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Foreword

This monograph contains a number of the talks given at the 41st Annual Meeting of the Berkeley Linguistics Society, held in Berkeley, California, February 7-8, 2015. The conference included a General Session and the Special Session *Fieldwork Methodology*. The 41st Annual Meeting was planned and run by the second-year graduate students of the Department of Linguistics at the University of California, Berkeley: Kenny Baclawski, Anna Jurgensen, Spencer Lamoureux, Hannah Sande, and Alison Zerbe.

The original submissions of the papers in this volume were reviewed for style by Anna Jurgensen and Hannah Sande. Resubmitted papers were edited as necessary by Anna Jurgensen and Kenny Baclawski, and then compiled into the final monograph by Anna Jurgensen. The final monograph was reviewed by Spencer Lamoureux. The endeavor was supported by Alison Zerbe's management of the Berkeley Linguistic Society's funds for publications.

The BLS 41 Executive Committee
July 2015

Reevaluating the Diphthong Mergers in Japono-Ryukyuan

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1 Introduction

Great strides have been made in the field of historical Japono-Ryukyuan studies in the past half century with the shift in the perception of the Ryukyuan languages as mere dialects of Japanese to cousin languages that preserve various phonological and morphological features that have been lost in the Japanese subfamily. In particular, the Ryukyuan data has both secured and contributed to reconstructions of Proto-Japono-Ryukyuan vowel system that had been previously based purely on internal reconstruction via Old Japanese and scant examples from Ryukyuan and/or dialect data.

One area of the vowel system reconstruction that has been particularly advanced by Ryukyuan data is that of the Proto-Japono-Ryukyuan diphthongs, which have preserved reflexes in various ways in the different Ryukyuan languages. In this paper, I explore the reflexes of the Proto-Japono-Ryukyuan diphthongs ending in *i in Southern Ryukyuan (henceforth referred to as Sakishima) languages. The evidence in these languages not only provides further evidence for the diphthongs that have been proposed in the literature, but also throws into question the diphthong mergers that have been proposed for Proto-Ryukyuan. Furthermore, I adduce evidence from these languages for the preservation of the proto-diphthongs not only after labial and velar stops, as the Old Japanese data has suggested, but also after coronal obstruents.

I first provide a background of the Ryukyuan languages in § 2, followed by a brief discussion of the work that has been done in the reconstruction of the Proto-Japono-Ryukyuan diphthongs in § 3. § 4 introduces the data from Sakishima languages and discusses the implications for reconstruction. Finally, § 5 concludes.[1]

*Special thanks to my Taketomi informants: Setsu Furugen and Teruo Irisato and to my Shiraho informants: Toyo Shiroma, Kiyoshi Tau, Yone Tau, Hiroshi Tooji, and Yuusei Miyara. Thanks as well to Christopher Davis, Natsuko Nakagawa, and Akiko Mizuno for sharing data and to the audience at the Polinsky Language Sciences Lab for providing helpful comments.

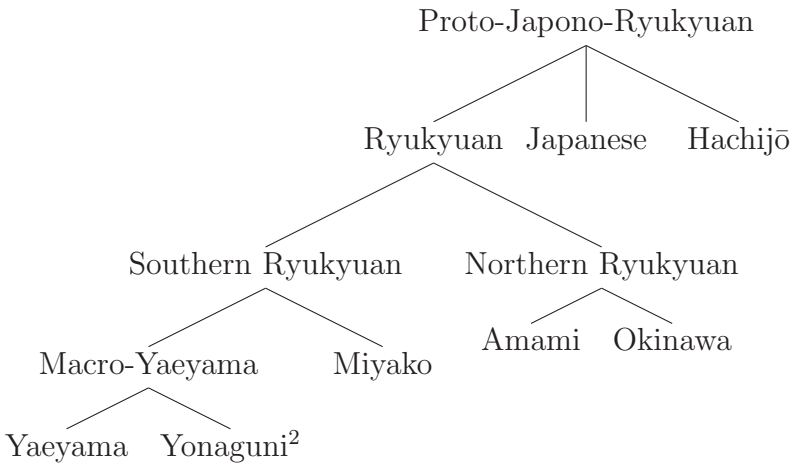
[1]The following orthography is used in place of IPA: c = [tɕ], sj = [ɕ], zj = [dʑ], f = [ɸ], ï = [ɨ]. In Yonaguni, apostrophes are used to represent a fortis consonant. In all Japono-Ryukyuan languages, *s* and *z* are palatalized before *i* and coda *n* is a placeless or uvular nasal (generally represented in Japanese phonology as ɴ), so *si* and *zi* uniformly represent phonetic [ɕi] and [ʑi], respectively, and *n* will be assumed to represent phonetic [ɴ] in coda position.

The abbreviations are as follows: ModJ = Modern Japanese, NR = Northern Ryukyuan, PJR = Proto-Japono-Ryukyuan, PR = Proto-Ryukyuan, SR = Southern Ryukyuan/Sakishima, WOJ = Western Old Japanese.

2 The Ryukyuan Languages

The Ryukyuan languages may be divided into five or six dialect continua, depending upon the classification (Serafim 2008:80). One such classification, provided by (Pellard 2015:15) is given in Figure 1. Those considering Kunigami to be a separate language group from Amami and Okinawa would place Kunigami as a sister branch to them under Northern Ryukyuan.

Figure 1: The Japono-Ryukyuan Language Family



These languages are spoken in the Ryukyuan islands, which comprise the entire modern day Okinawa Prefecture and the southern Amami islands of Kagoshima Prefecture, all of which stretch for about 900 kilometers south of Kyushu, the southernmost island of the Japanese mainland. The Proto-Ryukyuan language likely developed during the first centuries of the common era, coinciding with the migration of the Ryukyuans into the Ryukyuan islands (Pellard 2015:30). The languages subsequently spread throughout the Ryukyuan islands and were spoken ubiquitously into the unification of the Ryukyu Kingdom in 1406 and until the dissolution of the Ryukyu Kingdom in 1879, at which point Japanese imperialism led to policies suppressing the usage of the languages.

It is difficult to estimate the current number of speakers due to the lack of census data, but one can estimate given the fact that the population of the Ryukyu Islands is approximately 1.5 million and that virtually all speakers are at least fifty years of age (and many of the languages have even higher lower bounds) (Karimata 2015:114), that the number must be very low. The Ryukyuan languages stopped being transmitted intergenerationally by the 1950s and subsequently, speakers shifted to being monolingual in Japanese (Anderson 2015:481). Thus, UNESCO has classified all the Ryukyuan languages as either "definitely endangered" or "severely endangered" (Karimata 2015:115).

[2]Pellard refers to this language as "Dunan", which is the Yonaguni word for "Yonaguni".

3 Proto-Japono-Ryukyuan Diphthongs

Much of the reconstruction of the proto-vowel system has relied on internal reconstruction using Old Japanese, but the picture has been recently revised with careful attention to comparative data from Ryukyuan languages. § 3.1 discusses the Japanese data and § 3.2 brings the reader up to speed on the current view of the vowel system utilizing Ryukyuan data.

3.1 Initial Observations in Old Japanese

The reconstruction of Proto-Japono-Ryukyuan diphthongs began with the investigation of the Chinese characters that were used to represent vowels in Western Old Japanese, the language of the Nara Court in the eighth century in western Japan. It was noted as far back as 1764 by Motoori Norinaga that three of the five modern Japanese vowels *i, e, a, o, u*, namely *i*, *e*, and *o* were each the reflex of two different vowels (Lange 1973:21-23). These findings were partially synthesized in 1785 by Ishizuka Tatsumaro and then left untouched until Hashimoto (1917). The two sets of vowels are known as *koo* ("A") and *otsu* ("B") vowels. For the purposes of this paper, only the *i* vowels will be discussed and henceforth the vowels shall be referred to as i_1 and i_2.

The initial evidence for the vowel differentiation was the complementary distribution of the Chinese characters used for each CV syllable in the *Manyōshū*, a collection of Old Japanese poems from the 8th century. Each syllable could be written with any one of multiple Chinese characters; however, the characters used for a consonant with a *koo* vowel *never* overlapped with the characters used for a consonant with an *otsu* vowel. Thus, for example, ki_1 and ki_2 were written with complementary sets of Chinese characters.

While it was well-known that there were certain Japanese nouns whose final root vowel changed when in compounds and verbs whose final root vowel changed when derivational morphemes were added, the connection to the *koo/otsu* distinction was not remarked upon until the twentieth century (Yoshitake 1930). These words categorically end in the *otsu* vowels.

Figure 2: Apophonic Vowels

$tuki_2$	'moon'	→	tuku-jo	'moonlit night'
ki_2	'tree'	→	ko-dati	'grove of trees'

These alternating vowels, later termed apophonic vowels, were further evidence that the *koo* and *otsu* sets were phonemically distinct. While the exact phonetic values of i_1 and i_2 has been extensively debated, it is generally agreed upon that i_1 was the pure vowel [i] and i_2 was a diphthong with a [j] offglide (Lange 1973; Matsumoto 1974). One view, defended by Miyake (1999), reconstructs i_2 as [ij]. The exact phonetic value of the vowels is irrelevant to this paper; rather, the diphthongal nature of i_2 will be focused upon. In observing the vowel correspondences, Whitman (1985) reconstructs i_2 as being the reflex of two different diphthongs in Proto-Japanese, *ui and *oi (generally reconstructed as *əi to keep the vowel space balanced), based off the alternations in (2). The words that alternate i_2 with *u* are reconstructed with *ui, while those that alternate with *o* are reconstructed with *əi under

the then-accepted four vowel hypothesis (see Whitman (1985) for more). An important observation was that the *koo/otsu* distinction was only made following labials and velars Lange (1973). This fact will be relevant to the discussion in § 4.3.

3.2 Revisions with Ryukyuan Data

Early observations of Ryukyuan data accorded with the reconstructions of *ui and *əi. In particular, Arisaka (1934) and Hattori (1932) first noted that unlike Japanese, the sequences *kui and *kəi were kept distinct, and discovered that *kui merged with *ki (which became ki_1 in Old Japanese) while *kəi remained distinct. The treatment of *kui and *ki against that of *kəi differed by individual language. However, it may be generalized that the Northern Ryukyuan reflexes of *kui and *ki are kept distinct from those of *kəi via the consonant quality, whereas Southern Ryukyuan maintained the distinction via vowel quality.

Figure 3: Reflexes of *kui and *kəi in Ryukyuan (Modified from Pellard 2013:85)

Subgroup	Language	'moon'	'tree'
Japanese	WOJ	tu**ki**$_2$ (∼ tuku-)	**ki**$_2$ (∼ ko$_2$-)
Okinawan (NR)	Nakijin	si**ci:**	**ki:**
Yaeyaman (SR)	Ishigaki	tsï**kï**	**ki:**
Ryukyuan	PR	*tuki	*ke
Japono-Ryukyuan	PJR	*tukui	*kəi

The examples above show the most common identifier of *kui and *ki in each subgroup– palatalization in Northern Ryukyuan and vowel centralization in Southern Ryukyuan. However, some Northern Ryukyuan languages maintain the distinction from *kəi as a lenis/fortis distinction and some Southern Ryukyuan languages reflect *kui and *ki with fricativization of the vowel (> i > ï > s). The generalization appears to be that *kui and *ki underwent greater lenition than *kəi did. Due to this pattern, PJR *kəi was hypothesized to have monophthongized to *ke in Proto-Ryukyuan while PJR *kui and *ki merged to *ki. Vowel raising of the mid-vowels *e and *o to high vowels *i* and *u* then occurred individually across the Ryukyuan languages *after* palatalization in Northern Ryukyuan and centralization in Southern Ryukyuan, leading to greater opacity in seeing the difference.

Pellard (2013) finds evidence to argue for another diphthong *oi in Ryukyuan. The following table illustrates the cognates of Old Japanese ki_2- 'yellow' and a compound formed from it: *kugane* 'gold' (literally 'yellow-money'). As the root-final vowel shows an $i_2 \sim u$ alternation, we would expect the PJR form to be reconstructed as *kui. However, the Ryukyuan data contradicts this view.

The non-apophonic form 'yellow' operates as expected: palatalization in Northern Ryukyuan and vowel centralization in Southern Ryukyuan. However, the reflexes of 'gold' notably differ from the reflexes of other words that begin with *ku*. The word for 'cloud' retains *k in Northern Ryukyuan, but lenites *k to *f* in Southern Ryukyuan, whereas 'gold' shows the opposite pattern and so cannot derive from *kui. It is on this basis that Pellard reconstructs the apophonic alternation as an original *ki ∼ *ko and consequently the proto-diphthong as *koi. The hypothesis is bolstered by the fact that the modern Japanese form for 'gold'

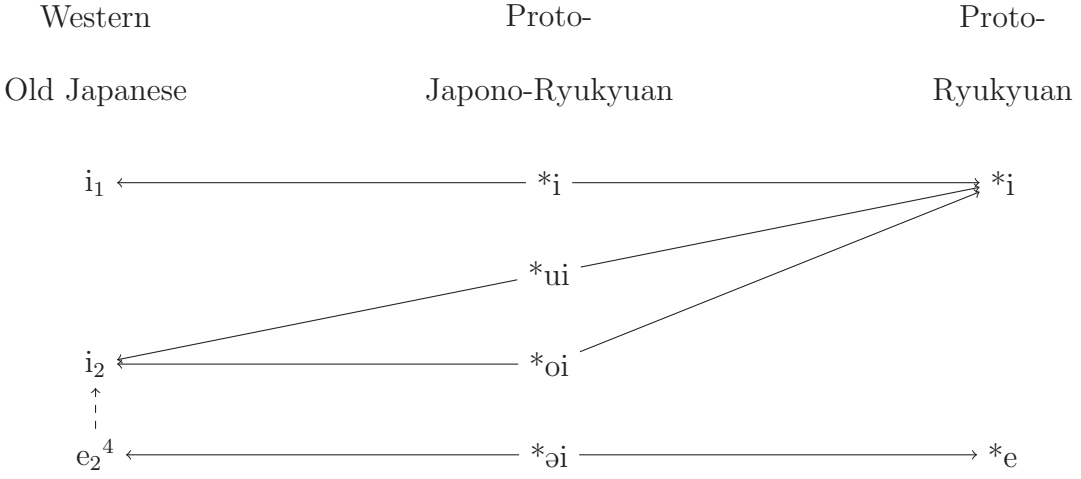
Figure 4: Evidence for *oi (Modified from Pellard 2013:86)

Subgroup	Language	'yellow'	'gold'	'cloud'
Japanese	WOJ	**ki**$_2$ (∼ ku)	**ku**-gane	**ku**mo$_1$
Okinawan (NR)	Nakijin	**ci:**-ru:	**fu**-gani	**ku**mu
Yaeyaman (SR)	Ishigaki	**kï:**	**ku**-gani	**fu**mu
Japono-Ryukyuan	PJR	*koi	*koi-kane	*kumo

is *ko-gane*, a borrowing from Eastern Old Japanese.[3] Another example that supports Pellard's reconstruction is the Ishigaki word *tsïkus-ïn* 'to exhaust', which would be expected have become *tsïfus-ïn* had the diphthong been *ui. Ishigaki *pïs-un* 'to dry' also supports Pellard's hypothesis as the *ï* tells us the proto-form could not have been *pəi as is usually reconstructed. The apophonic alternation with the transitive form *pus-un* (WOJ *pos-u*) informs that the first segment of the diphthong was *o (PJR *pu > Sakishima *fu, while *po > *pu). These words should be *tukos- and *poi-, respectively. For further evidence of *oi, see Pellard (2013).

To summarize, the dipthong proposal and mergers in the respective primary branches (Japanese and Ryukyuan) are presented below:

Figure 5: Diphthong Mergers in Japanese and Ryukyuan



While this diagram paints a clean picture of the diphthong mergers, it will become apparent given data from the Sakishima languages that the mergers cannot be so clearly dated to the time of Proto-Ryukyuan.

[3]While Western Old Japanese raised most of its mid-vowels *e and *o to *i* and *u*, respectively, Eastern Old Japanese retained most of them.

[4]Most of the *əi diphthongs had become i_2 by the time of Old Japanese, but some of them remained as e_2 and failed to undergo raising. The exact environments in which vowel raising occurred are not yet worked out, but see Frellesvig and Whitman (2008:22-23) for some discussion.

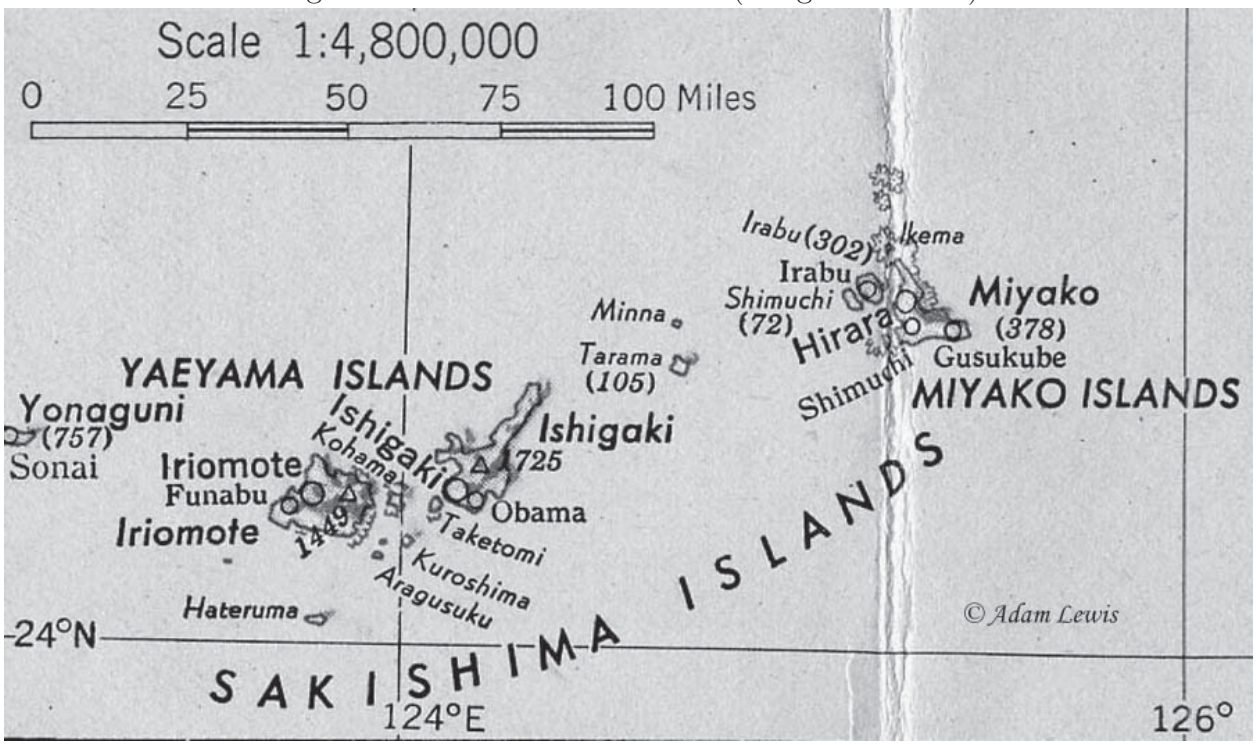
4 Reconciling the Sakishima Data

The reader will first be familiarized with the Sakishima languages, in particular, Yaeyaman, in § 4.1. § 4.2 presents exceptions to the diphthong mergers summarized in § 3.2. This section ends with a speculation on the implications of the exceptions in § 4.3.

4.1 Background of Sakishima

The Sakishima languages are spoken on two groups of islands separated from Okinawa mainland, the southernmost point where the Northern Ryukyuan languages are spoken, by approximately 120 miles of ocean. The eastern Miyako islands are where the Miyako languages are spoken, while the western Yaeyaman islands are where the Yaeyaman and Yonaguni languages are spoken. Yonaguni is spoken on the isolated westernmost Yaeyaman island, approximately 100 miles east of the eastern coast of Taiwan.

Figure 6: The Sakishima Islands (Image from here)



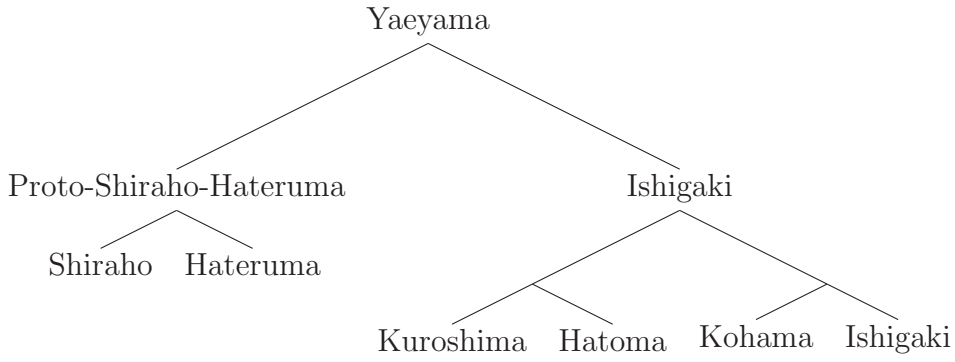
The Sakishima varieties from which examples are pulled may all be found on this map, except for Ōura, which is slightly north of Hirara in the Miyako Islands, Kabira, which is on the northwest part of Ishigaki Island, and Shiraho, which is just east of "Obama"[5] on the island of Ishigaki. The following dictionaries are used for each language: Ōno et al. (1974) for WOJ, Sakihara (2006) for Shuri Okinawan, Hirayama (1967) and Nakamatsu (1987) for all the Miyako and Yaeyama languages, Miyagi (2003) for Ishigaki, Maeara (2011) for Taketomi,

[5]This is an error and the Japanese characters should actually be read as "Ōhama".

and Ikema (2003) for Yonaguni. My fieldnotes from 2012-2014 are used for Shiraho and are crossreferenced for Taketomi and Yonaguni.

Because the islands on which Yaeyaman languages are spoken are relatively distant from one another, the Yaeyaman subgroup shows greater diversity than do any of the other Ryukyuan subgroups. The diagram in Figure 7 offers a tentative subgrouping, modified from Kajiku (1984:300) in order to include Shiraho.

Figure 7: Yaeyama subgrouping



The subgrouping of Yaeyaman is still a matter of heavy contention; however, it is patent from phonological, morphological, and lexical evidence that Hateruma and Shiraho are particularly divergent and thus likely branched off early. Kajiku does not discuss the position of Taketomi in his classification. It seems to be different enough from the "Ishigaki" subgroup varieties, however, to merit its own branch, but it remains unclear currently whether there is any relation to Hateruma/Shiraho.

With the exception of Hateruma/Shiraho and Taketomi, the Yaeyaman languages appear to undergo the expected diphthong mergers that are proposed for Proto-Ryukyuan. Shuri Okinawan, descended from the *lingua franca* of the Ryukyu Kingdom, will be cited as an example of Northern Ryukyuan and Ishigaki, which was spoken on the main Yaeyaman island of Ishigaki, will be cited as an example of Southern Ryukyuan. The Shuri examples are pulled from Pappalardo (2014), whose comparison of these forms with the Hateruma forms will be discussed in § 4.2. The relevant segment of each word is bolded.

Figure 8: WOJ *ki* syllables in Shuri

WOJ ki_1		WOJ ki_2	
'dress'	**ci**n	'tree'	**ki:**
'heart'[6]	**ci**mu	'to get up'	u**ki**-jun
'hear'	**ci**c-un	'moon'	ci**ci**
'breath'	i:**ci**	'fog'	**ci**ri
'to cut'	**ci**:-jun	'stem'	gu**ci**

Figure 9: WOJ *ki* syllables in Ishigaki

WOJ ki_1		WOJ ki_2	
'dress'	**kï**n	'tree'	**ki:**
'heart'	**kï**mu	'to get up'	u**ki**-run
'to hear'	**sï**k-un[7]	'moon'	tsï**kï**
'breath'	i**kï**	'fog'	**kï**ru
'to cut'	**kï**s-un	'stem'	fu**kï**

[6]The PJR word was *kimo, whose meaning seems to have been 'liver'. Japanese dialects take this meaning while in Ryukyuan languages the meaning has undergone metonymy, shifting to 'heart'.

[7]In Proto-Yaeyaman, this verb was *kïkun. There appeared to have been a rule that fricativized *k to *s

As can be seen in Figures 8 and 9, a subset of words that correspond to words with ki_2 in Western Old Japanese palatalized in Northern Ryukyuan and centralized in Southern Ryukyuan as those corresponding to ki_1 did, whereas the other subset did not. The palatalized/centralized subset is reconstructed with *kui while the other subset is reconstructed as *kəi. While the pattern for almost all Yaeyaman languages matches with that of the remaining Ryukyuan languages, we find exceptions in Hateruma/Shiraho and Taketomi.

4.2 Exceptions to the Diphthong Mergers

Pappalardo (2014) provides evidence that is counter to the current picture of the diphthong mergers in Proto-Ryukyuan. The forms he cites are in Figure 10.

Figure 10: WOJ *ki* syllables in Hateruma

WOJ ki_1		WOJ ki_2	
'dress'	**sï**nu	'tree'	**ki:**
'liver(/heart)'	**sï**mu	'to get up'	u**gi**-run[8]
'to hear'	**sï**k-un	'moon'	sï**kï**n
'breath'	ï**sï**	'fog'	**kï**sï
'promontory'	sa**sï**	'stem'	fu**kï**
'side'	ba**sï**	'time'	sï**kï**pïntsï

Unlike in Ishigaki and Shuri, Hateruma has not merged *ki and *kui. The three-way distinction is preserved faithfully as shown in the three different reflexes, each shaded with a different color in Figure 10. If we observe these words in Taketomi, another Yaeyaman language, we see yet another pattern. The data below is taken from a recent Taketomi dictionary by Maeara (2011) and corroborated with my fieldwork notes.[9]

Figure 11: WOJ *ki* syllables in Taketomi

WOJ ki_1		WOJ ki_2	
'dress'	**si**nu	'tree'	**ki:**
'heart'	**sj**ũ:	'to get up'	fu**i**-run
'to hear'	**hi**k-un	'moon'	hi**ki**
'breath'	i**si**	'fog'	**sj**u:ri/u
'promontory'	sə**si**	'stem'	fu**ki**
'side'	bə**si**[10]	'time'	hi**ki**pinici

when followed by *ïk. This potentially could be generalized to any high vowel followed by any voiceless stop; however, all *ku sequences became *fu and I have not found any *kiT examples so this claim cannot be made for certain.

[8]Proto-Yaeyaman *ki > *gi* in some intervocalic environments.

[9]However, I did not have the word for 'time' and my speaker does not have /ə/ in her phonology–both these words have /a/ instead. Both /ə/ and /a/ correspond to /a/ in other Japono-Ryukyuan languages. For further discussion on /ə/ in Taketomi, refer to Lawrence (1998) and Nishioka (2009).

Before analyzing the sound correspondences, a discussion of Taketomi sound change is in order, due to the seeming irregularity in the shaded forms in the table.

First, in Proto-Yaeyaman, *k palatalized to *s preceding *ïk. Taketomi has applied a rule in a similar environment to lenite *s to *h* preceding *ik. The same rule applies to two other words in the chart above–*hiki* 'moon' and *hiki-pi-nici* 'time' (literally 'moon-day-day'). As such, *hikun* 'to hear' may be reconstructed as *sikun in Pre-Taketomi.

Second, *fuirun* 'to get up' looks quite different from the corresponding Ishigaki and Hateruma forms, *ukirun* and *ugirun*, respectively. However, it appears that this word has undergone two sound changes in Taketomi. First, word-initial high vowels received a prothetic *h* when followed by a voiceless consonant, which synchronically became *f* before *u*, a in most Japono-Ryukyuan languages. The same rule applied to another Yaeyaman language, Kabira, which added *h* to all word-initial vowels followed by a voiceless consonant (cf. PJR *ukəi- : Kabira *fuki-* 'get up' and PJR *akai- : Kabira *haki-* 'open').

Subsequently, Taketomi appears to have undergone an innovation alongside Hateruma and Shiraho, in which some intervocalic voiceless stops became voiced.[11] As seen in Figure 10, Hateruma has *ugirun for 'to get up.' We may posit as well that Taketomi underwent the same change, forming *fugirun. The evidence for the same change comes from the fact that Taketomi subsequently elided voiced stops intervocalically if they preceded *i*. The evidence is shown, for example, by Taketomi *fui* 'neck' corresponds to PJR *kubi[12]. A synchronic example is the noun *nui-sasi* 'taking out and putting in', whose *nui-* component is derived from attaching the infinitive stem *-i* to the root of the verb *nug-un* 'to extract, take out'. Due to this elision, the path from *ukirun > *fukirun > *fugirun > *fuirun* can be seen.

Third, nasality on vowels in Taketomi are derived from an original intervocalic nasal consonant. As we know that the proto-form of *sjũ:* 'heart' was *kimo, the Pre-Taketomi form should be *simu. The palatalization occurs due to the illegality of the sequence *iu* and the loss of the *i* causes compensatory lengthening in the subsequent nasal vowel.

Fourth, an alternate form for *sju:ri* (or *sju:ru* in Maeara (2011)) 'fog' is recorded in Maeara (2011) as *kiruri*[13]. It is notable that this form is the only one that exists in the oldest source, Hirayama (1967).

Finally, Taketomi merged *ï to *i. Thus, extrapolating from the Hateruma and Ishigaki forms, the *i and *ui reflexes should both be reconstructed with *ï and the reconstructed Pre-Taketomi forms should be as in 12.

[10]Hirayama 1967 records this word as *pasi*. My field notes show *basi-nta*, which accords with Maeara (2011) (with a suffix that means 'side') and *basi* is the expected form as the proto-form was *waki (*w > *b in Sakishima), so the speaker could have had a rule that devoiced initial *b (and maybe other voiceless consonants) before a Vs environment. *wata 'cotton' in Taketomi is *bata* so the rule could not have applied before all voiceless obstruents. More likely is that *pasi* is a typographical error, due to the similar shapes of *p* and *b*.

[11]The details are not yet worked out for the environment in which intervocalic voicing occurs.

[12]Sakishima languages appear to mostly show a form beginning with *n* (ex. Ishigaki *nubi*), but a few languages, such as Taketomi, Kuroshima, and Ōura (a Miyako language) have forms corresponding to *kubi.

[13]While this form is certainly derived from the PJR word *kuiri 'fog', it appears there is extra material that I am currently unable to explain, as none of the other Yaeyaman languages show such a long word for 'fog'.

Figure 12: WOJ *ki* syllables in Pre-Taketomi

WOJ ki_1		WOJ ki_2	
'dress'	*s**ï**nu	'tree'	***ki:**
'heart'	*s**ï**mu	'to get up'	*u**ki**run
'to hear'	*s**ï**kun	'moon'	*sï**kï**
'breath'	*i**sï**	'fog'	***kï**ruri
'promontory'	*sa**sï**	'stem'	*fu**kï**
'side'	*ba**sï**[14]	'time'	*sï**kï**pïnicï[15]

Now, the Taketomi reflexes correspond neatly to the Hateruma ones. Crucially, the bottom four words in the *ki* column, which are reflexes of PJR *kui did not merge with the words in the first column, which are reflexes of PJR *ki, supplementing the Hateruma evidence that PJR *kui and *ki did not merge in Proto-Sakishima.

In looking at the Hateruma and Taketomi reflexes of Pellard's proposed *koi-gane, we see further evidence for *oi, due to the lack of the *ku > *hu* change for the words for 'gold'.

Figure 13: *oi in Taketomi and Hateruma

Gloss	PJR	WOJ	Hateruma	Taketomi	Ishigaki
cloth	***ki**nu	**ki**$_1$nu	**sï**n	**si**nu	**kï**nu
yellow	***koi**	**ki**$_2$	**kï**-nkï:	**si**-iru-san	**kï**-nsa:n
gold	***ko**-gane	**ku**-gane	**ku**-gani[16]	**ku**-ngani	**ku**gani
moon	*tu**kui**	tu**ki**$_2$	sï**kï**n	hi**ki**	tsi**kï**
tree	***kəi**	**ki**$_2$	**ki:**	**ki:**	**ki:**

Notably, the Taketomi word for 'yellow' and for 'moon' have different reflexes in the relevant syllables and furthermore, the Taketomi and Hateruma forms for 'yellow' cannot be derived from the same proto-form, suggesting that *oi has undergone different developments in the two languages.

I now return to the form for 'fog' in Taketomi, which is recorded in Hirayama (1967) only as *kiruri*, in my fieldwork notes as *sju:ri*, and in Maeara (2011) as *sju:ru*. In Proto-Sakishima *r appears to have become *s when following *TV$_{[+hi]}$, where T stands for a voiceless obstruent, as can be seen in the correspondences in Figure 14. This change will henceforth be called "r-fricativization". Once again, WOJ will be the model for Japanese, Shuri Okinawan will be the model for Northern Ryukyuan, and the remaining languages will stand in for in the Sakishima subgroup:

[14] I am unsure whether Taketomi *ə* should be reflective of a different proto-phoneme or whether this was an internal development. Due to lack of evidence for the former hypothesis, I proceed with the null hypothesis that there are no implications for the proto-language.

[15] *ï* is not allowed after nasals in any Sakishima language.

[16] This form is actually from Shiraho, a close sister language to Hateruma. The Hateruma form should be the same.

[17] My fieldwork notes have the form *tsu-mi*. The *da:ri* form recorded in Hirayama (1967) is a copular form used with adjectives, formed from the focus particle *=du* and the copula *a-*. *ts'u-mi* appears to be a dialectial variant. My consultant uses *ts'u-mi* with the existential verb *bu-*.

Figure 14: The Southern Ryukyuan Innovation of r-fricativization

Subgroup	Language	'to cut'	'to wear'	'white'
Japanese	WOJ	**ki**$_1$**r**-u	**ki**$_1$**r**u	**si**ro$_1$si
Okinawan	Shuri	**ci**-in	**ci**in	**si**ru-san
Miyako	Ōura	**kïs**-ï	**kïs**-ï	**ss**u-kan
Yaeyama	Ishigaki	**kïs**-ïn	**kïs**-ïn	**sïs**u-sa:n
	Taketomi	**ssj**-un	**ssj**-un	**ssj**u-san
	Hateruma	**ss**-un	**ss**-un	**ss**o-han
Yonaguni	Yonaguni	**ts'**-un	**ts'**-un	**ts**'u-da:ri[17]

Figure 14 demonstrates that all Southern Ryukyuan languages share this innovation. Furthermore, both Taketomi and Hateruma have syncopated *ï in between two instances of *s*, leaving a geminate that is palatalized in Taketomi but not in Hateruma. In Yonaguni, *s fortified to *c'*[18]. With regard to this change, we find a particular irregularity in the word for 'fog', whose forms are shown in Figure 15.

Figure 15: 'fog' in various JR languages

Subgroup	Language	'fog'
Japanese	WOJ	**ki**$_2$**r**i
Okinawan	Shuri	**cir**i
Miyako	Ōura	**kïs**ï
Yaeyama	Ishigaki	**kïr**u
	Taketomi	**kir**uri
	Hateruma	**kïs**ï
Yonaguni	Yonaguni	**c'ir**i

Except for in Ōura and Hateruma, the innovation of r-fricativization has failed to take place. Furthermore, while Hateruma *does* show *s*, it is notable that *kïs has *not* syncopated and geminated to *ss* as in the words in Figure 14. The reason becomes clear if we look to the original PJR reconstruction of 'fog' versus that of 'to cut' and 'to wear.' As discussed above, the word for 'fog' is reconstructed as *kuiri. If *ui and *i had merged by the time of Proto-Ryukyuan, the first three segments of 'to cut,' 'to wear,' and 'fog,' all of which begin with *k(u)ir- should have yielded the same outcome. It appears then that Hateruma and Ōura re-applied the rule of r-fricativization independently after the breakup of the subfamilies.

Crucially, because r-fricativization occurred across Sakishima only to reflexes of *ki and *not* to *kui, the diphthongs could not have merged at the time of Proto-Ryukyuan. Thus, we see that Taketomi and Hateruma are *not* the only Sakishima languages that demonstrate the lack of the *ui > *i merger proposed for Proto-Ryukyuan. Combining all the sound changes discussed, we may hypothesize that the changes occurred in the order in Figure 16. I use the term "Outer Yaeyaman" not to suggest a genetic grouping, but to point out sound changes that occurred in Taketomi and Hateruma and potentially as well in Yonaguni (although the same change in Yonaguni can be brought about by syncopating high vowels

[18] *c'* is an allophone of *ts'* that appears before *i*

between voiceless obstruents and subsequently assimilating the first consonant to the second and fortifying it, a process that is known to have occurred in Yonaguni).

Figure 16: Relevant sound changes in Sakishima

PJR	Proto-Sakishima		Outer Yaeyaman			
	*i > ï	*Tir > *Tis	Fricativization	*ks > s	*ui > *i	Vowel Raising
*kir-	*kïs-	*kïs-	*ksïs-	*sïs-		
*kuir(ur)i	*kuïr(ur)ï				*kïr(ur)ï	
*uke-						*uki-
*siru-	*sïsu-	*sïsu-				

	Taketomi					
	h-prothesis	Voicing	D Syncope	*ï > i	Palatalization	SiS Syncope
*sïs-				*sis-	*sisj-	ssj-
*kï(ru)rï				*kiruri		
*uki-	*huki-	*hugi-	hui-			
*sïsu-				*sisu-	*sisju-	ssju-

	Hateruma		
	Voicing	*Tïr > Tïs	SïS Syncope
*sïs-			ss-
*kï(ru)rï		kïsï	
*uki-	ugi-		
*sïsu-			ssu-

	Yonaguni				
	Voicing	SïS Syncope	*ï > i	Palatalization	Fortition
*sïs-		ss-			ts'-
*kï(ru)rï			kiri	ciri	c'iri
*uki-	ugi-				
*sïsu-		ssu-			ts'u-

*ui > *i must have happened *after* the split of Proto-Sakishima for had it occurred before, it would have bled the environment that fricativizes *ki but not *kui to *sï in "Outer Yaeyaman". Vowel raising must also have occured after the split, as it would have fed both the centralization and r-fricativization environments and *ukerun 'to get up' would end up as *ukïsun*. Moreover, raising also must occur after the *ui to *i merger; otherwise, we would expect PJR *kowe 'voice' to have become *kuwi > *kui > *ki*. However, 'voice' is consistently *kui* across the Ryukyuan languages. While it is unparsimonious to posit both monophthongization *and* vowel raising independently in the languages, they can both be considered areal features. First, there is a considerable dearth of diphthongs in Ryukyuan languages. Specifically in Sakishima, *ai*, *au*, and *aï* appear to be the only diphthongs allowed in Miyako, while only the former two are allowed in Yaeyama (and many have simplified *ai and *au to *e:* and *o:*, respectively, leaving no diphthongs), and only *ai* is allowed in

Yonaguni. Considering this paucity, it is not unfathomable that *ui could have merged with *i independently among the languages due to pressures to monophthongize. As the Ryukyuan islands were in relatively close contact with one another, vowel raising is also a feature that could have spread. The main empirical piece of evidence that points to monophthongization and vowel raising occuring late is the different reflexes of *kIr (where I can stand for *i, *ui, or *oi) environments in Sakishima languages.

4.3 Support for a Coronal Distinction?

As mentioned in § 3, i_1 and i_2 were only differentiated following labial and velar stops, providing little evidence for diphthongs following coronal stops from Old Japanese alone.[19] However, Sakishima languages may provide further hints for such diphthongs. Three words that correspond to WOJ words beginning in *ti* are provided below, using forms that are recorded in Hirayama (1967).

Figure 17: WOJ *ti-* words in Yaeyaman

Gloss	WOJ	Hateruma	Taketomi	Ishigaki
nipple	**ti**	**tsï**	**ci:**	**tsï:**
near	**ti**ka-	**sï**ka-	**ci**ka-	**tsï**ka-
power	**ti**kara	**sï**kara	**si**kara	**tsï**kara

If we consider that *ï > *i* in Taketomi (and subsequently led to palatalization of *ts > *c*), the comparison to the different reflexes of WOJ ki_1 and ki_2 becomes noticeably parallel. Following the same pattern as the *k(V)i examples, we might reconstruct these words with *ti, *toi, and *tui.

Figure 18: Comparing reflexes of WOJ *ki* and WOJ *ti*

PJR	Hateruma	Taketomi	Ishigaki
*ki	sï	si	kï
*koi	kï		
*kui		ki	

PJR	Hateruma	Taketomi	Ishigaki
*ti?	tsï	ci	tsï
*toi?	sï		
*tui?		si	

Later sources on Taketomi, including Nakamatsu (1987), Maeara (2011), and my own field notes record 'power' not as *sikara* but as *hikara*, 'near' not as *cika-* but as *ikka-*, and 'nipple' not as *cï:* but as *sï*. The first example can be explained as being at the tail end of the change outlined in § 4.2 of *sik > *hik*. The second example is more difficult to account for. *cika-* may be derived by regular sound change in Taketomi as outlined in the previous paragraph, though it may also be borrowed from Japanese, due to the perfect phonological match. As *ikka-* co-exists in the language, these two words may be an example of a doublet of a borrowing from a prestige language alongside a native word. How the first consonant is lost

[19] One hint, however, was apophonic vowel alternations in intransitive/transitive verb pairs, such as *otiru* 'to fall' ∼ *otosu* 'to drop'.

and where the gemination comes from remains puzzling. The third example will be discussed in more detail below. However, even with the revised correspondence, the Taketomi data still points to three different reflexes.

Figure 19: Revised Taketomi Correspondences

PJR	Hateruma	Taketomi	Ishigaki
*ti?	tsï	si	tsï
*toi?	sï	i	
*tui?		hi	

Unfortunately, these words may simply be irregularities that must be explained by another means as I have not yet been able to find other examples of WOJ *ti* corresponding with Taketomi *i* or *si/hi*. However, there are examples of WOJ *ti* also corresponding with both Taketomi and Hateruma/Shiraho *(d)zï*. In Figure 20, the left variants of 'nipple' in Hateruma and Taketomi are recorded by Hirayama (1967) while the right ones are recorded by Nakamatsu (1987) and Maeara (2011), respectively, and accord with my fieldwork notes. The Shiraho tokens are from my fieldwork notes.

Figure 20: Voiced Correspondences of *ti*

Gloss	WOJ	Hateruma	Shiraho	Taketomi	Ishigaki
blood	ti	dzï	zi[20]	si	tsḯ
nipple	ti[21]	tsḯ/dzḯ	sí/zí-ci	cí/sí	tsï

The atonic words show the voiced *(d)z* consonant in Hateruma/Shiraho whereas the tonic words appear to have variations. The voicing that occurs in 'blood' may be explained by the atonic root's having been perceived as a low tone, whereas 'nipple', which is tonic, was perceived as a high tone. This association would have triggered tonogenesis (see Haudricort 1954), a process which is hypothesized to be the source of the different tone classes of Hateruma (see Shinji and Aso 2012). Why the word for 'nipple' has become voiced more recently is a little unclear, but there may be analogy with the word for 'blood', due to the almost identical phonological shape apart from the tone and due to heavy bilingualism with Japanese, in which the two are still homophones apart from the tone ('blood' is *ci* whereas 'nipple' is *ci*). Unfortunately, this hypothesis is rather tenuous. Nevertheless, the development of the voicing in 'blood' via tonogenesis appears to be fairly certain.

Why 'blood' in Taketomi begins with *s* is less clear, but it is possible that the pitch accent plays a role. The lack of an accent on the word may have led to lenition from an affricate to a fricative. Another example of initial *s* corresponding to *ts* in Ishigaki and *t* in WOJ is *sja* 'tea', which also happens to be unaccented. However, whether lenition in atonic words beginning with the affricate *c* is a productive rule is unclear. Once again, similarly to Hateruma and Shiraho, it is possible that the more modern token for 'nipple' *sí* is also derived from analogy with 'blood'.

[20]Shiraho is on the way to merging *ï* to *i*, as Taketomi has already done.

[21]Accent was not marked in Old Japanese. However, modern standard Japanese has 'blood' as a tonic word and 'nipple' as an atonic word, corresponding with the Yaeyama distribution.

Another coronal distinction that is possibly revealed by Sakishima languages is the environment following PJR *s. Just like *t*, *s* is also a coronal consonant and so there was no *koo/otsu* distinction for a following *i* in Old Japanese. If we look at Sakishima words that correspond to words beginning with *sir* in WOJ, we see two different correspondences, as laid out in Figure 21.

Figure 21: WOJ *sir* syllables in Ryukyuan

Subgroup	Language	'white'	'louse'	'soup, sap'	'sign, omen'
Japanese	WOJ	**si**ro$_1$-si	**si**rami	**si**ru	**si**rusi
Okinawan	Shuri	**si**ru-san	**si**ran	**si**ru	**si**rusi
Miyako	Gusukube	**ss**u:-ssu	**sï**sam	**sï**ru	**sï**rusï
Yaeyama	Ishigaki	**sïs**u-sa:n	**sï**san	**su**ru	**si**rusï
	Taketomi	**ssj**u-san	**ssj**an	**si**ru	**si**rusi
	Hateruma	**ss**o-han	**s**an[22]	**s**u:[23]	**sï**rusï
Yonaguni	Yonaguni	**ts'u**-da:ri	**ts'**an	**c'i**ru	**c'i**ruc'i

The latter two words, like 'fog', have *not* undergone r-fricativization unlike the first two. By the same logic, then, we might posit that the second two words began with *sui rather than *si, just as 'fog' was known to begin with *kui instead of *ki.

We can also observe the behavior of Sakishima *pIr (where I stands for *i, *ui, or *oi) sequences. The corresponding forms are presented in Figure 22.

Figure 22: *pIr sequences in various JR languages

Subgroup	Language	'wide'	'afternoon'	'flat'	'to pick up'	'to dry'
Japanese	WOJ	**pi$_1$r**o$_2$-si	**pi$_1$r**u	**pi$_1$r**ata-	(ModJ: **hi**ro-u)	**pi$_2$r**u
Okinawan	Shuri	**hir**u-san	**hir**u-ma	**hir**a-san	-	**hi**-in
Miyako	Hirara	**pïs**u:-pïsu	**pis**u-ma	-	-	-
Yaeyama	Ishigaki	**pïr**u-saan	**pïr**o:-ma	**pïs**a-sa:n	**pïs**a-un/**pï**so:-n	**pïs**-un
	Taketomi	**hir**u-san	**pir**õ:	**pisj**a-san	**ssj**-un	**ssj**-un
	Shiraho	**pis**o-han	**pir**o:-ma	**pis**a-han	**pis**-un	-[24]
Yonaguni	Yonaguni	**c'**-an	**ts'**u-ma	**ts'**a-nda	-	-

Unfortunately, there does not quite seem to be systematicity in the patterning of where we see r-fricativization and where we do not. We would expect *poi to avoid r-fricativization by the same pattern as *kui and our proposed *sui syllables, but it seems that the *opposite* of what we expect occurs; namely, that there are actually some *pi syllables that avoid r-fricativization. Furthermore, why 'wide' undergoes r-fricativization in Shiraho, but 'afternoon' does not is also unclear. There may be interactions with accent, but due to the work on Ryukyuan accent still being young, I leave this question to further research.

[22]The Shiraho word is *ssan*, so the Hateruma word should also be the same. It is possible that the recorder did not hear the gemination.

[23]I cannot explain why the *r has dropped out, but the crucial fact is that the initial *s* is not geminated. More internal reconstruction on Hateruma/Shiraho must be carried out to solve this question.

[24]The word for drought, *pe:ri*, is likely related to the expected cognate.

Before concluding, I draw the reader's attention to the Taketomi words for 'to pick up' and 'to dry', both *ssj-un*. These forms are exactly identical to the words for 'to cut' and 'to wear' and very similar to 'white' (*ssju-san*). It should also be mentioned that Maeara (2011) cites *ssju-san* as also meaning 'wide'. It seems then that there was a process by which Taketomi turned Proto-Sakishima *TIrV$_{[+back]}$ sequences into *ssju-*. The modern form of 'fog', *sju:ri* then falls into this sound change as well, although it is unclear why the *s* is ungeminated.

Figure 23: Fricativization in Taketomi

	'to cut'	'to wear'	'fog'	'white'	'to pick up'	'wide'	'to dry'
PJR	*kir-	*kir-	*kuiri	*siro	*pirap-	*piro	*poi-
Taketomi (1967)	ssj-un	ssj-un	kiruri	ssju-san	?	hiru-san	?
Taketomi (2011)	ssj-un	ssj-un	sju:ri/u	ssju-san	ssj-un	ssju-san	ssju-n

The fricativization process here tells us that *kui and *p(u)i were both initially resistant to fricativization. We are unfortunately missing the 1967 data points for 'to pick up' and 'to dry', but we may surmise based off 'wide' that they are *hira-un (or *hiro-on if crasis already occurred) and *pir-un (or *pis-un if there was already r-fricativization as in the word for 'flat'). Still, there is no explanation for why 'afternoon' has resisted fricativization. I leave this as a puzzle to be resolved with future reconstruction work.

5 Conclusion

The data presented here provides supporting evidence for Pellard's proposed *oi diphthong and also adds evidence to Pappalardo's claim that the merger of *ui and *i could not have happened at the time of Proto-Ryukyuan. The data from Taketomi matches that of the Hateruma data presented by Pappalardo once sound changes are undone, suggesting that the two languages underwent parallel development and could suggest a possible genetic relationship. At the very least, the two languages appear to share similar innovations with each other and even with Yonaguni, a language that forms a clade with Yaeyaman. The implications are at the very least heavy contact at some point between the varieties.

Due to shared innovations in both Proto-Sakishima and Proto-Yaeyaman (see Pellard 2015 for details), it would be implausible to suggest that Taketomi and Hateruma branched off from Proto-Ryukyuan early before *ui and *i merged. Furthermore, I have demonstrated as well that sequences corresponding to Old Japanese *Ti$_{(2)}$r* show different reflexes in Sakishima, which had a rule of r-fricativization to *s*, revealing that most, if not all, Sakishima languages provide vestiges of a lack of merger between *ui and *i even as late as the separation of the Sakishima subfamilies into separate languages. I suggest, then, that the monophthongization of *ui to *i* is the result not of an innovation by Proto-Ryukyuan or even by Proto-Sakishima, but rather of a conspiracy in Ryukyuan languages to rid of diphthongs, as suggested by the poor diphthong inventories (ranging between 0 and 3) of most, if not all, Sakishima (and potentially Ryukyuan) languages.

The lack of merger is particularly revealing in potential implications for the reconstruction of Proto-Japono-Ryukyuan, particularly of words for which the Old Japanese forms do not

provide information as to whether they should be reconstructed with a diphthong or not. Namely, because i_1 and i_2 were undifferentiated following coronal consonants by the time of Old Japanese, Sakishima languages provide clues for *tVV and *sVV (where VV stands for a diphthong) via the failure of r-fricativization to apply. It is, of course, not implausible that there may be an interaction with accent that determines whether r-fricativization takes place. However, as Ryukyuan accentual reconstruction remains in a relatively nascent state (see Matsumori 2008 and Shimabukuro 2007 for the current work), I leave the investigation of the interaction with accent to future work.

Further work must be carried out to find more examples of phonological processes failing to take place and to discover the implications for Proto-Japono-Ryukyuan. As Old Japanese lost the distinction between i_1 and i_2 following coronal consonants, it is particularly difficult to reconstruct diphthongs for nouns in which WOJ *Ci* (where C is a coronal consonant) was either not the initial syllable (and so could not trigger apophony) or did not form compounds. Future attempts should be made to search for potential evidence of correspondences to o_1 and o_2 after labial consonants as they were not differentiated in these environments in Old Japanese.

Ryukyuan languages provide a wealth of data preserving features that have been lost in Japanese and I have shown that Sakishima provides evidence of these features, which happen to have also been lost in Northern Ryukyuan. In the process of internal reconstruction of the individual languages, many of which remain to be described in sufficient detail, more light will be shed on the puzzles of Ryukyuan subgrouping and reconstruction of the proto-languages.

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