its articulatory details in Section 5. The last section summarizes and concludes the paper.

Tarama Ryukyuan

Tarama Ryukyuan is spoken on Tarama Island, which is located between Miyako Island and Ishigaki Island (Figure 1).

Tarama Ryukyuan belongs to Miyako, one of the Southern Ryukyuan languages; the other two Southern Ryukyuan languages are Yaeyama and Yonaguni (Figure 2). Tarama Ryukyuan has two sub-varieties, Shiokawa and Nakasuji, but there is no crucial difference between them. Thus, in this study they will not be distinguished.

Although a population of Tarama village is 1,271 at 2013 [3,4], the number of Tarama speakers must be less than that. It is estimated at about 380, all of whom are over 60 years old (2:2). Speakers aged 40-60 years can only understand Tarama and cannot speak it, and the younger generations can neither speak nor understand it.



Tarama Ryukyuan has six vowels /i e a o u i/, fourteen consonants /p b t d k g f v s z h m n r/, and two semivowels /w j/. This paper focuses on the acoustic and articulatory details of the vowel /i/ in Tarama. As shown in this paper, /i/ has two cross-linguistically uncommon properties. First, it often generates sibilant noise like an alveolar fricative [s, z]; second, it is articulated with a flat tongue position. These properties indicate that the vowel /i/ has a double laminal-dorsal articulation.

Methods

In this study, two instrumental phonetic approaches were employed, an acoustic analysis and static palatography. Those data were collected during field research on Tarama Island between 2009 and 2010.

Acoustic analysis

Six male speakers provided acoustic data of the Tarama vowels (Table 1). Their places of origin and years of birth are listed in Table 1:

The recordings were made using a Marantz PMD6 recorder and AKG C420 microphone (16 bit, 44.1 kHz).

Static palatography

Two male Shiokawa speakers are participated in the palatographic study. One speaker, S7, was born in 1958, the other, S8, in 1967. Palatographic research was conducted in the following order [5]:

1. Paint the tongue with a black substance;
2. Ask the speaker to say a word containing the articulation to be studied;
3. Put a mirror into the mouth and photograph the whole of the upper surface;
4. Observe where the black substance has been transferred to the roof of the mouth.

S1 Shiokawa, b. 1921	S2 Shiokawa, b. 1929	S3 Nakasuji, b. 1930
S4 Shiokawa, b. 1935	S5 Shiokawa, b. 1935	S6 Nakasuji, b. 1935

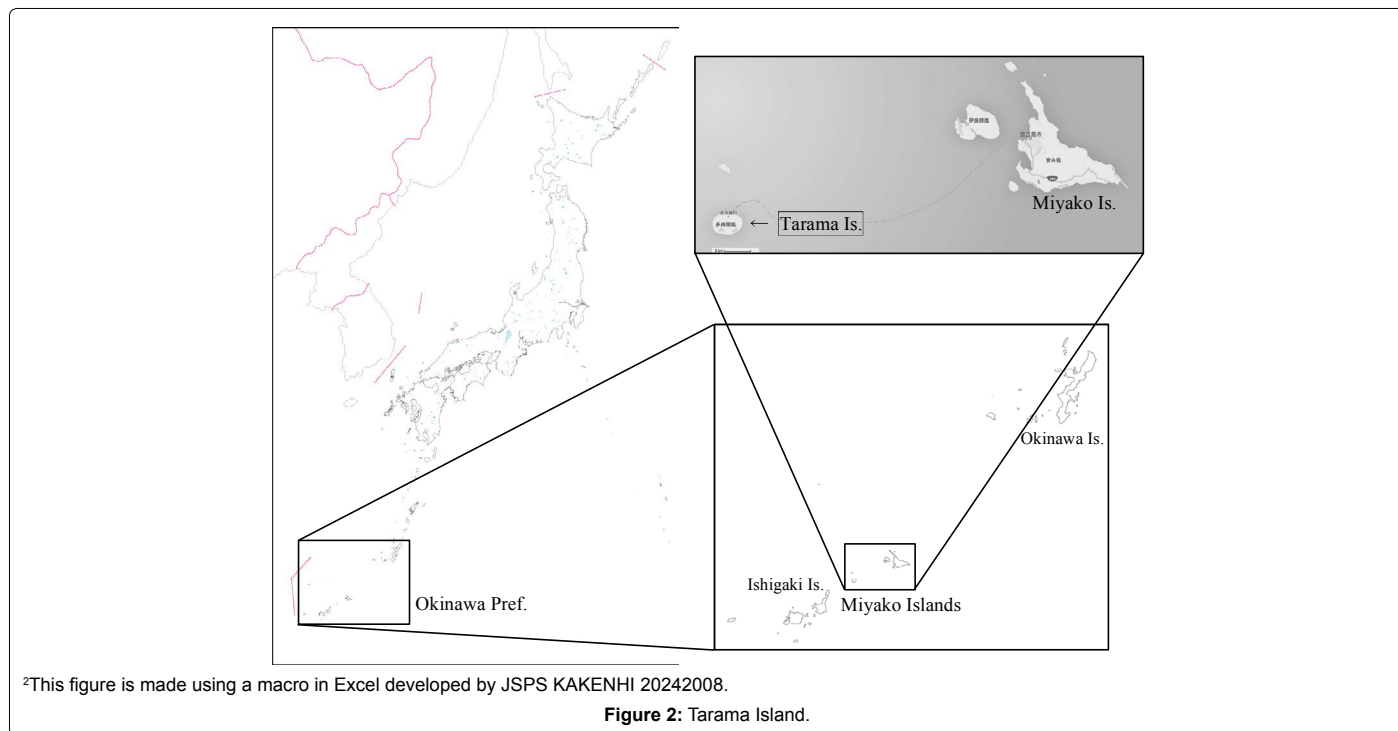
Table 1: Tarama speakers.

***Corresponding author:** Hayato Aoi, Assistant Professor, National Institute for Japanese Languages and Linguistics, Japan, E-mail: aoi8810@gmail.com

Received July 30, 2017; **Accepted** August 11, 2017; **Published** August 14, 2017

Citation: Aoi H (2017) Phonetic Features of a Laminal Vowel in Tarama-Miyako Ryukyuan. J Phonet and Audiol 2: 128. doi:[10.4172/2471-9455.1000134](https://doi.org/10.4172/2471-9455.1000134)

Copyright: © 2017 Aoi H, et al. This is an open-access article distributed under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.



Using this system, we can get photographs of the roof of the mouth. These photographs are called palatogram. We can get the information of which part of the tongue has been used by reversing the process, by painting the roof of the mouth. Photographs of the tongue made in this way are called linguograms. Palatograms and linguograms of the three high vowels /i u i/ were collected in this study.

Auditory-acoustic features

Formants

Figure 3 shows the acoustic vowel space of Tarama. A wordlist for scaling and plotting the vowel formants is shown below:

ii ‘picture’, *eegu* ‘song’, *aa* ‘millet’, *ooiru* ‘blue’, *uu* ‘(Year of) the Hare’, *#* ‘rice ball’

From the value of F2 of /i/, which falls between those of /i/ and /u/, [6] inferred that /i/ has a central vowel articulation. We will see in Section 5, however, that Tarama’s /i/ does not have such an articulatory character. Palatograms of /i/ tell us that it is articulated with a flat tongue.

Sibilant noise

A laminal vowel often causes sibilant noise [s z], especially when /i/ is preceded by a plosive [7-9].

(1) A laminal vowel causes sibilant noise (s z)

a. $i \rightarrow [i^s] / T_ (T: a voiceless plosive)$

pi^sdar [p^s da] ‘left’

ti^smi [t^smi] ‘nail’

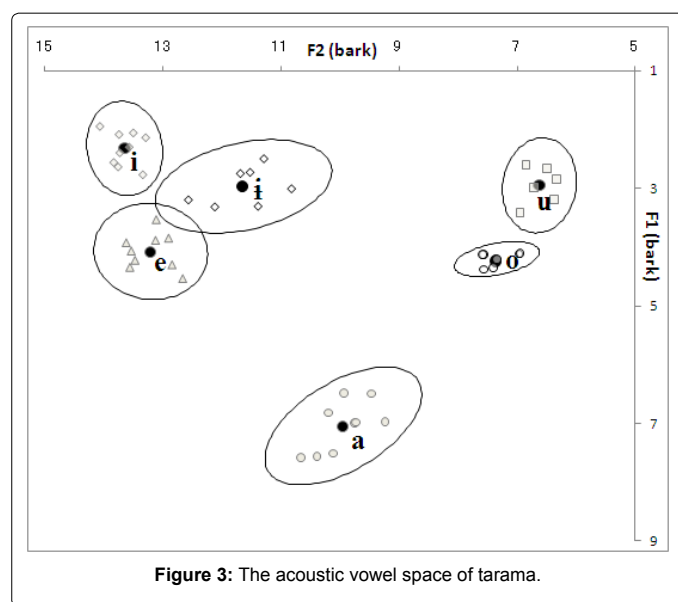
muti^s [mut^s] ‘have’ (nonpast form)

ki^sn [k^sn] ‘cloth’

maki^s [mak^s] ‘sow (seeds)’ (nonpast form)

b. $i \rightarrow [i^v] / D_ (D: a voiced plosive)$

bi^vdui [b^vdui] ‘(Year of) the Boar’



kabi [kab^si] ‘paper’

gi^vpa [g^vpa] ‘hairpin’

kugi [kug^si] ‘paddle (v)’ (nonpast form)

c. $i \rightarrow [i^e] / \text{elsewhere}$

mi^egi [mi^egi] ‘right’

si^ema [si^ema] ‘island’

pa^esi [pa^esi] ‘bridge’

zi^emami [zi^emami] ‘peanuts’

nu^ezi [nu^ezi] ‘rainbow’

As shown in (1), the voicing of the preceding consonant determines whether the noise is [s] or [z]; it is [s] after a voiceless consonant (1a) and [z] after a voiced (1b). We see from Figure 4 that [s]-like frication noise occurs between a plosive and [i].

This figure tells us that sibilant noise was generated between /p/ (or /b/) and /i/, as indicated by an aperiodic wave and intense energy band in frequencies over 3000 Hz.

One explanation for this phenomenon is assimilation of a stricture, i.e., Stricture Assimilation [2,9]. That is, frication noise between a plosive and [i] is caused because the stop-type stricture of a plosive assimilates to the approximant articulation of [i]³. Please refer to the diagram in (2).

According to [10], there are four types of prolongable strictures: stop<fricative>approximant<resonant (the further to the right it is, the wider its stricture). Plosives have a stop stricture and oral closure, and high vowels have an approximant stricture. When a high vowel /i/ follows a plosive, the approximant stricture of /i/ is more closed at the beginning and thereby creates fricative noise. This fact shows that stricture, not only place or voicing, can assimilate to a neighboring segment.

Articulatory Features

Palatograms

³ A nasal stricture is also a stop type, but it cannot cause Stricture Assimilation. This may be because airflow in the oral cavity is more reduced than in the case of a plosive. In other words, high-velocity airflow is required to make turbulent noise.

Palatograms and linguograms of S8's high vowels /i u i/ are shown in Figure 6.

The palatograms show that the front vowel /i/ involves contact with the third tooth and the back vowel /u/ with the eighth tooth. The contact of /i/ indicated by the palatogram is with the second tooth from the front, which is quite similar to that of the front vowel /i/. However, /i/ differs from /i/ in that it does not involve an approximant articulation of the palate and the front of the tongue. Rather, it is likely that the approximation is made with the tongue flat. In other words, not only the blade of the tongue but its whole body is involved in the articulation of /i/.

Interpretation

Some previous research, such as [11,12], indicated that the vowel /i/ in Miyako Ryukyuan should be called an apical vowel, symbolized phonetically as [ɿ], because it involves constriction like that of [s]. The linguogram of /i/ shows us, however, that as the tip of the tongue is not involved, it cannot be interpreted as an apical vowel [ɿ]. Both sides of the blade are stained, but it does not seem that only the blade is involved in the articulation. Rather it is likely that the approximation with the tongue flat. In other words, not only the blade of the tongue but its whole body is involved in the articulation of /i/.

The palatograms and linguograms in Figure 6 do not show that the

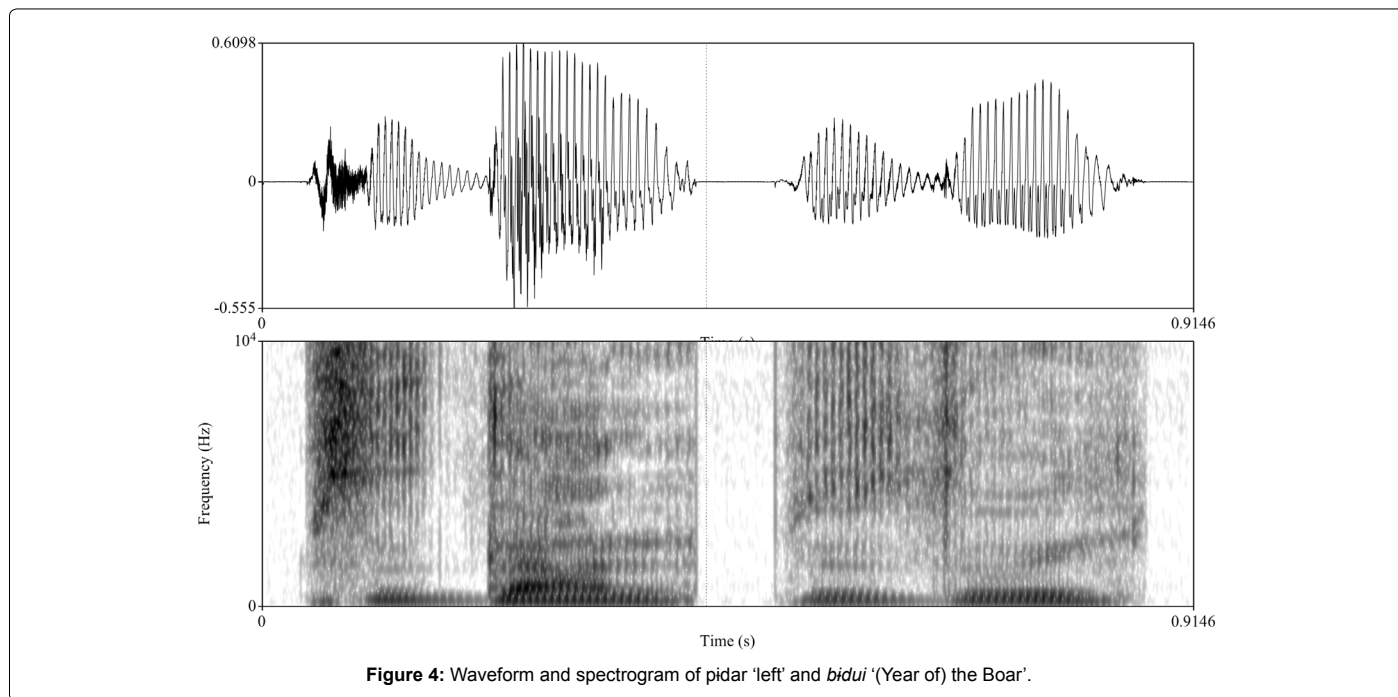


Figure 4: Waveform and spectrogram of pidar 'left' and bidui '(Year of) the Boar'.

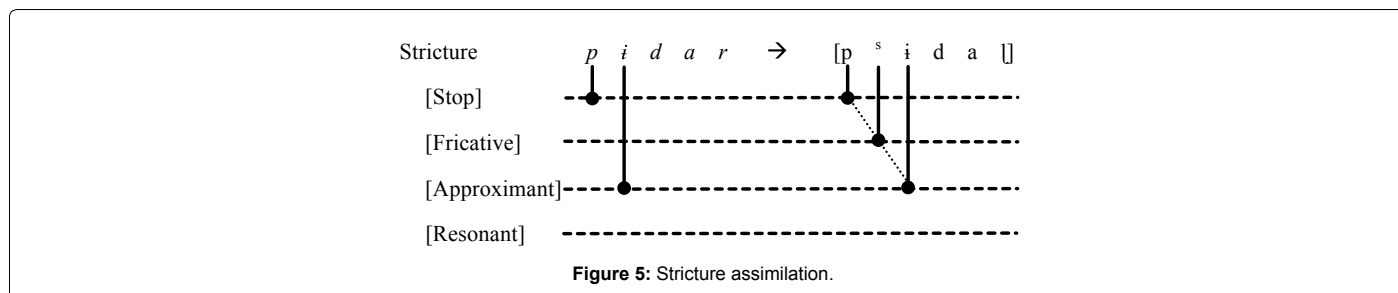
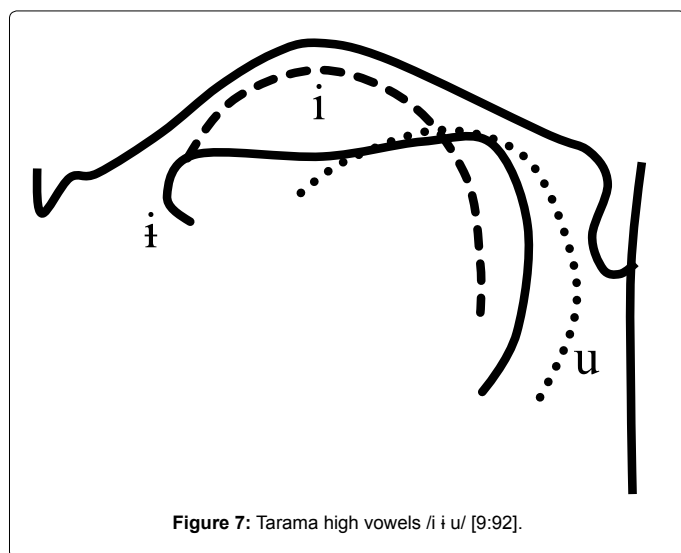
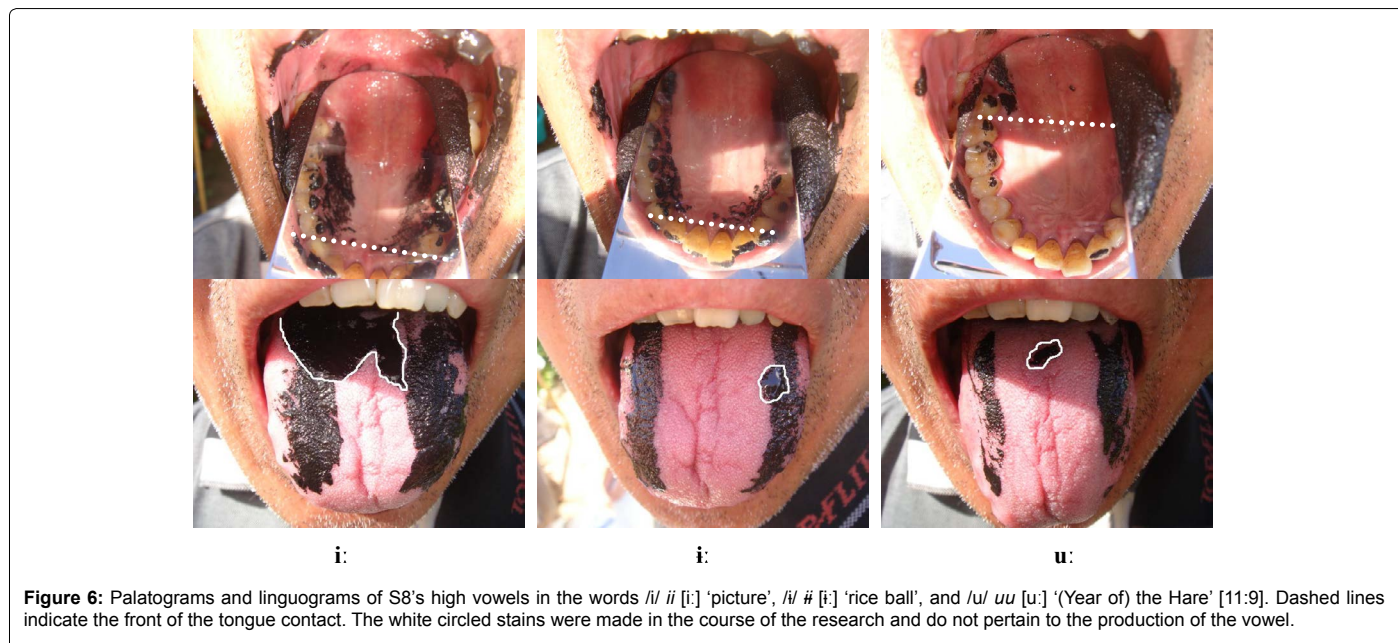


Figure 5: Stricture assimilation.



vowel /i/ has only a laminal constriction. Rather, it is inferred that it has also a dorsal constriction of the same degree as that of the laminal. Based on the same palatographic data of Tarama vowel /i/, [9] reinterpreted the flatness of the tongue during /i/ as a double articulation of laminal and dorsal, i.e., a laminal-dorsal vocoid [1]. Figure 7 shows the inferred articulations of the high vowels in Tarama Ryukyuan [9].

[1] commented on the possibility of a third type of vowel segment, a double (apical /) laminal-dorsal vocoid, in addition to an unrounded vowel (a single dorsal vocoid) and a rounded vowel (a double labial-dorsal vocoid). When it is articulated, the blade is raised to the point where it contributes an audible coloring to the perceived quality of the sound produced but whose degree of stricture remains one of open approximation at the alveolar place of articulation. In such a situation, one would have to say that a vocoid segment was being produced with a double oral articulation, one (dorsal) with the body of the tongue and the other (apical or laminal) with the tip or blade of the tongue.

Conclusions

In this paper, I described the acoustic-auditory and articulatory details of a laminal vowel in Tarama Ryukyuan. The laminal vowel in Tarama and the other Miyako Ryukyuan has the phonetic features in [2].

- (2) Phonetic features of a laminal vowel (remove bold)
 - a. A laminal vowel has the acoustic character of a high central vowel;
 - b. often causes sibilant noise [s z], especially if it is preceded by a plosive; and
 - c. articulates with not only the body but also the blade of the tongue, i.e., it constitutes a double laminal-dorsal vocoid [1].

This paper reports the rare phonetic features of a laminal vowel in Tarama Ryukyuan. It is quite likely that the laminal vowels of the other varieties of Miyako Ryukyuan have the same phonetic features, but further investigation of possible phonetic variation in the laminal vowels of the Miyako Ryukyuan is called for.

References

1. Laver J (1994) Principles of Phonetics. Cambridge University Press.
2. Aoi H (2016) Minami Ryukyu Miyako go Tarama hougen no onseigaku-teki on'inron-teki kouzou no syosou (Aspects of phonetic and phonological structure of the Miyako-Tarama variety of Southern Ryukyuan). Unpublished PhD thesis, Tokyo University of Foreign Studies.
3. Pellard T (2015) The linguistic archaeology of the Ryukyu Islands. In: Heinrich P, et al. (edn.) Handbook of the Ryukyuan Languages: History, Structure, and Use. Mouton de Gruyter. 13-37.
4. Tarama village office (2014) Tarama-son: Sonsei Sikou Hyaku Syuunen Kinen-si [Tarama village: A Journal for the Hundredth Anniversary of Affairs of Tarama Village]. Tarama village office.
5. Ladefoged P (2003) Phonetic Data Analysis. Blackwell.
6. Oono M, Kuno M, Sugimura T, Kuno M (2000) Minami Ryukyu hougen no nakazita boin no onsei zissitu [Phonetic Substance of Neutral Vowels in the South Ryukyu Dialects]. J Phonet Society Jap 4: 28-35.
7. Karimata S (1996) Miyako hougen no on'in henka ni tsuite no oboegaki: kuukirikigaku-tekina kanten kara mite [Notes on phonological changes in

-
- Miyako Ryukyuan: From a viewpoint of aerodynamics]. Gengogakurin 96-97, 709-722. Tokyo: Sanseido.
8. Uemura Y (2003) The Ryukyuan language (translated by Wayne P. Lawrence). ELPR Publication Series A4-A018.
 9. Aoi H (2012) Miyako-Tarama hougen ni okeru "nakazita boin" no onsei-teki kaisyaku [The phonetic interpretation of the "central vowel" in the Tarama variety of Miyako Ryukyuan]. Gengo Kenkyu 142: 77-94.
 10. Catford JC (1976) Fundamental Problems in Phonetics. Edinburgh University Press.
 11. Aoi H, Niinaga Y (2013) The central high vowels in Ryukyuan languages: A comparative palateraphic study of Yuwan Amami and Tarama Miyako. Int J Okinawan Stud 4: 3-12.
 12. Sakiyama O (1963) Ryukyu Miyako syotou hougen hikaku on'in-ron [Comparative phonology of the Miyako Ryukyuan languages]. Kokugogaku 54: 6-21.