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Shimoji, Michinori
RSPAS, Australian National University

<https://hdl.handle.net/2324/7342424>

出版情報：思言：東京外国語大学記述言語学論集. 2, pp.21-40, 2007-01-31. 東京外国語大学地域文化
研究科・外国語学部記述言語学研究室
バージョン：
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Michinori Shimoji

RSPAS, Australian National University

Key words: syllable structure, Ryukyuan, semi-consonant, fricative vowel

1. Introduction

The aim of this study is to present a comprehensive description of the syllable structure of Irabu Ryukyuan¹, a dialect of Southern Ryukyuan language. As compared with the apparent emphasis on the diachronic phonology in previous studies (e.g. Motonaga 1982; Nakama 1983), the synchronic phonology has been poorly explored in Irabu Ryukyuan. Above all, the syllable structure, which is the heart of the phonological description, has never been discussed in any detail. This study will aim to fill this major gap in the literature, and give the first comprehensive description of the syllable structure of Irabu Ryukyuan, with an exclusive focus on its synchrony. This attempt will lead us not only to depict typologically interesting natures of Irabu Ryukyuan, but to suggest new solutions for an issue which has been discussed extensively in the literature of the Ryukyuan phonology: how to treat the so-called ‘central vowel’, or ‘fricative vowel’ in Irabu Ryukyuan, which has always been argued in terms of whether it is a vowel phoneme or a consonant phoneme.

The present study will be organized as follows: in Chapter 2, a preliminary sketch of the segmental phonology will be offered. In Chapter 3 I will proceed to describe the syllable structure of Irabu Ryukyuan. In Chapter 4 I will discuss the problems of the so-called ‘central vowel’ in terms of the syllable structure as identified in this study. In Chapter 5 conclusions will be drawn.

2. Preliminaries

In this chapter I will give a phonological overview of Irabu Ryukyuan. I will first present the phonological categories which are relevant in the description of the phonology of Irabu Ryukyuan, then list the phoneme inventory.

2.1. Phonological categories

Irabu Ryukyuan distinguishes thirty eight phonemes. As is shown in (1) below, these phonemes fall into two primary phonological categories, i.e. syllabic phonemes and non-syllabic phonemes, in terms of the ability to serve as a syllable nucleus. Among syllabic phonemes a further distinction is made between **vowels** (/a, i, u, e, o/) and **semi-consonants** (/m, n, v, z, r/), on the basis of the fact that vowels only function as a syllable nucleus, while semi-consonants may function both as a syllable nucleus and as a syllable margin (onset/coda), by havintypes of

¹ By Irabu Ryukyuan I will mean Sawada-Nagahama dialect, unless otherwise specified. On Irabu Island there are four language varieties identified, three from dialects of Irabu Ryukyuan (Sawada-Nagahama dialect, Kuninaka dialect, and Irabu-Nakachi dialect), and one from (arguably) Ikema Ryukyuan (Sarahama dialect).

allophones². Non-syllabic phonemes only function as syllable margins, and will be called **consonants** in this study. They are made up of all the other phonemes than vowels and semi-consonants.

(1) Phonemes in Irabu Ryukyuan and their sub-categorization

			Nucleus	Margin
Phonemes	syllabic	vowels	+	-
		semi-consonants	+	+
	non-syllabic	consonants	-	+

Following general linguistics' wisdom, this study assumes that vowels and consonants are defined phonologically and not phonetically. Namely, it is syllabicity which is a defining factor of vowels and consonants (see, for example, Pike 1943 and Laver 1994). In light of this assumption, there are a few phonemes in Irabu Ryukyuan which may not be analysed as either category: those phonemes whose allophones may appear both as a nucleus and as a syllable margin. I call these semi-consonants, as the third phonological category. Semi-consonants include /m, n, v, z, r/. It is noted here that /z/ has been referred in Ryukyuan linguistics as 'central vowel' (with a friction like [z]), with an implication that it is a vowel. The phonological/phonetic aspects of /z/ are somewhat intricate, and will be discussed in Chapter 4.

2.2. Phoneme inventory

The phoneme inventory of Irabu Ryukyuan is listed as follows.

(2) Inventory of phonemes (in a practical orthography)

a. Syllabic phonemes (~ indicates free variation; / indicates conditioned allophony)

Vowels		Semi-consonants
<i>i</i>	<i>u</i> ([u]~[ʊ])	<i>m, n</i>
<i>(e)</i>	<i>(o)</i>	<i>v</i> ([v]/[ʋ]), <i>z</i> ([z]/[^(z/s/ø) ɹ])
<i>a</i>		<i>r</i> ([r]/[ɾ]~[ɽ])

b. Non-syllabic (consonant) phonemes

<i>p, b</i>	<i>pj, bj</i>	<i>t, d</i>	<i>tj, dj</i>	<i>kj, gj</i>	<i>(kw), (gw)</i>	<i>k, g</i>
		<i>ts, dz</i>	<i>tsj, dzj</i>			
	<i>mj</i>		<i>nj</i>			
			<i>(rj)</i>			
	<i>f</i>	<i>s</i>	<i>sj</i>	<i>(hj [ç])</i>		<i>(h)</i>
			<i>j</i>	<i>(w)</i>		

Semi-consonants may show a conspicuous allophonic variation depending on its positioning

² The term was already suggested by Karimata (2002: 111) in discussing syllabic consonants in Miyako dialects, for those phonemes which 'behave like a vowel in a sense that they function as a syllable nucleus'.

within a syllable, while other phonemes show little allophonic variation.

[ɺ] is a symbol covering an approximant/fricative produced by the tongue ridge rising up toward the passive articulator (the alveolar through to the palato-alveolar), to the extent that a friction noise may obtain (see Chapter 4).

Palatal/palatalised phones are treated as single phonemes, rather than phoneme clusters. This solution maximally simplifies the description of syllable structure, as will be discussed in 3.2.3.

Phonetic length is phonemic (short/long). Long vowels and long semi-consonants are described as underlying vowel/semi-consonant sequences, and represented by doubling the same letters: /kagi/ [kagi] ‘good’ vs. /kaagi/ [ka:gi] ‘smell’; /mna/ [m̥na] ‘shellfish’ vs. /mmna/ [m̥:na] ‘all’.

3. Syllable structure of Irabu Ryukyuan

This chapter sets out to describe the syllable structure of Irabu Ryukyuan. Traditionally, this topic has been so poorly explored in the literature that we simply cannot argue for or against the few scattered descriptions (For the most detailed description, see Motonaga 1982). Rather I will give an independent description in the sections below. First I will describe the structural aspect of syllables (i.e. how many margins and nuclei are possible in what kind of positioning) in 3.1, then the phonotactic aspect of syllables (i.e. what kind of phonemes may or may not go into such margins/nuclei) in 3.2.

3.1. Structural aspects of syllables

A word (i.e. a phonological word, as defined in terms of phonological delimitation³) is composed of syllables of varying structures. Thus in the following examples, each phonological word (morphologically simple or complex) involves a different syllable structure (C indicates a syllable margin; N indicates a syllable nucleus):

(3a) /bikidum/ [bikid̥um] ‘man’ (CN.CN.CNC)

(3b) /kuvva/ [k̥vva] ‘thigh’ (CN.CCN)

(3c) /sjsjanakatam/ [ʃʃanakatam] ‘was dirty’ (CCN.CN.CN.CNC)

³ The phonological word in Irabu Ryukyuan is defined according to the following criteria. 1) the phonological word has only one pitch peak (see 3.1.3); 2) the phonological word must be a unit of utterance; 3) the phonological word must have at least two moras (see 3.1.2); 4) the phonological word may begin with an onset cluster of up to two phonemes, and may end with a single coda, with the possible word-medial margin clusters of up to three phonemes (see 3.1.2). On the other hand, the word is also defined grammatically, i.e. we can define the grammatical word. It is defined morphologically and semantically: 1) the grammatical word is composed of a specific set of morphemes, with a fixed order; 2) the grammatical word contains inflectional endings; 3) the grammatical word has a conventionalised meaning. The phonological word and the grammatical word often define the same unit, but not always so. The grammatical word is a morphological unit, so it is given a particular word class (noun, verb, particle, etc.). For discussions on the distinction between the phonological word and the grammatical word in linguistics, see Anderson (1985) and Dixon and Aikhenvald eds. (2002). For the notion word in Irabu Ryukyuan, see Shimoji (2006b).

(3d) /ffattam/ [ffattam] ‘did not bite’ (CCN.CCNC)

(3e) /brbrgassa/ [b|b|:gassa] ‘alocasia odora’ (CN.CNN.CN.CCN)

Though the whole syllable structure of phonological words differs, a given phonological word may be described in terms of a single basic syllable, which clusters and builds up different phonological words. Thus it is appropriate for us to take a ‘bottom-up’ approach, where the definition of the basic syllable is offered first in 3.1.1 below, then the description is made of the syllable structure of the whole phonological word in 3.1.2 below.

3.1.1. Basic syllable as material for a word

(4) below is a schematic representation of the basic syllable in Irabu Ryukyuan. As is shown in (4), the maximal number of moras in a single syllable is four, with (C1)N1, N2, C2 and C3 having one mora. The presence of C2 is dependent on that of C1. Thus we have the possible onsets C1 and C2C1 but not *C2 without C1.

(4) Basic syllable of Irabu Ryukyuan

((C2) C1) N1 (N2) (C3)

Key: Each underlined component has one mora

C indicates syllable margins (C2/C1: onset; C3: coda)

N indicates syllable nucleus (N= vowels or semi-consonants)

(5) Examples (=3)) (N.B. dots indicate syllable boundaries and are not orthographically relevant)

a. /bi.ki.dum/ [bikid̥um] ‘man’ (C1N1.C1N1.C1N1C3)

b. /ku.vva/ [k̥ovva] ‘thigh’ (C1N1.C2C1N1)

c. /sjsja.na.ka.tam/ [ʃʃanakatam] ‘was dirty’ (C2C1N1.C1N1.C1N1.C1N1C3)

d. /ffa.ttam/ [ffattam] ‘did not bite’ (C2C1N1.C2C1N1C3)

e. /br.br.ga.ssa/ [b|b|:gassa] ‘alocasia odora’ (C1N1.C1N1N2.C1N1.C2C1N1)

As is shown in (6) below, the difference in nucleus type (vowel or semi-consonant) considerably affects the syllable structure and the possible positioning of the syllable in a phonological word.

(6) Nucleus type and syllable structure

Nucleus type	Syllable structure	Permissible position of the syllable in a word		
		Initial	Medial	Final
a. Vowel:	((C2)C1) N1(N2)(C3)	OK	OK	OK
b. Semi-Consonant (/z/):	(C1) N1(N2)(C3)	OK	OK	OK
c. Semi-Consonant (/r/):	(C1) N1(N2)	OK	(OK)	*
d. Semi-Consonant (/m, n, v/):	N1(N2)	OK	*	*

While vowel nuclei have a full range of syllable margins, semi-consonant nuclei have a restricted set of syllable margins; while the syllable of vowel nuclei can appear in word-initial, medial, and final positions, that of semi-consonant nuclei mostly appear in the word-initial position, except for /z/ (and /r/ in very rare cases). Below are the examples of semi-consonant nuclei (a: word-initial; b: word-medial; c: word-final).

(7) Semi-consonant nucleus (/z/)

- a. /mz.taar/ [m^(z)ta:] ‘three persons’ (C1N1.C1N1N2C3)
- b. /sa.tu.bz.tu/ [satɔb^(z)tu] ‘neighbour’ (C1N1.C1N1.C1N1.C1N1)
- c. /su.ku.bz/ [sɔkɔb^(z)] ‘belt’ (C1N1.C1N1.C1N1)

(8) Semi-consonant nucleus (/r/)

- a. /mrr.na/ [mɾ:na] ‘green chive’ (C1N1N2.C1N1)
- b. /na.brr.kja/ [nabɾ:kja] ‘slippery’ (C1N1.C1N1N2.C1N1)

(9) Semi-consonant nucleus (/m/)

- /m.ta/ [m̥ta] ‘mud’ (N1.C1N1)

(10) Semi-consonant nucleus (/n/)

- /n.vu/ [n̥v] ‘pull out’ (N1.C1N1)

(11) Semi-consonant nucleus (/v/)

- /v.da.mu.nu/ [vdamɔnɔ] ‘thick’ (N1.C1N1.C1N1.C1N1)

In compounding, the syllable whose nucleus is /v/ may exceptionally appear word-medially, as in /m.tsz.v.sa/ [m̥tsɔvsa] ‘dawdling’ (N1.C1N1.N1.C1N1; *mtsz+fusa*) and /mmi.v.tsz/ [mmiɔtsɔ] ‘chest’ (C2C1N1.N1.C1N1; *mmi+ vtsz*).

3.1.2. Syllable structure of a phonological word

The basic syllable ((C2)C1)N1(N2)(C3) constructs a phonological word. Given this basic syllable structure it follows that, as shown in (12) below, a phonological word may begin with an onset of up to two phonemes, and may end with one coda; word-medially a cluster of up to three margins (C3.C2C1) is possible.

(12) Syllable margins in the phonological word

Initial	Medial	Final
#((C2)C1)	(C3).((C2)C1)	(C3)#

Key: # indicates a phonological word boundary

. (dot) indicates a syllable boundary

(13) Examples

- a. /ka.na.mar/ [kanama] ‘head’ (C1N1.C1N1.C1N1C3; 4 moras)
- b. /a.vva/ [awa] ‘oil’ (N1.C2C1N1; 3 moras)
- c. /ar.fu/ [af]~[afu] ‘walk’ (N1C3.C1N1; 3 moras)
- d. /ssan/ [san] ‘not know’ (C2C1N1C3; 3 moras)
- e. /ssai.ttam/ [sarttam] ‘could not know’ (C2C1N1N2.C2C1N1C3; 6 moras)
- f. /tur.tsjtsjaa.ki/ [tu[tt]a:ki] ‘taking (contemporaneous converb)’
(C1N1C3.C2C1N1N2.C1N1; 6 moras)

A phonological word must be minimally bimoraic, i.e. must have at least two moras, which is a typical requirement for the phonological word in many languages (Olawsky 2002: 211). Thus a monosyllabic word must have either of the following syllable structures: C2C1N1 (2 moras), C1N1C3 (2 moras), N1N2 (2 moras), C1N1N2 (2 moras), C2C1N1C3 (3 moras), N1N2C3 (3 moras), C1N1N2C3 (3 moras), C2C1N1N2 (3 moras), and C2C1N1N2C3 (4 moras). *C1N1 and *N1, which have only one mora, are impermissible for a monosyllabic phonological word.

3.1.3. Syllable structure and pitch assignment

In Irabu Ryukyuan, intonation gives rise to a certain pitch patterns, and the domain of these pitch patterns is the phonological word. Pitch does not have a contrastive function, though it helps delimit the phonological word boundaries. Pitch assignment is thus explained in terms of phonological word, and sensitive to both concepts of syllable and mora:

(14) Pitch assignment: constraints

- a. Within a phonological word, pitch may rise and/or fall only once (i.e. there is only one pitch peak).
- b. Pitch may rise between syllable boundaries, but not within a syllable.
- c. Pitch may fall between syllable boundaries; pitch may fall within a syllable only if that syllable is word-final.

(15) Pitch patterns: general principles

- a. Falling pitch may occur between the second and the third mora of the phonological word.
- b. If the word has two moras, then pitch may fall between the first and the second mora

In Irabu Ryukyuan a single phonological word may allow several different pitch patterns. However, it does not mean that pitch is assigned arbitrarily: there is a strong constraint on pitch assignment as defined in (14), and if it is satisfied, the pitch is assigned according to (15). Thus, in each of the following examples, several pitch patterns are observed, all following the

constraints in (14) and (15):

(16a) /maa.su/ ‘solt’	(16b) /nn.ku/ ‘pus’	(16c) /ni.waa/ ‘garden’
HH.H	HH.H	H.HH
HH.L	HH.L	H.HL
LL.H	LL.H	L.HL

Given that the constraints in (14) precede those in (15), (15) is not always satisfied. This happens, for example, when the place between the second and the third mora is within the word-medial syllable. According to (15a), we expect that pitch may fall at this position; however, (14c) blocks this. That is, a phonological word cannot have falling pitch between the second and the third mora if this results in the violation of (14c). Thus a phonological word /tuur.guu/ ‘trans-pond’ consists of five moras, but the pitch cannot fall between the second (/u/) and the third mora (/r/), which results in a falling pitch within a word-medial syllable. Instead the pitch falls between the third mora and the fourth mora, which does follow (14c).

If a putative phonological word has two pitch peaks, which violates (14a), it is not a single phonological word, and must be composed of two separate phonological words. This frequently occurs in compounding, where stems are distinct phonological words⁴:

(17a) /bi.ki.dum.vva/	(17b) /ka.na.mar.jam/
H.H.LL.HL	H.H.L.L.H.L
bikidum+ffa	kanamar+jam
man+child	head+disease
‘son’	‘headache’

Note that in (17b) /r/ and /j/ are adjacent at the syllable boundary (C3.C1). As will be shown in 3.2.5, this combination violates the phonotactics of the phonological word. This supports our analysis that (17b) is not a single phonological word and consists of two phonological words.

3.1.4. Phonological word of morphologically complex structure

The phonological word in Irabu Ryukyuan mostly consists of one to three syllables, though there are some words of more than three syllables. The longer the phonological word, the more likely it is to have a morphologically complex structure with compounding and/or affixation.

(18) Compounding

a. /mii.vva/ [mi:uva] ‘daughter’ (C1N1N2.C2C1N1)

⁴ See, for example, Dixon (1988), which describes that the similar situation obtains in Boumaa Fijian: a compound may consist of two phonological words, each of which is a stem of the compound (sáranúá ‘tourist’ < sára ‘look’ +vanúá ‘at place’).

- (*mii* ‘woman’ + *ffa* ‘child’)
 b. /u.ku.ga.ma.tsz/ [ʊkʊgamatsɿ] ‘sulky look’ (N1.C1N1.C1N1.C1N1.C1N1)
 (*uku* ‘big’ + *kamatsz* ‘cheek’)

(19) Affixation

- a. /miir/ [mi:] ‘look’ (C1N1N2C3; *mii*- ‘look (root)’ -*r* ‘(non past)’)
 b. /mii.sz.mi.tam/ [mi:sɿmitam] (C1N1N2.C1N1.C1N1.C1N1C3)
 ‘did not make (someone) write’
 (*mii*- ‘look (root)’ -*szmi* ‘(causative)’ -*tam* ‘(past)’)
 c. /mii.sz.mi.rai.bu.sz.ka.tam/ [mi:sɿmirabʊsɿkatam]
 (C1N1N2.C1N1.C1N1.C1N1N2.C1N1.C1N1.C1N1.C1N1C3)
 ‘wanted to be forced to make myself look’
 (*mii*- ‘look (root)’ -*szmi* ‘(causative)’ -*rai* ‘(passive)’ -*busz* ‘(adjectivalizer)’ -*ka*
 ‘(adjective stem expander)’ -*tam* ‘(past)’)

No matter how many affixes are attached to a root, the overall string of morphemes is a phonological word: affixes (but not clitics) are always *inside* the phonological word. In other words, affixes never break down the syllable structure of the phonological word as defined in (12) above. Thus (19c), which consists of as many as eight syllables, is a single phonological word, the whole syllable structure of which perfectly follows that of the phonological word as defined in (12) above. Note also that (19c) has only one falling pitch, which is a necessary condition for a phonological word (see footnote 3, and (14a) above).

On the other hand, attachment of a clitic to its host may often break down the syllable structure of a phonological word as defined in (12): clitics appear *outside* the phonological word. For example, a phonological word *miir* (*mii*-*r*) ‘look’ as in (19a) may be followed by an enclitic =*m*, together constituting a morphological string *mii*-*r*=*m* ‘look (finite form)’. Here, the attachment of =*m* results in a coda cluster at the end of the ‘word’, and breaks down the coda restriction of a phonological word. We assume then that there is a phonological word boundary between *mii*-*r* and =*m* (#*mii*-*r*#*m*; #C1N1N2C3#C). It is at the same time noted that =*m* is not a phonological word on its own, since it only has one mora (see 3.1.2). It is just a phonologically bound extra attachment to the preceding phonological word⁵.

3.1.5. Syllable structures of roots

Different roots (nominal, adverbial, adjectival, and verbal) differ in the syllable structure. Since Irabu Ryukyuan mostly involves suffixation rather than prefixation, roots are mostly in the left-most position of the phonological word.

⁵ On the other hand, clitics may often be an independent grammatical word. For example, many discourse-oriented bound morphemes such as =*du* (focus) are phonologically clitics but independent grammatical words, and constitute a word class called discourse marker (Shimoji 2006a).

(20) Different roots and syllable structure: examples

- a. Nominal: /ka.na.mar/ [kanama] ‘head’ C1N1.C1N1.C1N1C3
- b. Adverbial: /mjma/ [mma] ‘well (a filler)’ C2C1N1
- c. Adjectival: /ta.ka/ [taka] ‘high’ C1N1.C1N1
- d. Verbal: /ka.k/ [kak] ‘write’ C1N1.C1

Nominal roots and adverbial roots may function as a phonological (and grammatical) word by itself, therefore always end either with N1, N2, or C3, at the syllable boundary. On the other hand, verbal and adjectival roots must require further morphological elaboration to appear as a phonological (and grammatical) word. Thus as in (20d) above, verbal roots may end with C1, which is a part of the following syllable. However, adjectival roots, though morphologically bound, always end at the syllable boundary, just as nominal/adverbial roots do. In this sense, adjectival roots have more independence than verbal roots in terms of the syllable structure.

(21) Root types and the syllable structure

	Phonological word?	Typical length (syllable/mora)	End at syllable boundary?
a. Nominal/adverbial	OK	2/2-4	OK
b. Adjectival	*	2/2-3	OK
c. Verbal	*	1/2	May end with C1

Verbal roots are classified in terms of whether the root ends at the syllable boundary. TYPE 1 always ends at the syllable boundary, ending either with N1, N2, or C3; TYPE 2 ends with C1, which is the onset of the following syllable. Below I will list bimoraic verbal roots, which are typical in TYPE 1, and monomoraic verbal roots which are typical in TYPE 2:

(22) Typical verbal roots

	Syllable structure	Root	Word form (finite intentional)
a. TYPE 1: C1N1N2	(C1)N1.C1N1	mii- ‘look’	mii-di
		nii- ‘boil’	nii-di
		fii- ‘give’	fii-di
		u.ti- ‘drop’	uti-di
		n.tsi- ‘put’	ntsi-di
		sz.ti- ‘throw’	szti-di
b. TYPE 2: (C1)N1.C1		as- ‘do’	as-u-di
		ka.k- ‘write’	kak-a-di
		pa.r- ‘leave’	par-a-di
		pz.k- ‘pull’	pzk-a-di
		tu.b- ‘fly’	tub-a-di

As is indicated above, the intentional finite verb form (which is both a phonological and a grammatical word) is produced by attaching the inflectional suffix *-di* to the stem. Note here that in TYPE 1 the root directly takes the inflectional suffix, i.e. the root functions as a stem, while the root of TYPE 2 must take a vowel morpheme (here *-a*, or its allomorph *-u*) to carry the inflectional suffix, i.e. the root must be turned into a stem by attaching a vowel. Thus in TYPE 2, the stem ends with C1N1 (at the syllable boundary) with *-a* (N1) forming a syllable with the root-final C1. In terms of the syllable structure, therefore, it is pointed out that whether a given root is TYPE 1 or TYPE 2, the stem must end at the syllable boundary. Given that nominal, adverbial, and adjectival roots, all of which end at the syllable boundary, directly function as a stem, a generalisation is made that all the stems in Irabu Ryukyuan must end at the syllable boundary.

3.2. Phonotactic aspects of syllables

In this section I will describe the phonotactic aspects of syllables, i.e. what type of phonemes may and may not go into the structural schema as identified in 3.1.

3.2.1. Nucleus

In Irabu Ryukyuan, both vowels and semi-consonants may go into the syllable nucleus slot.

(23) Vowel nuclei

- a. N1: /a, i, u, (e), (o)/
- b. N1N2: /aa, ii, uu, (ee), (oo)/; /ai, au, (ae), (ao), ui, (ue)/⁶

(24) Consonant nuclei

- a. N1: /m, n, v, z, r/
- b. N1N2: /mm, nn, vv, zz, rr/

3.2.2. Single onset C1

Restrictions on C1 differ depending on nucleus type and the position in a word.

(25) Vowel nucleus

- a. Word-initially, C1 must not include /z/, /v/, and /r/, although they may appear in C2C1 clusters (/zz/, /vv/, and /rr/).
- b. Word-medially and finally, any consonant and semi-consonant phonemes may appear as C1, though /w/, /kw/, and /gw/ are highly restricted. We find these C1's mostly in loans such as numerals /kwai/ (as in /san.kwai/ 'three times').

⁶ Within a phonological word, /i/ followed by /u/ and /a/ turns into /juu/ and /jaa/ respectively. Thus a verb stem *kaki* 'write' and the progressive auxiliary *ur* compose a single phonological word *kakjuur* rather than **kakiur*. Across the phonological word boundary it is possible to get /i.u/ and /i.a/, as in a phrase *mmedi ur* 'still exist' (a phonological word *mmedi* 'still' followed by another phonological word *ur* 'exist') which never turns into **mmedjuur*.

(26) Semi-consonant nucleus (only /z/ and /r/ may carry C1)

- a. As for /z/, C1 must be /p, b, m, s, ts, dz/
- b. As for /r/, C1 must be /p, b, m/

3.2.3. Onset cluster (C2C1)

C2C1 must be carried by vowel nuclei. C2C1 must be a geminate. The set in (27a) below may appear word-initially as well as word-medially, while the set in (27b) only appear word-medially.

(27) C2C1

- a. Word-initial/medial: /tt, ttj, tts, ff, vv, ss, sjsj, mm, mjmj, nn, zz, rr/
- b. Word-medial: /pp, pj, kk, kj, (kwkw), tsjtsj, njnj/

Below are those examples of word-initial C2C1 clusters:

(28) Word-initial C2C1 clusters in Irabu Ryukyuan

a. /tar/ [t ² tar]	b. /tjtaa/ [t ² t ² aa:]	c. /ttsi/ [t ² t ² fi]	d. /ffa/ [ffa]
‘came’	‘then’	‘put on (imperative)’	‘child’
e. /vva/ [uva]	f. /ssam/ [ssam]	g. /sjsjana/ [j ² ana]	h. /mma/ [mma]
‘you’	‘lice’	‘dirty’	‘mother’
i. /mjmja/ [mm ² ja]	j. /nnama/ [nnama]	k. /zza/ [zza]	l. /rra/ [lla]
‘(filler)’	‘now’	‘father’	‘placenta’

Palatal/palatalised phones (e.g. [j]) are treated as single phonemes (/sj/) rather than phoneme clusters (/s+/j/), in order to maximally simplify the description of syllable structure. For example, if we follow the latter approach, [ʃʊ:] ‘grandfather’ would be phonemically represented as /s j u u / (C2C1N1N2), and we would admit two types of C2C1: 1) geminate C2C1 where C2 sustains one mora; 2) non-geminate C2C1 where C2 does not sustain one mora. 2) is unnecessary as long as we analyse [ʃʊ:] as /sj u u / (C1N1N2). Also, such an example as [ittja] ‘how much’ would be phonemically represented as */i.t ts j a/ (*N.CCCN)⁷ or */i.ts j ts j a/ (*N.CCCCN) if [tj] is treated as a phoneme cluster, where the syllable onset would involve an onset of three and four phonemes respectively.

Given the basic syllable ((C2)C1)N1(N2)(C3) where C2C1 is a geminate, word-medial geminate clusters CC (as in /avva/ ‘oil’) may be parsed either as a taut-syllabic C2C1 (/a.vva/) or an inter-syllabic C3.C1 (/av.va/). However, this study employs the former parsing, based on the following reason: if we follow C3.C1 approach, then such an example as /vttsa/ ‘quail’ must be parsed as /vts.tsa/, which complicates the otherwise straightforward

⁷ Alternatively, /ittsja/ could be parsed as N1C3.C2C1N1, where C3 is /t/. As is shown in 3.2.4, however, this solution in turn complicates the description of C3, which is otherwise filled by semi-consonants. Thus assuming palatal/palatalised phones as phoneme clusters is inconvenient in any way.

description of the semi-consonant nucleus /v/, and we would have to say that among semi-consonant nuclei, /v/ may accompany C3 which must be /ts/. On the other hand, if we parse /vttsa/ as /v.ttsa/, then we can simply say that semi-consonants except for /z/ cannot carry C3. Thus such an example as /jakkan/ ‘kettle’ is parsed as ja.kkan (C1N1.C2C1N1C3) rather than jak.kan (C1N1C3.C1N1C3). Likewise /ippai/ ‘a lot’, /guffa/ ‘(onomatopoeia)’, /aganjnjaa/ ‘east side’, /anna/ ‘mother’, /dumma/ ‘even’, /kuvva/ ‘thigh’, and /turra/ ‘bird (topic)’ must also be analyzed as /i.ppai/, /gu.ffa/, /aga.njnjaa/, /a.nna/, /du.mma/, /ku.vva/, and /tu.rra/ respectively.

On the other hand, word-medial *non-geminate* margin clusters CC (including partial geminates), as in /artsz/ ‘walking’ and /ingama/ ‘puppy’, are unambiguously treated as C3.C1 rather than C2C1, since C2C1 must be complete geminates. Thus such examples as /amdir/ ‘basket’, /minku/ ‘deaf’, /nivtam/ ‘slept’, /fazmunu/ ‘food’, and /arfu/ ‘walk’, are parsed as /am.dir/, /min.ku/, /niv.tam/, /faz.munu/, and /ar.fu/ respectively.

Such clusters as /mta/ ‘mud’ are treated as /m.ta/, to keep intact our generalization that C2C1 must be a geminate. If we consider /mta/ as constituting one syllable, C2C1 would include exceptional non-geminate clusters. Also, /mta/ may involve HL pitch pattern, which cannot occur within onset C2C1 (since it lacks nucleus). Therefore I analyze /mta/ as constituting two syllables (/m.ta/ N1.C1N1; HL). This treatment also appreciates the well attested patterns for syllable onset consonant clusters in human language (Sonority Sequencing Principle, see Blevins 1995), which requires that sonority increases rather than decreases from onset toward the nucleus. Thus /mta/ is better described as /m.ta/ rather than /mta/, the latter of which violates the above-mentioned constraint, with the first component /m/ exhibiting higher sonority than the second component /t/.

Some speakers show inconsistency in pronunciation of such word-initial non-geminate (therefore inter-syllabic) sequences as /m.ta/ ‘mud’, /m.tsz/ ‘road’, /m.na/ ‘shellfish’ (all involve N1.C1 cluster): they often pronounce these as partial geminate sequences /n.ta/, /n.tsz/, and /n.na/. This is explained in terms of /m/ becoming homorganic. This change indicates that Irabu Ryukyuan strongly opts for the geminate rather than non-geminate cluster in the word-initial position, irrespective of whether the cluster is tauto-syllabic (C2C1) or inter-syllabic (N1.C1). Eventually, these word-initial non-geminate sequences will all become homorganic, and there will be a situation where all the word-initial clusters are partial and complete geminates. However, this diachronic change is not thorough in the contemporary Irabu Ryukyuan, with such clearly non-geminate sequences as /v.d/ (as in /vdamunu/ ‘thick’) and /v.ts/ (as in /vtsz/ ‘inside’), and with the majority of speakers retaining /m.t/, /m.ts/, and /m.n/.

3.2.4. Coda (C3)

C3 may be carried by vowel nuclei and the semi-consonant nucleus /z/. C3 may appear word-finally or medially. Word-medially or finally, C3 must be a semi-consonant.

(29) Word-final C3

- a. /kam/ [kam] ‘god’
- b. /kan/ [kaŋ] ‘crab’
- c. /pav/ [pau] ‘crawl’
- d. /paz/ [paz] ‘fly’
- e. /par/ [pa] ‘leave’

(30) Word-medial C3

- a. /kam.nar/ [kamna] ‘lightning’
- b. /kan.kan/ [kaŋkaŋ] ‘can’
- c. /pav.tam/ [pautam] ‘crawled’
- d. /paz.gi/ [pazgi] ‘rash’
- e. /par.tam/ [pa|tam] ‘left’

The semi-consonant nucleus /z/ has a more restricted member of C3 than do vowels. The available C3 for the nucleus /z/ is restricted to /m/ and /n/ (cf. /m, n, v, z, r/ for vowels).

(31) Semi-consonant nucleus (/z/) and C3

- a. /szn/ [sɯŋ]~[sɯŋ] ‘die’ (C1N1C3)
- b. /tszn/ [tsɯŋ]~[tsɯŋ] ‘cloths’ (C1N1C3)
- c. /szm/ [sɯm] ‘ink’ (C1N1C3)

3.2.5. Word-medial clusters

Given that the syllable structure of the phonological word is schematised as ((C2)C1)...(C3),((C2)C1)...(C3), the word-medial margin clusters may involve either of 1) C2C1 margin clusters, 2) C3.C1 margin clusters, or 3) C3.C2C1 margin clusters, in a phonological word. 1) is a geminate, as has been discussed in 3.2.3. 2) is a non-geminate, and mostly found in morpheme boundaries; 3) is only found in morpheme boundaries. Below I will describe 2) and 3).

C3.C1 must be a non-geminate (including a partial geminate such as nasal-stop clusters (e.g. /np/, /nt/, /nk/)). While the word-medial C2C1 (geminate; see 3.2.3) is frequently found both in morphologically simple and complex words, the word-medial C3.C1 is much less frequent and highly restricted to occurring at morpheme boundaries. In other words, Irabu Ryukyuan strongly opts for geminates word-medially, as well as word-initially (see 3.2.3). As for the phonotactic constraints on C3.C1, C3 must be a semi-consonant, and C1 must be a stop, an affricate, a nasal, and a fricative /s/. Other fricatives, liquids and glides are excluded from C1.

C3.C2C1 is very rare in a phonological word; if a sequence of morphemes gives rise to C3.C2C1, the sequence tends to be arranged as two phonological words (as in (32a) below), or C3.C2C1 is simply avoided by some way (as in (32b) below):

(32a) /bi.ki.dum.vva/

C1N1.C1N1.C1N1C3.C2C1N1
H.H.LL.H.L
#bikidum#vva#
‘son’

(32b) /bikivva/

C1N1.C1N1.C2C1N1
H.H.LL
#bikivva#
‘son’

In (32a), the compounding of two stems *bikidum* ‘man’ and *ffa* ‘child’ compose a grammatical word *bikidumvva* ‘son’. Here we have C3.C2C1 sequence /mvv/. However, *bikidumvva* is not a

single phonological word, given that it involves two pitch peaks. Thus it is analyzed as consisting of two phonological words, each being a stem. On the other hand, in (32b), the compound is a single phonological word, but the stem *bikidum* is reduced down to *biki*, whereby the expected sequence of C3.C2C1 is avoided. Thus, C3.C2C1 tends to be avoided in a phonological word in some way.

4. Phoneme /z/

In this chapter I will offer a new view on the phonological treatment of /z/, the so-called ‘central vowel’ in the literature. First I will give a set of factual accounts of this phoneme largely based on our independent description, then discuss the problems associated with /z/ in the literature and how our approach may solve them.

4.1. Facts of /z/

4.1.1. Phonetics of /z/

The major allophones of /z/ are the sonorant-like [ɹ] and the more obstruent-like [z], with weaker and stronger friction respectively. Articulation involving both allophones of /z/ requires the active articulator (the blade of the tongue) to rise up toward the passive articulator (the alveolar through to the palato-alveolar), to the extent that a friction obtains (see also Sakiyama 1963; Oono et al. 2000; Sawaki 2000; Karimata 2002). In terms of the auditory impression, the sonorant-like [ɹ] shows a ‘mixed’ nature of a centralized vowel and a fricative. Phonetically speaking, therefore, it is an intermediate between a sonorant on one hand and an obstruent on the other.

Taking a more careful look at [ɹ] in terms of acoustic phonetics further reinforces that it exhibits both sonorant-like and obstruent-like characteristics. On one hand, it is sonorant-like in that it shows a clear formant structure as is typical in sonorants (Ladefoged 1982), where F1 and F2 indicate it is analogous to a central vowel. On the other hand, it is obstruent-like in that it carries a friction which is indicated around the region over 3,000Hz, coinciding with the clear indication of F1 and F2.

Typologically, the sonorant-like [ɹ] may be analogous to a fricative vowel or a syllabic fricative in general linguistics’ terms (Elias et al. 1984; Connell 1997; Ladefoged and Maddieson 1990). The difference between fricative vowel and syllabic fricative is primarily the phonological identity of the phone in question: while a fricative vowel is defined as a nucleus phone with friction, a syllabic fricative is defined as a fricative ‘spreading to nucleus position, under specifiable conditions, e.g. deletion of the vowel nucleus with compensatory lengthening of an adjacent fricative’ (Connell 1997). That is, if a phone is best treated as a nucleus and not a margin in terms of the syllable structure, then we should say that it is a fricative vowel; if the phone is best treated as a margin without a nucleus (e.g. if it is convenient to assume that the syllable structure of that language never allows the phonetic obstruents to appear in the nucleus slot), it is a syllabic fricative. It is phonology, and not phonetics, which counts here.

4.1.2. Phonemics of /z/

/z/ is a semi-consonant phoneme which subsumes the two major allophones as identified above. Basically both allophones of /z/ show complementary distribution (see below), and they show obvious phonetic similarity.

The allophone [ʔ] (and its voiceless counterpart [ʔ̥]) is observed as in:

(33) Environment of [ʔ̥]: as a nucleus optionally with C1 /p, b, m, s, ts, dz/

a. /ku.sz/ [kʊʔ̥] ‘back’ (C1N1.C1N1)

b. /tszn/ [tsʔ̥] ‘cloths’ (C1N1C3)

c. /dz.zz/ [dzʔ̥:] ‘letter’ (C1N1N2)

d. /zz/ [ʔ̥:] ‘rice ball’ (N1N2)

e. /bzz/ [bʔ̥:] ‘sit’ (C1N1N2)

f. /pzz/ [pʔ̥:] ‘day’ (C1N1N2)

g. /pz.tu/ [pʔ̥tʊ] ‘man’ (C1N1.C1N1)

Note that in (33a) to (33c) the allophone is assumed as [ʔ̥], whose friction noise is drown out with the preceding consonant. When the preceding consonant is not /s/, /ts/, or /dz/, or no consonant precedes, the friction noise becomes apparent, as in (33d, e, f, g). Also noted is that occasionally this allophone loses its friction noise, as free variation:

(34a) /mzz/ [mʔ̥:]~[mʔ̥:] ‘flesh’ (C1N1N2)

(34b) /sukubz/ [sʊkʊʔ̥]~[sʊkʊʔ̥] (C1N1.C1N1.C1N1)

The allophone [z/ʒ] is observed in such examples as the following:

(35a) [z]/[ʒ]: as C1 and C2

/zza/ [zza] ‘father’ (C2C1N1)

/bi.zi/ [biʒi] ‘sit (imperative)’ (C1N1.C1N1)

/azzi/ [aʒʒi] ‘say (imperative)’ (N1.C2C1N1)

(35b) [z]: as C3

/paz/ [paz] ‘fly’ (C1N1C3)

In summary, the allophonic distribution of /z/ is formalized as follows:

(36) /z/ and its allophones

/z/ → [ʔ̥]/C1_ (C1: /p, b, m, s, ts, dz/)	}	/z/ as in N
#_		
[z]/_N1 (N1: /a, u, e, o/)	}	/z/ as in C1
[ʒ]/_N1 (N1: /i/)		
(In C2C1, C2 is identical to C1)		
[z]/_#		/z/ as in C3

4.2. Problems of /z/

Phonetic/phonological treatment of /z/ in Irabu Ryukyuan and its corresponding phoneme/allophones in other Ryukyuan dialects has been one of the frequently discussed topics in the literature of Ryukyuan linguistics (see Karimata 2002 for a summary of the discussion). The discussion can be reduced down to a single point: is /z/ a vowel or a consonant?

4.2.1. Phonetic transcriptions and phonemic interpretation

The first thing to note in solving the problem of /z/ is to be cautious of becoming a slave of phonetics. As has been described in 4.1.2, /z/ has two major allophones: the sonorant (approximant)-like [ʔ] and the obstruent (fricative)-like [z]. However, this phonetics-oriented account may be an illusion: the actual phonetic distinction between these two allophones is often a matter of degree, and we often cannot say that a given allophone is [ʔ] and not [z], or vice versa, without the phonological judgment, i.e. based on the syllable structure. Namely, if an allophone is better described as appearing in the nucleus slot, then it is better transcribed as [ʔ], and if it is better described as appearing in the margin slot, then it is better described as [z]. Thus the phonetic transcription of /z/ is already phonemic to a considerable degree. In fact, we could even dispense with the symbol [ʔ], and just get away with [ʔ̚] (syllabic allophone of /z/) and [z] (non-syllabic allophone), as long as this transcription clearly shows that these allophones are phonetic approximations of [z] in some way (which justifies that these are the allophones of a single phoneme, i.e. /z/), and that the allophones are conditioned by syllabicity. The more elaborated phonetic descriptions do not seem to help the phonology of /z/. This is the first step to recognise to solve the problem of /z/.

4.2.2. /z/ as a semi-consonant

The second step to solve the problem of /z/ is to consider how to treat a phoneme which has syllabic and non-syllabic allophones in the phonology of Irabu Ryukyuan. Our phonological description of the syllable structure has clarified that such a phoneme may be treated as belonging to a distinct category, i.e. semi-consonant. We did not relate /z/ to vowels or consonants, but rather decided to relate it to /m, n, v, r/, i.e. semi-consonants, in terms of whether a phoneme may function as a nucleus or as a margin: vowels function as a nucleus only, consonants function as a margin only, and semi-consonants function both as a nucleus and as a margin. Thus our answer to the question of whether /z/ is a vowel or a consonant is as follows: /z/ is neither a vowel nor a consonant, but a semi-consonant, with the major allophones [ʔ] (syllabic) and [z] (non-syllabic).

4.3. Semi-consonant in diachronic perspective

Before concluding our description on /z/, it is worthwhile to note the diachronic development of /z/ and other semi-consonants, which would clarify the synchronic differences among them.

As has been noted in (6) in 3.1.1, which is listed again in (37) below, semi-consonant nuclei differ in the syllable structure and the possible positioning in the phonological word.

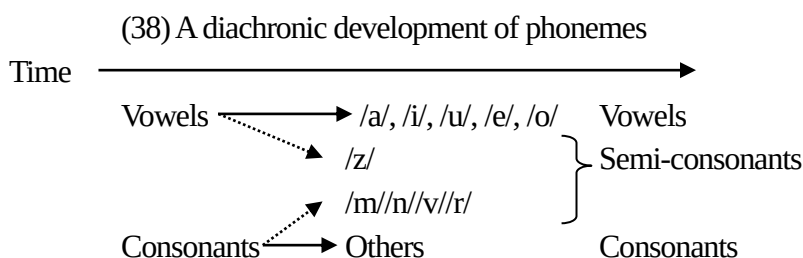
Among semi-consonants /z/ shows the quasi-vowel characteristics in these respects: /z/ may carry C1 and C3, and it may appear word-initially, medially, and finally.

(37) Nucleus type and syllable structure

Nucleus type	Syllable structure	Permissible position in a word		
		Initial	Medial	Final
a. Vowel:	((C2)C1)N1(N2)(C3)	OK	OK	OK
b. Semi-Consonant (/z/):	(C1)N1(N2)(C3)	OK	OK	OK
c. Semi-Consonant (/r/):	(C1)N1(N2)	OK	(OK)	*
d. Semi-Consonant (/m, n, v/):	N1(N2)	OK	*	*

This peculiarity of /z/ in its quasi-vowel productivity of syllable patterns may be explained in terms of diachronic phonology, as summarized in (38) below: /z/ was once a vowel (see Uemura 1989), but gradually lost its vowel status, by having its margin C2 ‘stripped off’, and by acquiring an ability to appear in syllable margins by itself. Consequently, /z/ has become a semi-consonant. Conversely, /m/, /n/, /v/, and /r/ were once consonants, only appearing as syllable margins⁸, which gradually lost the consonant status by spreading into syllable nucleus slots. Consequently, /m/, /n/, /v/, and /r/ have become semi-consonants.

In short, from two different sources, /z/ and /m/, /n/, /v/, /r/ arrived at a new category semi-consonant.



/z/ still shows the above-mentioned vowel-like characteristic (productive syllabicity) *as historical remnants*; it has come to show consonant-like characteristics (i.e. the ability to appear in the syllable margins) *as historical innovation*. In describing the synchronic nature of /z/, we cannot say, based solely on the historical remnants, that /z/ is a ‘vowel which is slightly consonant-like’. On the other hand, we cannot say, based solely on the historical innovation, that /z/ is a ‘consonant which is largely vowel-like’. It is an arbitrary judgement in the end, and there is no especial advantage in pursuing this description. What is crucial in the synchronic nature of /z/ is its ability to serve as a nucleus and as a margin. By assuming a distinct category semi-consonant, then, we can not only capture the synchronically significant nature of /z/, but

⁸ /v/ is ultimately traced back to a vowel */u/ rather than a consonant; however, it must have gone through a stage of */u/ > */vu/ before giving rise to a syllabic /v/, with a margin spreading into the nucleus at a certain point of its development. In this sense, /v/ has developed from a consonant, just as /m, n, r/.

also relate it to /m, n, v, r/, which show an obvious consonant-like characteristic (ability to appear in the syllable margins) as historical remnants and a vowel-like characteristic (syllabicity) as historical innovation.

5. Conclusions

This study has provided a comprehensive description of the syllable structure of Irabu Ryukyuan. It has been shown that in order to describe the syllable structure of Irabu Ryukyuan it is convenient to assume three phonological categories, i.e. vowels, consonants, and semi-consonants. A syllable nucleus may be filled by a vowel and a semi-consonant, though the possible syllable structure of vowel nuclei and semi-consonant nuclei differ. Syllable margins (onset/coda) may be filled by semi-consonants and consonants, but the coda must be filled by semi-consonants.

/z/ has been shown to be a semi-consonant, sharing the significant phonological characteristic with /m, n, v, r/: they may function both as a nucleus and as a margin. It has been also pointed out that the phonological identification of /z/ must be done before clarifying the phonetic identity of the allophones of /z/, and that the attempt in the reverse order is unfruitful.

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伊良部島方言の音節構造

下地理則

オーストラリア国立大学大学院太平洋アジア研究所

要旨

本研究の目的は、南琉球語伊良部島方言（以下、伊良部島方言）の音節構造を記述することである。本稿では以下の点を明らかにする。

- 1) 伊良部島方言においては、**vowel**（音節核にしかねない音素群）・**consonant**（非音節核にしかねない音素群）・**semi-consonant**（音節核と非音節核の両方の機能を果たせる音素群）という音韻論的な単位を設定できる。

		音節核		非音節核
音素	成節的	Vowels	+	-
	非成節的	Semi-consonants	+	+
		Consonants	-	+

- 2) 伊良部島方言の音節は、基本的に以下の構造を有し、その音節の組み合わせによって語の音節構造を記述できる（以下、C は非音節核、N は音節核、下線は 1 モーラを表す）。

((C2) C1) N1 (N2) (C3)

- C2 は C1 とともに出現
- C2C1 は同一音素の *geminate cluster* のみ
- N は **vowel** または **semi-consonant**
- C3 は **semi-consonant** のみ

- 3) 語の音節構造は、非音節核の配列に着目すると以下のように定式化できる。

語頭	語中	語末
((C2)C1)	(C3).((C2)C1)	(C3)

- 4) 伊良部島方言の /z/（「舌先母音」音素）の記述および解釈においては、まず音節における機能に基づいた音韻論的な解釈が先決であり、音声学的な特徴を微細に記述することからは解決は図れない。
- 5) /z/ と、いわゆる「成節子音」(/m, n, v, r/) は、共に音節核の異音と非音節核の異音を持つ **semi-consonant** と分類でき、音韻的な解釈が連動している。