Notes on the Synchronic Phonology of Nauruan

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This article proposes an analysis of several aspects of Nauruan synchronic phonology. It establishes inventories and contrasts among consonants and vowels, and offers an analysis of the stress system. Underlying quantity and quality contrasts are obscured by allophonic processes affecting vowels, but can be revealed if stress information is taken into account. A Nauruan Swadesh list is supplied in the appendix.

Keywords: Nauruan; Stress; Quantity; Micronesian

1. INTRODUCTION.[1]

1.1. LANGUAGE, DATA, AND PRIOR WORK. Nauruan is a Micronesian language spoken by just under 10,000 people in the Republic of Nauru and by diaspora communities elsewhere (Eberhard, Simons, and Fennig 2021). Linguistics research on Nauruan has been less extensive than on its Micronesian relatives. The ethnographic description of Hambruch (1914–1915) and the grammar by Kayser (1993 [1937]) provide some early resources. In the 1970s, Nathan and colleagues began the search for Austronesian cognates (Nathan 1973a), and took the initial steps toward a synchronic description (Nathan 1973b; Hough 1974). Fieldwork focused on the classifier system was carried out by Johnson (1999, 2002). More recently, two researchers visited Nauru for on-site fieldwork. The fruits of that work are now becoming available: Blumenfeld, Burness, and Riley (2015) and Blumenfeld (2017) proposed a new analysis of Nauruan stress and length, and Hughes investigated the synchrony and diachrony of Nauruan phonology, culminating in his PhD thesis (Hughes 2020). Among other results, Hughes established the classification of Nauruan as a Micronesian language. The present sketch builds on this work, and offers a phonemicization of Nauruan with special attention to stress and quantity.

1. I am grateful to my Nauruan consultants, audiences at COOL10, LSA, MOT, to Kevin Hughes, Ken Rehg, and to my Carleton colleagues for helpful comments. I am especially gratefult to Alamanda Lauti for continuing help with all aspects of my work with Nauruan. The work was supported in part by an SSHRC Insight Development Grant #430-2013-000826.

The materials used in this description include the following: (i) word lists in carrier phrases (about 600 items); (ii) recordings of possessive paradigms of directly possessed nouns; (iii) recordings of stories and legends from a printed collection (Detudamo n.d.); (iv) a recording of about 6000 headwords from Jacob et al. (1996), a draft of the Nauruan dictionary, collected for a dictionary project; and (v) recordings of approximately eighty hours of morphosyntactic elicitation. The data were collected over several visits to Nauru between 2014 and 2018 (four months total time on site), with five speakers aged between thirty-five and seventy, with the majority of data coming from two speakers in their forties and fifties. A significant portion of the data resulted from a collaborative project with the local community on re-digitizing an old dictionary draft (Jacob et al. 1996). Spontaneous speech is conspicuously lacking on this list, but I believe that a reasonable analysis of the phonology can be made with the data available.

In the remainder of this section, I discuss general methodological issues. Consonant inventory is discussed in section 2, and vowels in section 3. The stress system, which ties the analysis together, is introduced in section 4, with evidence, analysis, and predictions. While the present treatment is in substantial agreement with that of Hughes (2020), there are some differences, which are discussed in section 5. I conclude with brief notes on Micronesian parallels of Nauruan patterns and on the orhtography. The appendix supplies a Swadesh list.

1.2. A NOTE ON DESCRIPTIVE GOALS. It is easiest to first say what this paper is *not* about. This is not a paper primarily focused on arguing theoretical claims or committed to a particular framework. Rather, it draws on some very basic theoretical concepts (stress theory, rule ordering) to make sense of Nauruan facts. This is also not a paper about Nauruan phonetics, even though some phonetic data are admitted to the extent they shed light on phonology. (For a careful and detailed phonetic study of the language, see Hughes 2020.) This is also not a paper on diachrony. Neither the external connections of Nauruan nor the diachronic origins of the observed patterns are within the scope of this work. The diachrony of Nauruan is discussed in Blumenfeld (2022). This paper is descriptive, but does not attempt to present a *complete* description of Nauruan phonology. Its main task is to present a phonemicization of Nauruan, that is, to give an underlying inventory and rules to derive forms that are closer to the surface, treating with special attention issues of vowel quality, quantity, and their interaction with stress.

While some phonetic evidence is used below to support the phonological claims, it is worth emphasizing that phonological analysis does not operate on raw data. Before being scrutinized from the point of view of phonology, data undergo preliminary segmentation and categorization of phones. This initial preparation of curated data is largely done by ear, but is also guided by the phonological analysis being developed. The mutual dependence of analysis and prior data processing raises the question of circularity. No doubt this

standard practice is not without risks. However, the reliability of the analysis is buttressed by the *self-consistency* in the operation of its mutually dependent parts (in this case, stress and vowel quality), and by the presence of confirmed predictions for data outside of the scope that initially served to establish the analysis. Both of these features are present in the current proposal, as I hope to make clear in the remainder of this paper.

1.3. A NOTE ON ORTHOGRAPHIES AND DATA PRESENTATION. While Nauruan lacks a standardized orthography, several related near-standards have been in use in various sources: Kayser's (1993 [1937]) grammar, the Nauruan Bible, the proposal from the 1930s Nauruan language commission (NLC), and Jacob et al.'s (1996) dictionary orthography (Barker 2008). An informal system is used online by modern speakers. Some differences between them are superficial, such as the grapheme for the velar nasal (<ṅ> in Kayser's grammar, <ñ> in the Bible and Jacob orthographies, <ng> in the NLC and informal orthographies). More wide-ranging differences involve the spelling of vowels.

Data below will be presented in the dictionary orthography of Jacob et al. (1996). Orthography choice is a culturally sensitive and controversial topic on Nauru. My use of the Jacob orthography in this paper is a matter of temporary convenience. I am most certainly not endorsing the choice of this orthography over others. That choice, under discussion by the Nauruan stakeholders as of this writing, belongs to the Nauruan community, not an ousider linguist. Some details about the orthography-phonology mapping are given in section 7.

Nauruan data will be given in both their graphic form and in phonemic (or narrow phonetic, where appropriate) transcription, for example, *dorerin Naoero* /doř˕řɨn næu̯˕řo/ 'Nauruan language'. The graphic form is italicized in text and tables.

2. CONSONANTS.

2.1. INVENTORY. The phonemic inventory of consonants is given in table 1.

I start with some brief highlights, and discuss a subset in more detail in the remainder of this section.

2.1.1. Gemination. Not reflected in the chart below, coronal and labial sonorants /mʷ, n, r, ř/ display a singleton-geminate contrast. This contrast is discussed in detail below.

TABLE 1. NAURUAN CONSONANTS.

pʷ	p	t		k	kʷ
bʷ	b	d		g	
mʷ	m	n		ŋ	
		ř	r		
w		j			

2.1.2. Place. Consonants contrast at three primary places of articulation: bilabial, coronal, and dorsal. There is a secondary articulation contrast in labials and rhotics and the voiceless velar, described in more detail below.

2.1.3. Manner. There is a notable absence of phonemic fricatives and affricates. Allophonically, voiced stops, especially the velar /g/, are realized with some degree of frication intervocalically, and coronal stops are realized as affricates before /i/.

2.1.4. Coronal affrication. The sounds /t,d/ have affricate allophones before /i/, with a range of realizations between lightly affricated [tˢ,dᶻ] and [tʃ,dʒ]. Heavier affrication is characteristic of younger speakers. Hughes (2020:53ff.), who transcribes these phones consistently as postalveolars, treats them as separate phonemes, contrary to other descriptions, including the present one. See section 5 for commentary.

2.1.5. Glides and semivowels. The glides /w, j/ are realized with significant frication. The palatal glide is especially variable, with common realizations ranging from [j] to [j̞] to [z]; heavier frication is characteristic of younger speakers. Distinct from the glides, there are two surface semivowels [u̞, i̞]. They are discussed in more detail in section 3.3, along with diphthongs.[2]

Now I turn to a more detailed look at aspects of the inventory.

2.2. SECONDARY ARTICULATION.

2.2.1. Labials. Labials contrast two series. The front labials are palatalized [p, b, m]; the back labials are velarized, and thus could be more accurately transcribed as [pˠ, bˠ, mˠ], as is done by Hughes (2020). Here, I will sacrifice phonetic accuracy and keep to the standard Oceanist convention by representing the back series as [pʷ, bʷ, mʷ], with the understanding that these phones lack rounding. The front series are transcribed as plain [p, b, m]. Examples of front/back labial contrast are shown below.

(1)	*pwid*	pʷid	'inquire'	*pida*	pida	'float to the top'
	ibwija	ibʷija	'excrement	*ibija*	ibija	'milkfish'
	imwi	imʷi	'tooth'	*imin*	imin	'thing'
	ebwe	ebʷe	'old'	*ben*	ben	'hand.3SG'
	mwemwe	mʷemʷe	'wormy'	*men*	men	'face.3SG'
	baba	bʷæbʷæ	'break'	*baka*	bækæ	'bad'
	eman	emʷæn	'clever'	*eman*	emæn	'dead'
	buõg	bʷuʌg	'help'	*ibũbũ*	ibubu	'beach, sand'
	pudu	pʷudu	'fall'	*ñabũna*	ŋabuna	'these people'
	ebod	ebʷod	'nose'	*beõbeõ*	bobo	'cough'
	pan	pʷɑn	'say'	*tũebõn*	tuɨbɑn	'believe'

2. An anonymous reviewer suggests that frication is phonemic for the phones transcribed here as /j, w/, and that the phones treated as semivowels /i̞,u̞/ are glides. Such an approach is taken in Hughes (2020). The resulting phonemic inventory contains voiced fricatives but no corresponding voiceless ones, and for this reason the approach is avoided here. No part of the analysis depends on this choice, however.

2.2.2. Rhotics. There are two rhotics, transcribed here as /r, ř/, following the notation in Hughes (2020). Phonologically, the contrast parallels the back/front labial contrast, with /ř/ patterning with front segments in its interactions with vowel allophony (see section 4.4). Hughes (2020:92) suggests that the /ř/ is distinguished from /r/ by its degree of constriction. Examples of contrasts are shown below.

(2)	*iri*	iri	'dig'	*eri*	eři	'jump'
	õrre	arre	'come'	*are*	ařře	'steal'
	eor	i̯or	'straight'	*eor*	i̯oř	'reef'

2.2.3. Velars. On velars, the secondary articulation contrast is one of rounding, where rounded [kʷ] contrasts with an unrounded counterpart. [g, ŋ] do not appear to show a parallel contrast.

(3)	*iquinibe*	ikʷinibe	'fingernail'	*kiwi*	kiwi	'scrape'
	quetow	kʷetow	'fill'	*tekei*	tʌkeij	'like, as'
	qua	kʷæ	'wear'	*ka*	kæ	'knowledgeable'
	quõr	kʷʌr	'tie'	*kõr*	kʌr	'indeed, very'
	quoquon	kʷokʷon	'try'	*õkow*	ʌkow	'arouse; mature'
	iquo	ikʷo	'fish trap'	*eko*	eko	'no, not'
	quõn	kʷʌn	'hat.3SG'	*kõn*	kʌn	'eaten'
	aeoq	æi̯ʌkʷ	'4'	*emek*	emek	'live'
	raq	řʌkʷ	'long'	*arak*	ɑřʌk	'sick'

2.2.4. Word-final distribution. Word-finally, as the examples above show, the secondary articulation contrast on rhotics and velars is preserved. For labials, the distinction is neutralized; the underlying shape of the consonant can be revealed by affixation, as the following examples show, using the suffixes *-en* 'perfective, inchoative', *-õn* [-ɑn] 'applicative', *-i-n* [-ɨ-n] 'construct state; 3SG'.[3] There are examples only for /b, m/; for /p/, the only items in my data are *epep* [epep] 'discuss' and *gabõp* [gʌbʷʌp] 'devour'; /p/ is generally not frequent.[4] I am not aware of suffixed forms of *p*-final items.

(4)	/-b/	*abab*	æbæb	'kill'	æbæb-en
		tebab	tebæb	'carry'	tebæb-en
		tũeb	tuɨb	'believe'	tuɨb-ɑn
		kõawenib	ko̯uænɨb	'meddle'	ko̯uænɨb-en
		reãb	řei̯eb	'wide'	řei̯eb-en
	/-m/	*nim*	nim	'drink'	nim-en
		eijim	eijim	'fold'	eijim-en
	/-bʷ/	*ibweb*	ibʷeb	'capture'	ibʷebʷ-en
		tabab	tʌbʷæb	'poke'	tʌbʷæbʷ-en

3. The suffix is represented here as [-ɨ-n], together with a preceding vowel, for simplicity of presentation. It is possible that its vowel is epenthetic, separating a cluster in C-final stems (see Hughes 2020:116, 131, 249). Alternatively, there can be synchornic allomorphy, [-n] occuring after Vs, [-ɨn] after Cs. See also Blumenfeld (2022) on stem-final vowels "recovered" under suffixation.

4. There are also loans with final [p]s: *dorop* 'rope', *dowip* 'whip'.

	bũm	bʷɨm	‘night’	bʷɨmʷ-ɨ-n
	tob	tob	‘hope’	tobʷ-en
	dõb	dʌb	‘honest’	dʌbʷ-en
	eñab	eŋʌb	‘old’	eŋʌbʷ-en
/-mʷ/	*kagam*	kægæm	‘feel’	kægæmʷ-en
	eram	eřʌm	‘forehead’	řʌmʷ-ɨ-n
	kamam	kæmʷæm	‘drill’	kæmʷæmʷ-en

These examples demonstrate that the identity of the final labial of a stem is predictable. Its secondary articulation matches that of the preceding labial, if any. Otherwise, front labials /b, m/ occur after /e, i, ɨ/, and back labials elsewhere.

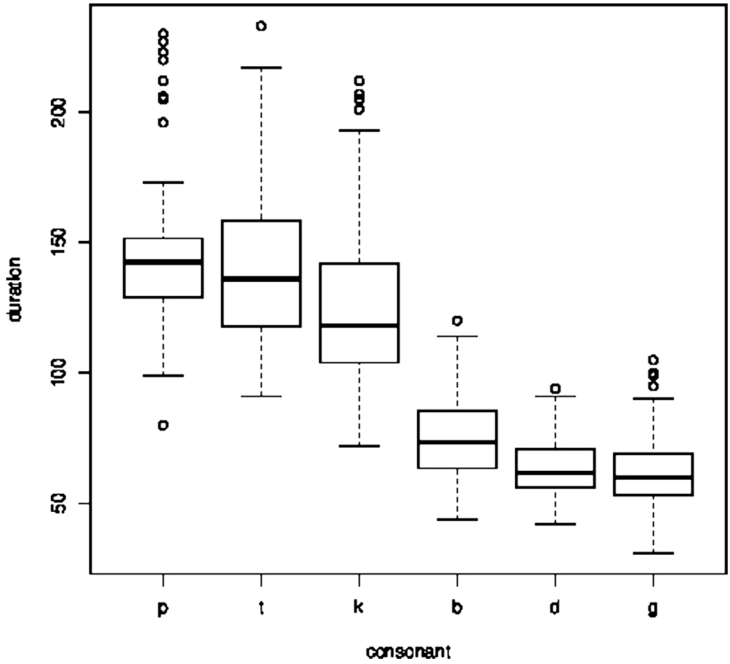
2.3. VOICING AND DURATION. Obstruent stops contrast two series, transcribed here as the voiceless series [pʷ, p, t, k] and the voiced [bʷ, b, d, g]. Some (near-)minimal pairs are shown below.

(5)	*epa*	epʷæ	‘turn’	*eba*	ebʷæ	‘break’
	epaba	epʷæbʷæ	‘ruin’	*ebaba*	ebʷæbʷæ	‘breaking’
	ebwer	ebʷʌř	‘basket’	*epwer*	epʷʌř	‘mistake’
	eada	i̯æda	‘upwards’	*eata*	i̯ata	‘load’
	erida	eřida	‘awake’	*erita*	eřita	‘amaze’
	eda	eda	‘lead’	*eta*	etæ	‘axe’
	ega	egæ	‘fissure in reef’	*eka*	ekæ	‘wisdom’
	egae	egai̯	‘defeat’	*ekae*	ekai̯	‘unlike’
	õgõr	ʌgʌr	‘go, ride’	*õkõr*	ʌkʌr	‘very’
	paten	pʷɑten	‘say.PF’	*baten*	bʷaten	‘lip.3SG’
	pa	pʷæ	‘divert’	*ba*	bʷæ	‘open’
	tar	tær	‘write’	*dar*	dær	‘cry’
	kain	kei̯n	‘march’	*gain*	gei̯n	‘loss’

Hughes (2020:24) argues that Nauruan is a “true voicing language in that voiced and voiceless oral stop consonants are distinguished by negative vs. short-lag (unaspirated) positive voice onset time.” The contrast between the two series is also realized by duration: the voiceless series are long, the voiced series short, but the duration difference is not phonological, in that it does not figure into quantity-sensitive stress, as described below. In fast speech, the voiced stops, especially the velar, can be realized without significant closure. Figure 1 shows duration measurements for voiced and voiceless stops consonants at each place of articulation, taken in careful word-list pronunciations.

Word-initially, the contrast between the voiced and voiceless series is present but somewhat unstable. There are minimal pairs, but the distinction is maintained only in careful speech. In fast speech, voiceless consonants may be realized and perceived as voiced. This vacillation is revealed by unstable spellings and unstable speaker intuition about the nature of the consonant. This is especially true for orthographic initial <t(s)>, which can be pronounced voiced, for example, [tˢitˢin] and [dᶻidᶻin] ‘cook’. In final position, the stop voicing contrast is neutralized (see also Hughes 2020:29).

FIGURE 1. STOP DURATION.



While the length differences in obstruent stops are concomitant with the voicing contrast, length is phonemically contrastive in the sonorants [m, n] and the two rhotics [r, ř]. The velar nasal [ŋ] does not show gemination, and neither do the sonorants [j,w], although both are phonetically long compared to the semivowels [i̯,u̯]. Near-minimal pairs for geminates are shown in table 2. Gemination is only clearly contrastive in the posttonic position under penultimate stress (see section 4.2 below on stress). In other positions, gemination is not consistently realized. Hughes (2020:70) only lists labials as contrastive for gemination, not /n/ or the rhotics, a fact that may reflect a change in progress.

TABLE 2. GEMINATE CONTRASTS.

	dume	dume	'cover'	*deme*	demme	'breadfruit'
mʷ	*emwe*	emʷe	'maggot'	*emo*	emmʷo	'goodness'
	ima	imæ	'death'	*tsima*	dᶻimmʷæ	'shut'
	kõgõmwe	kʌgʌmʷe	'treat'	*kanomwa*	kanommʷæ	'eat secretly'
n	*obweni*	obʷeni	'year'	*arõeni*	æroenni	'tribe'
	nenõ	nenʌ	'taste'	*renõ*	řennʌ	'fluid, fuel'
	kanani	kænæni	'extremely'	*ananu*	ænænnu	'anguished'
	tsitsino	dᶻidᶻino	'lie'	*dinar*	dᶻinnʌr	'mildewy'
r̥,ř	*kirõ*	kiřʌ	'scram'	*kerũ*	keřřɨ	'hide'
	werire	u̯erire	'observe'	*itira*	itˢirræ	'milo tree'
	era	eræ	'timber'	*era*	eřřæ	'blood'

FIGURE 2. NASAL AND RHOTIC DURATION DENSITY PLOTS.

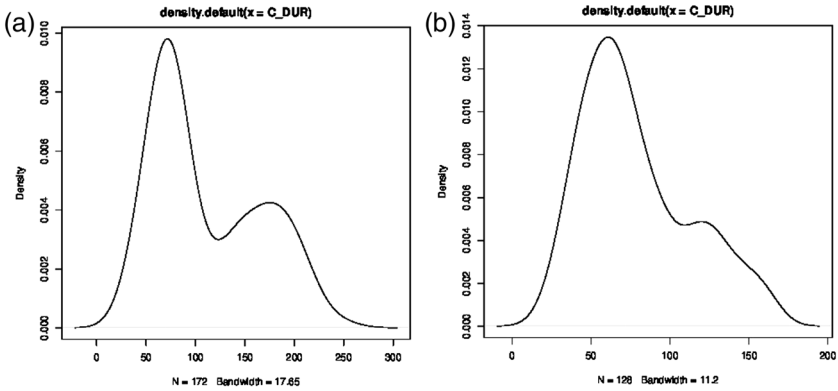


Figure 2 shows the density plot for duration measurements in a set of nasals and rhotics, respectively. The two peaks point to the existence of two categories, more clearly in the case of nasals than rhotics.

While it seems superficially attractive to unify the duration contrasts of sonorants with the voicing contrast of obstuents as a single quantity contrast, such a move would be misguided, as the two contrasts are not phonologically parallel. The contrastive sonorant quantity contributes to weight and affects stress placement, while the non-contrastive, phonetic gemination of obstruents does not. This claim will be illustrated below, after the discussion of stress and quantity in vowels.

3. VOWELS.

3.1. INVENTORY. The vowels, and their interaction with the rest of the system, present the major difficulty of Nauruan phonology. The main obstacle to previous descriptions was the lack of attention to stress. Once stress is taken into account, a phonemicization of Nauruan vowels is achievable. I will begin in this section by presenting the vowel inventory and the basic evidence for contrasts among long vowels. I will turn to short vowels in section 3.2, and to diphthongs in section 3.3. The discussion of stress in section 4 will tie the analysis together.

The proposed vowel inventory, shown in table 3, consists of six long vowels and two short vowels.[5]

5. An anonymous reviewer questions the naturalness of a system with so many more long vowels than short vowels. Such a system is in fact typologically ordinary. As will be seen below, the long/short vowel distinction primarily affects stress placement. There are other languages where stress-repelling vowels are outnumbered by stress-attracting vowels. In Asheninca there is only one light vowel, [i], compared to three "normal" vowels, [e, o, a], and apparently a similar number of "long" vowels (Payne 1990:186–87). In Au, an Oceanic language, there are two stress-repelling vowels /ɨ,ʌ/ out of a total inventory of seven vowels (Scorza 1985:219). More in

TABLE 3. NAURUAN VOWELS.

Long vowels		Short vowels
i	u	ɨ
e	o	ʌ
æ	ɑ	

This system departs from the early work of Nathan (1973a,b), Hough (1974), and Johnson (1999), who propose a twelve-vowel inventory, consisting of the six vowels /i, e, æ, u, o, ɑ/, plus a length contrast. Phonological arguments against that analysis will appear below, as more aspects of the system are presented. To the extent that phonologically short vowels exist, there are only two such vowels, not six. Apparent examples of short versions of other vowels are best treated as allophones of /ɨ, ʌ/. Hughes (2020) proposes a similar inventory except that he treats [ʌ] and [ɑ] as allophones (he transcribes [ʌ] as [ɐ]). I will give arguments for their phonemic status after discussing the stress system.

The following (near-)minimal pairs show contrasts among long vowels.

(6)

i~e	*epi*	epi	'float'	*epe*	epe	'stone'
e~æ	*eme*	eme	'face'	*ema*	emæ	'die'
i~u	*iji*	iji	'gather'	*iju*	iju	'remainder'
e~o	*ite*	ite	'joint'	*ito*	ito	'guess'
æ~ɑ	*edan*	edæn	'guided'	*ridan*	řidɑn	'awakened'
u~o	*adu*	adu	'down to'	*ado*	ado	'nine'
o~ɑ	*bon*	bʷon	'smell'	*pan*	pʷɑn	'say'

3.2. SHORT VOWELS. In addition to the long vowel phonemes listed above, there are two short central vowels, /ɨ/ and /ʌ/. The case of /ɨ/ is more straightforward. Its existence can be established with (near)-minimal triplets distinguishing it from both /i/ and /u/, as shown in Table 4.

TABLE 4. NEAR-MINIMAL TRIPLETS FOR /i/, /ɨ/, and /u/.

	/i/			/ɨ/			/u/	
id	id	'plait'	*ũdõ*	ɨda	'ask'	*uda*	uda	'pluck'
kani	kʌnni	'get'	*anũ*	anni	'shade.1SG'	*adu*	ɑdu	'gift'
dinar	dᶻinnʌr	'moldy'	*dũñi*	diŋi	'resemble'	*dudu*	dudu	'wash'
pwij	pʷij	'shine'	*pũmwe*	pʷɨmʷe	'buy'	*pudu*	pʷudu	'fall'
bwien	bʷiʌn	'home'	*bũm*	bʷɨm	'night'	*buõg*	bʷuʌg	'help
bwit	bʷit	'drill'	*dũgidũgo*	dɨgɨgɨgo	'travel'	*dug*	dug	'stop'
nim	nim	'drink'	*nim*	nɨm	'would'			

general, systems described as "sonority-driven stress" (Kenstowicz 1994; De Lacy 2002) tend to have a small number of stress-repelling vowels, typically /ə/ or /ɨ/, out of a larger vowel inventory. In fact, the proposal by Hughes (2020:144) that CVC syllables are light when they contain a central vowel, heavy otherwise is a variation on the same theme, where central vowels are phonologically light or short.

The contrast between /ɑ/ and /ʌ/ is more problematic, so much so that Hughes (2020) does not treat these sounds as contrastive. In his analysis, the difference between them is one of height (he transcribes them as [a] and [ɐ], respectively; the vowel is realized as [ɐ] after front consonants and in CVC syllables when not in the environment w__{w,r,n}; otherwise in open syllables the vowels are in free variation (2020:109ff.).

There are some pairs suggesting a difference in vowels. In all clear minimal pairs, the vowel is followed by [r], and Hughes locates the contrast on that following rhotic. He treats the words in the first column in (7) as having /ř/ rather than /r/, and the vowel's realization as [ʌ] ([ɐ] in his notation) follows from the rules (see 2020:114). In my analysis, these rhotics are /r/; I will return to their identity in section 5 below and discuss Hughes' analysis in more detail there.

(7)	*gõr*	gʌr	'travel'	*gar*	gɑr	'copy'
	õr	ʌr	'straight'	*ar*	ɑr	'they'
	mware	mʷʌre	'wear'	*aro*	ɑro	'two'

In addition, as will be clear below, a lexical distinction between /ɑ/ and /ʌ/ is necessary for an anslysis of stress. Yet, because of the pervasive uncertainty as to the identity of this vowel, much of the time it is unclear whether a given surface token reflects underlying /ɑ/ or /ʌ/. In such cases I will use the symbol /a/ to represent a disjunction of the two phonemes.

While it may be difficult to identify clear cases where minimal pairs distinguish these two vowels on the surface, the distinction is indirectly manifested in other facts. For example, words ending in /-a/ show two possible behaviors when suffixed with /-n/ (there are several suffixes with this form: perfective, 3SG, and construct state; see footnote 3 for a note on the underlying form of this suffix). In some cases the vowels remain [a], in other cases they change to [e].[6]

(8)	*rida*	řida	'awaken'	řidan
	rabata	rabʷada	'body.1SG'	rabʷaden
	inõ	inna	'mother.1SG'	innen

As these examples hint, the final vowel transcribed [a] may have two underlying identities, and the analysis below will harness the /ʌ/ versus /ɑ/ contrast to account for these cases, and others. More in general, it appears that the surface distinction between /ɑ/ and /ʌ/ is disappearing, and may be altogether restructured if Hughes' analysis is representative of a change in progress. However, in my data, the distinction between the two vowels (and more generally between

6. An anonymous reviewer requests more evidence of the *a* ~ *e* alternation, not observed by Hughes (2020). Phonetic measurements confirm it. In my data, there are eight tokens of 3SG words ending in *-en* with a mean F2 of 1265, SD = 85, and nine tokens of 1SG words ending in *-a*, with a mean F2 of 1725, SD = 138. A Welch two-sample t-test is significant ($t(16) = -8.27$; $p < 0.001$).

long and short vowels) is evident in its effects on stress. This will be the subject of section 4.3.

3.3. SEMIVOWELS AND DIPHTHONGS. Nauruan possesses two sounds that I will call *semivowels*, [i̯, u̯] (Nathan [1973a] refers to them as "semivowel glides"; Hughes [2020] as "glides"). They contrast with the the sounds /j, w/, termed glides in this work (9a), and with each other (9b) (see also Hughes [2020:85ff.]).

(9)	a.	*aeiu*	ei̯u	'seven'	*aeju*	eju	'three'
		ewewin	eu̯eu̯in	'hide'	*ewewen*	ewewʌn	'hair'
	b.	*baõen*	bʷæu̯en	'broken'	*aãn*	æi̯en	'liver'

On the surface, there is only one environment where the syllabic status of these sounds is readily apparent: in stressable position. Stress normally falls on penultimate long vowels (see section 4.2). Thus, the stress placement in words like [é.i̯u] 'seven' points to the consonantal nature of [i̯] in the postvocalic environment, in contrast to forms like [i.bí.a] 'lump, swelling'.

(10)	*aeiu*	é.i̯u	'seven'	*ibia*	i.bí.a	'lump'
	eaeo	i̯ǽ.i̯o	'native banyan'	*tsiõ*	tˢí.a	'servant'
	ewewein	eu̯éu̯in	'hide'	*jiũ*	jí.ɨ	'light'

These facts suggest a complementarity between vowels and semivowels. Outside of examples that place the semivowels in a stressable position, I am not aware of clear evidence of their syllabic status of the type discussed in, for example, Rehg (2007).

Nauruan also possesses surface diphthongs, where the offglide is one of the semivowels [i̯,u̯]. Once again, the stress in examples like *maeda* [mǽi̯.da] 'billow' and *ñain* [ŋéi̯n] 'child' attests to the nonsyllabic surface status of these offglides, but the evidence is only clear in positions where [i̯] would have been stressed had it been syllabic: penultimate or in final closed syllable, according to the stress rule in section 4.2. For consistency, vowel-offglide sequences are transcribed as diphthongs in all environments in this paper.

Diphthongs with a long vowel in the nucleus are listed below in (11). The remaining combinations of long vowels with /u̯,i̯/ are not attested in my data. Some of them may be systematic absences, which is likely for /ii̯/ and /uu̯/. Others may be accidental gaps. There are not enough examples and no alternations to establish the full pattern at this time.

(11)	ei̯	*ñain*	ŋei̯n	'child'
	æi̯	*edae*	edæi̯	'time'
	oi̯	*oe*	oi̯	'inland, bushland'
	ɑi̯	*atae*	atɑi̯	'ten'
	eu̯	*eõ*	eu̯	'tongue'
	æu̯	*baõ*	bʷæu̯	'broken'
	iu̯	*iũ*	iu̯	'fish'

The near-minimal pair *eimwi* [ei̯mʷi] ‘right’ versus *emwin* [emʷɨn] ‘call’ illustrates the contrast between the diphthong and its stand-alone nucleus. Before the glides [j,w], there are predictable epenthetic semivowels [i̯,u̯], respectively, thus constrast like [e~ei̯] are neutralized in that environment.

3.4. CV SEQUENCES. Nauruan syllables are CV(C). There are no word-internal codas other than first halves of geminates. All consonants may function as word-final codas, up to neutralization of obstruent voice and secondary articulation of labials. Table 5 shows all the possibilities of CV combinations I was able to identify.[7] Consonants are grouped into seven classes: back labials, front labials, /r/, /ř/, coronals, dorsals, and /kʷ/.

These examples show *underlying*, not surface forms. The distribution in surface forms is different in two relevant respects. First, there are no surface /Bɨ, řɨ/ sequences, where B is a front labial, but the analysis developed in the rest of this paper requires such underlying sequences in examples such as *imin* ‘thing’ and *eribe* ‘blend’, which surface as [imin] and [eřibe], respectively. Underlying forms of these words are shown in the table. Second, the cell for /řu/ is left blank, because I am unable to find clear examples of underlying /řu/, even though surface [řu] can occur in words like *iruwa* [iřuwa], where it reflects underlying /řɨ/ in my analysis; see (23) below.

Almost all the CV possibilities are attested, with the notable exception of combinations with [u]. This vowel is infrequent to begin with, and it is not clear

TABLE 5. CV SEQUENCE EXAMPLES.

	i	e	æ	u	o	ɑ	ɨ	ʌ
pbmʷ	*mwin* mʷin ‘mouth’	*emwe* emʷe ‘worm’	*eman* emmʷæn ‘male’	*pudu* pʷudu ‘fall’	*bodin* bʷodᶻin ‘nose’	*ebak* ebʷɑk ‘many’	*ibũr* ibʷɨr ‘boil’	*par* pʷʌr ‘quick’
pbm	*pida* pida ‘sink’	*ben* ben ‘hand’	*ima* imæ ‘die’	*ñabũna* ŋabuna ‘those’	*beõbeõ* bobo ‘cough’	*tuebõn* tuɨbɑn ‘believe’	*imin* imɨn ‘thing’	*ebõk* ebʌg ‘water’
ř	*rida* řida ‘awaken’	*redõ* ředa ‘return’	*era* eřřæ ‘blood’	?	*oerõn* u̯eřon ‘rain’	*kirõn* kiřɑn ‘scooted’	*eribe* eřɨbe ‘blend’	*raq* řʌkʷ ‘long’
r	*iri* iri ‘dig’	*reõ* reʌ ‘catch’	*era* eræ ‘timber’	*urure* urure ‘pull’	*buroda* bʷuroda ‘deluge’	*õgarõn* agæran ‘clear’	*eõrin* eʌrɨn ‘custom’	*rõrõ* rʌrrʌ ‘famine’
tdn	*tsitsin* tˢitˢin ‘cook’	*deme* demme ‘breadfruit’	*tar* tær ‘write’	*dume* dume ‘cover’	*dorer* dořʌř ‘speak’	*anar* anɑr ‘sigh’	*tũr* tɨr ‘dark’	*dabar* dʌbʷʌr ‘honest’
kgŋ	*kiwi* kiwi ‘scrape’	*geida* gei̯da ‘ascend’	*garõ* gæra ‘clear’	*ñune* ŋunne ‘this here’	*goda* goda ‘high’	*gar* gɑr ‘copy’	*gũta* gɨtæ ‘hatred’	*kõr* kʌr ‘truly’
kʷ	*qui* kʷi ‘lie’	*equen* ekʷen ‘container’	*equan* ekʷæn ‘sun’	?	*quoquon* kʷokʷon ‘try’	*õquaqui* akʷɑkʷi ‘strive’	*iqũr* ikʷɨr ‘mug’	*eqõr* ekʷʌr ‘tie’

7. See also the tables in Hughes (2020:20–21), showing surface distributions of CV combinations.

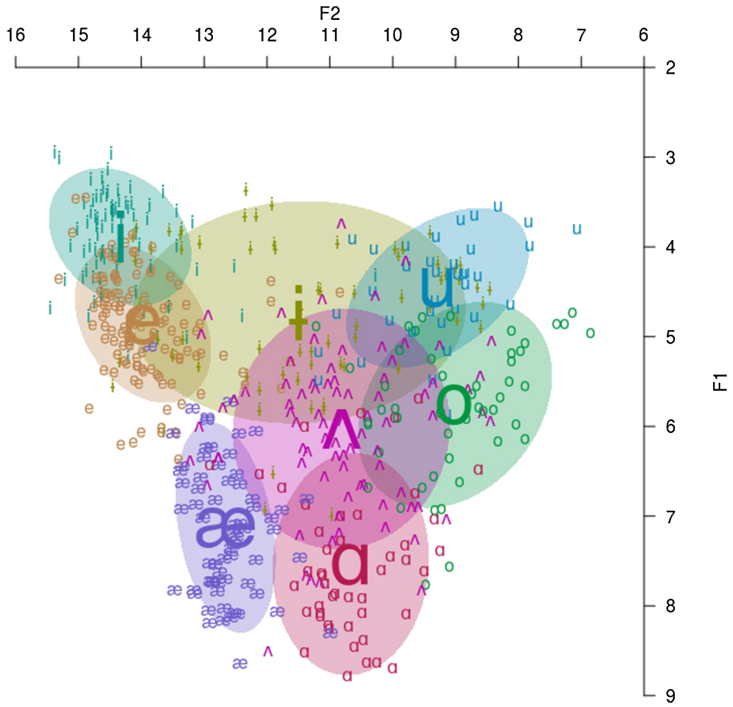
whether the gaps are systematic or accidental, especially in the case of /kʷu/, where /kʷ/ is also infrequent. There are no examples of /řu/; I know only two examples with front labials followed by [u]: the item cited in the table, together with its morphological relatives, and *ibũbũ* [ibubu] 'sand, beach'.

Beyond CV sequences, another constraint appears to be that [ɑ] does not occur between front consonants (see also Hughes [2020:109], in whose analysis /ɑ/ surfaces as [ʌ] after front Cs). A consequence of this fact is that there are no word-final sequences where /ɑ/ occurs before a front labial, /ɑb, ɑm/ (see (4) above and discussion there). The vowel [ɑ] does occur with front consonants to the left, but all the examples have the applicative suffix [–ɑn]: *tuebõn* [tuɨbɑn] 'believe' and *nimõn* [nimɑn] 'feel'.

Finally, [ɑ] is subject to another similar restriction: [ɑř] does not occur word-finally. This fact led Hughes (2020) to treat [ɑ] and [ʌ] as allophones conditioned by the following rhotic. See arguments in section 5 below for the phonemic status of this vowel.

3.5. PHONETIC MEASUREMENTS. Detailed phonetic measurements of Nauruan vowels can be found in Hughes (2020). Figure 3 shows

FIGURE 3. VOWEL MEASUREMENTS.



Bark-normalized formants of 638 vowel tokens from a female speaker, largely in agreement with the inventory reported in Hughes.

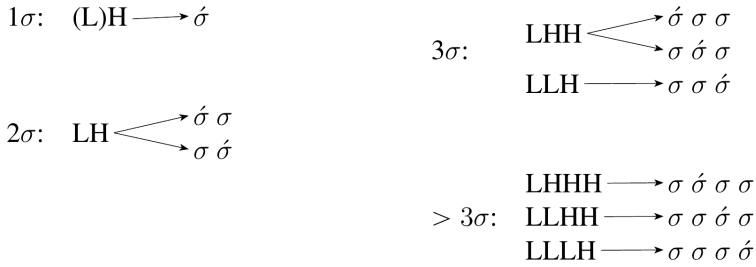
4. STRESS.

4.1. EVIDENCE FOR STRESS. The main source of evidence for stress comes from recordings of the headwords of the draft of the Nauruan dictionary (Jacob et al. 1996), as part of a dictionary re-digitization project. Due to the number of headwords and time constraints, they were not embedded into carrier sentences, resulting in production with a rising listing intonation. This listing intonation, consisting of an LH rising melody on words longer than one syllable, gives evidence of the location of stress.

To identify the location of the intonational rise, 515 words from randomly selected dictionary pages were processed by two analysis-naive phonetically trained investigators, identifying the location of the rise.[8] There was an 81.9% agreement on the location of the rise between the two raters. A common disagreement was that the first evaluator placed the rise 1 syllable to the left of the second (40 cases, or 53% of all disagreements). A reasonable hypothesis is that the intonational rise occurs on the stressed syllable, unless initial, in which case it occurs on the posttonic syllable. The observed melodies are thus partly indicative of the location of stress, as shown in figure 4.

Here, it may be worth highlighting the methodological issue of circularity (see section 1.2). There are two unknowns here: the stress rule, and the rule aligning the intonational rise to that stress. One cannot be known without the other. However, it is possible to construct a *self-consistent* account of the facts that includes a rule about how the intonation lines up with stresses

FIGURE 4. LISTING INTONATION AND STRESS.



8. An anonymous reviewer wonders whether the investigators' native language (English) would influence their judgments. Note that they did not just identify the location of the stress (a linguistic judgment) but of the pitch peak (a more low-level phonetic judgment), where the effect of native language would be weaker.

(as shown in figure 4) combined with a stress rule (given below). It helps that both rules are typologically banale.

While the heuristic process leading to the proposal may remain outside the scope of this paper, I will give some highlights. When the final syllable is CVC or CVV (diphthong), final rise occurs 112 times and penult rise occurs 26 times.[9] In twenty-four of these twenty-six cases, the word contains a short vowel in the final CVC syllable. This suggests that final CVC only attracts the rise to itself when it contains a long vowel, and a ready vehicle for that attraction is a component of the stress rule that places stress on final CVC when the vowel is long. There are twenty examples with a rise on the ate-penult. In all cases (outside of reduplication; see section 4.6 below) the penult is open and has a short vowel. Conversely, of the seventy-three examples with rise on the penult, only four are on penults with short vowels. This suggests that short vowels on penults are also not attractive to the intonational rise, and again suggest a component of the stress rule that makes light open penults unstressed. These ideas are brought toghether in the following section.

In addition to the data used to discover the stress rule described in the preceding paragraphs, in the remainder of this paper I will also cite data using my own hearing of the intonational rise and stress. A particular difficulty is the distinction between initial and second-syllable stress in two- and three-syllable words, where the intonational rise does not give full information about its location. There are limitations to relying on the researcher's own intuition about his own data, but at present I have no other, more reliable source of evidence for stress location. This issue in data quality is the main weakness of the present account. However, the consistency of the behavior of stress in cases where intonation does provide good indication makes it unlikely that it misbehaves just in those cases where it is more difficult to identify.

4.2. THE STRESS RULE. I start with a descriptive statement of the stress rule.

(12) a. Final syllable is stressed if it contains a long vowel with a coda;
b. else penult is stressed if it contains a long vowel;
c. else antepenult is stressed.

Using the investigated data, the success of the stress rule is 90.4%.[10] The three possible locations of the stress rule are illustrated the following three tables. The first column shows the identity of the stressed nucleus in final- and penultimate-stressed words, where it is always a long vowel or diphthong.

9. Only data consistently transcribed by the two raters is included in these counts.
10. Nathan's (1973a) and Hughes' (2020:138) stress rule, "final if closed else penult," has a 68% success rate on the same data with the same assumptions about intonation.

(13) Final stress

i	*taramawir*	taram^{w}awír	‘worship, adore’
	dowatsib	dowʌt^{s}íb	‘soursop’
e	*itsibweb*	it^{s}ib^{w}éb	‘ball game’
	dõmaneab	dʌm^{w}ʌnéb	‘meeting house’
æ	*kamarar*	kamærǽr	‘think, ponder’
	edaredar	edæředǽř	‘crying, wailing (loudly)’
	tebab	tebǽb	‘poke’
	beritagag	beřitægǽg	‘spread, scatter’
u	*dadug*	dædúg	‘restrain, stop’
	daurur	dorúr	‘blaze, flare’
o	*timor*	t^{s}im^{w}ór	‘life, existence, health’
	eoror	i̯orór	‘fence’
	enor	enóř	‘low tide’
	oeron	u̯eřón	‘rain’
	quoquon	k^{w}ok^{w}ón	‘try’
ɑ	*daparar*	dap^{w}arɑ́r	‘despairing, desolate’
	anar	anɑ́r	‘sigh’
	oumarar	om^{w}arɑ́r	‘worry; problem’
	kaiõt	kei̯ɑ́t	‘hear’
diphth.	*apain*	ap^{w}éi̯n	‘egg, seed, nut’
	mañain	mæŋéi̯n	‘jaw.3SG’
	denigae	denigǽi̯	‘fail, lose’

(14) Penultimate stress

i	*werire*	u̯e(r,ř)íre	‘look, observe’
	eirira	ei̯řířæ	‘shake, shudder’
	dariri	daříři	‘panic, frantic’
	dabwike	dab^{w}íke	‘stick’
	dowipõr	dowíp^{w}ʌr	‘demon, devil’
	quõrida	k^{w}ʌřída	‘administer, assist, support’
	õrañida	ařæŋída	‘dismiss, terminate’
e	*towepo*	towép^{w}o	‘travel together’
	eredu	erédu	‘respect’
	amweda	am^{w}éda	‘place up high or inside’
æ	*kanani*	kænǽni	‘extremely, excessively, very’
u	*deigõmatutu*	dei̯gʌmætútu	‘blow fish, puffer fish’
	gapudu	gæp^{w}údu	‘bear (child), deliver’
o	*eibioro*	ei̯bióro	‘proud’
	ogoda	ogóda	‘raise, elevate’
	kaijoda	kei̯jóda	‘stand, jut (up), stand on end’
	oboda	ab^{w}óda	‘engage, do battle’
	manoda	mænóda	‘loose, free’
ɑ	*panañe*	p^{w}ɑnɑ́ŋe	‘jabber’
	idõdõ	idɑ́da	‘laugh’
	anano	anɑ́no	‘rest, stand, relax’
diphth	*gapaeda*	gap^{w}éi̯da	‘search’

(15) Antepenultimate stress

bijaro	bíjʌro	'twins, double'
imago	ímʌgo	'sea, ocean'
bakoro	bʷǽkʌro	'break, shatter'
uwadõ	úwʌda	'my burden'
bainigiri	bʷei̯níǵiři	'actions which are shameful in public'
nũñida	nɨ̃ɲ̟ɨda	'reveal, leak'
derũga	déřɨga	'lie, deceive'
megeda	mégʌda	'sit'
õpageda	apʷʎgʌda	'explode, burst'
eneñab	énʌŋʌb	'full tide'
kinogog	kínʌgʌg	'pleasure, satisfaction'
akarigin	akárɨgɨn	'pedigree'
ikumo	íkɨmʷo	'pig'
weraga	wérʌga	'exposed, uncovered'

An anonymous reviewer requests evidence of antepenultimate stress, in view of the fact that Hughes' (2020:139) stress rule would stress penultimate syllables in all examples in (15). I have measured the durations of vowels in penults and antepenults for the examples in (14) and (15). The results are shown in table 6; they point to a clear difference between the two sets.

An addendum to the clause (12b) of the stress rule is that closed penultimate syllables also attract stress. The only word-medial codas are first halves of geminate consonants. The effect of the geminate can only be seen where the vowel in the penult is short (16a). Examples with short penults and no geminate following it are shown in (16b); in such cases, stress is antepenultimate.[11]

(16)

a.	*õnani*	anʎnni	'seek'
	õgõrõ	ʌgʎrrʌ	'run, bolt'
	gõgõrõ	gʌgʎrrʌ	'crawl'
	edũra	edɨ́rræ	'sin'
	ekarũrõ	ekarɨ́rra	'gutter'
	mũrũrõ	mɨřɨ́řra	'rumble, roar'
b.	*memõri*	mémʷʌři	'move'
	itũrũ	ítɨřɨ	'with me'
	arũmin	árɨmʷɨn	'image, likeness'

Although the phonemically voiceless stops are phonetically geminate, their predictable gemination does not make preceding syllables heavy for the

TABLE 6. MEAN V DURATION IN ANTEPENULT AND PENULT SYLLABLES IN (14) AND (15).

	Antepenult duration	Penult duration	Mean antepenult/penult ratio
(14): penult stress	109.4	138.5	0.8
(15): antepenult stress	89	72	1.3

11. The other analytical choice ("analysis B"), where stress is contrastive and gemination is predictable, is rejected here because under such an analysis stress would not be contrastive under any other circumstances except when a [nřřm(ʷ)] is in the onset of the final syllable.

purposes of the stress rule. Thus, words where the penult is followed by a voiceless consonant may be stressed on the antepenult, unlike words where the penult is closed by a phonemic gemiate. Thus, there are no words like *[íɡɨmmʷæ] or *[ɡʎɾʌmmi], in contrast to the following examples.

(17) *igũpa* íɡɨpʷæ 'case, shell (of shellfish)'
garapi ɡʎɾʌpi 'whistle'
egate éɡʌte 'parade, march'
edako édʌko 'girls' house'
egaquo éɡʌkʷo 'pimple'

For further examples of the application of the stress rule, consider the following nominal paradigms. The 1SG suffix is a short vowel /-ʌ,-ɨ/ (the choice between them need not concern us here). Thus, according to the rule, stress either falls on the penult if it contains a long vowel, or otherwise on the antepenult, as seen below.

(18) ænʌkʷéi̯ʌ 'shoulder' rábʷʌdʌ 'body'
mæŋéi̯ʌ 'cheek' éɾɨwɨ 'behind'
itɨɡæ̯i̯ɨ 'above' jɨ́ɾɾɨŋʌ 'weakness'

In contrast, the 2SG affix is a consonant, [-m]. In consonant-final stems, it is preceded by an epenthetic short vowel. Stress thus can fall on the final syllable when the stem ends in a long vowel, else on the penult when the penult contains a long vowel, else on the antepenult.

(19) ænʌkʷém 'shoulder' anímʷʌm 'over' rábʷʌdʌm 'body'
nænǽm 'leg' itɨɡæ̯i̯im 'above' éɾɨwɨm 'behind'
bækǽm 'badness' jɨ́ɾɨŋʌm 'weakness'

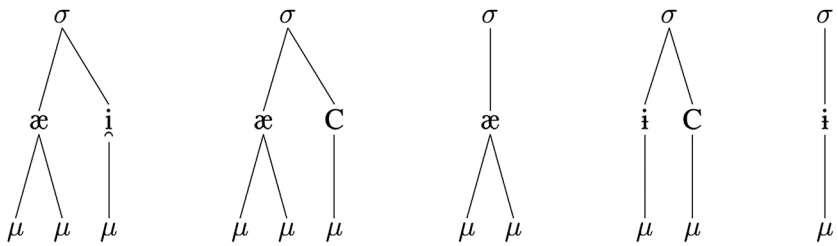
4.3. FORMAL ANALYSIS. The stress rule relies on the opposition between short and long vowels. The analysis presented here encodes this distinction in the mora count.

The representational assumptions are as follows. Long vowels contain two moras; short vowels contain one mora. Codas, including the offglides of diphthongs, contribute a mora. If the diphthong nucleus is a long vowel, this makes diphthongs trimoraic.[12] These assumptions are illustrated with the five logically possible syllables (figure 5): syllables with diphthongs, and {open, closed} syllables with {long, short} vowels.

With these assumptions, the stress rule becomes quite simple. The final mora is extrametrical, and a bimoraic, left-headed foot (a moraic trochee) is assigned at the right edge.

12. An anonymous reviewer wonders about typological parallels for diphthongs offglides in the coda. One parallel is found in Ulwa (Green 1999:32ff.; cf. Golston and Krämer 2020). In Spanish, a language with no phonemic vowel length but a syllable weight distinction, offglides act as moraic consonants (Martínez-Paricio 2013). It is possible that Nauruan diphthongs are diachronically recently derived from sequences of two vowels, which may explain their typologically unusual quantity.

FIGURE 5. REPRESENTATIONS OF SYLLABLE TYPES.



(20) a. Final mora is extrametrical;
b. Build a two-mora trochee as close to the right edge as possible.

The application of this analysis to various word types is shown below. Angled brackets illustrate mora extrametricality.

(21)	deni(ǽ)⟨i̯⟩	'fail'	μ.(μ́μ)⟨μ⟩
	tˢi(mʷó)⟨r⟩	'life'	μ.(μ́μ)⟨μ⟩
	i(já)gɨ⟨n⟩	'broken'	μ.(μ́μ).μ⟨μ⟩
	to(wé)po	'travel together'	μ.(μ́μ).μ⟨μ⟩
	a(nán)⟨nɨ⟩	'seek'	μ.(μ́μ).⟨μ⟩
	(úwʌ)⟨dʌ⟩	'burden.1SG'	(μ́.μ).⟨μ⟩

4.4. STRESS RULE AND SHORT VOWELS. The stress rule, while relatively successful, is still not perfect. We find many examples where what appear to be long vowels fail to attract stress, according to the generalizations spelled out above. For example, the following items contain the vowels [u,o] either in a final closed syllable or in a penultimate syllable; in both cases the stress rule predicts those vowels to be stressed, but they are not.

(22)	u	*iruwo*	íruwo	'chant'
		iruwa	ířuwa	'stranger, foreigner'
		tsimeduw	tˢímeduw	'new'
	o	*egirow*	égiřow	'angry'
		edowa	édowæ	'ready'
		kũñijow	kɨ́ŋijow	'hot'
		areow	æřéow	'spider'
		detow	détow	'slice, cut'
		õkakow	ʌkǽkow	'mature, adultlike'

The stress rule could be incorrect in that it admits exceptions. A claim of exceptionality, however, amounts to abandoning a search for generalization, and must be left as a last resort. It is not difficult to see the common property for the rounded vowels in (22): they precede [w]. The clear solution is to treat these surface [u,o] as derived from underlying /ɨ,ʌ/ by a rounding and backing rule before [w].

(23) /ɨ,ʌ/ → u,o/__w

A less obvious situation arises in the following set of cases, where the vowels [i,e] similarly fails to attract stress.

(24)	i	*tsimine*	tˢímine	'exist'
		mwitida	mʷítˢida	'bite'
		eribe	éřibe	'blend, harmonize'
		eitsiber	éi̯tˢibeř	'prone, prostrate'
		imin	ímin	'thing'
	e	*toreda*	tóředa	'catch water'
		eitsiber	éi̯tˢibeř	'prone, prostrate'
		dorer	dóřeř	'speak'
		medena	médenæ	'road'
		tsimeduw	tˢímeduw	'new'

Here, once again the consonantal context matters: all of the offending vowels are between two consonants that are either coronal, or front. It is natural to derive these surface [i,e] from underlying /ɨ,ʌ/ by a fronting rule in the context {B,ř,[cor]}__{B,ř,[cor]}, where B is a front labial. (Note here that [ř] phonologically patterns with front labials).

(25) /ɨ,ʌ/ → i,e/{B,ř,[cor]}__{B,ř,[cor]}

More in general, consonants fall into three broad classes: *front*, containing /p,b,m,ř,t,d,n,j/, *round*, containing /w/, and *neutral*, containing everything else. Short vowels are fronted when surrounded by front consonants, and rounded before the rounded consonant.

In addition, there are other sporadic examples where /ɨ,ʌ/ undergo rounding, shown below. In all such cases a rounded vowel follows in the next syllable.

(26)	*gibono*	gíbʷono	'virginity'
	dobodu	dóbʷodu	'foam in sprouting coconut'
	dogoro	dógoro	'stave, wand (for dancing)'
	bagadugu	bægádugu	'ancestors'
	deibaidubu	dei̯bʷéi̯dubʷu	'caterpillar'

4.5. FURTHER EVIDENCE. As the examples cited in (8) above suggest, even though the quality distinction between /ɑ/ and /ʌ/ can be obscure on the surface, the existence of the two vowels is hinted by different possible behaviors under affixation, repeated in (27) below with stress supplied. The difference in segmental behavior can now be understood: words like 'awaken' end in underlying /-ɑ/ which surfaces unchanged, while words like 'body' end in underlying /-ʌ/. The addition of the [-n] suffix puts that /ʌ/ in a fronting environment, and thus it surfaces as [e] by rule (25), similar to examples in (24) above. The location of stress on the final syllable in 'awaken' but on the antepenult in 'body' further supports this analysis.

(27)	řídɑ	řidɑ́n	'awaken'
	ráb^wʌdʌ	ráb^wʌden	'body'

More broadly, once the stress facts are taken into account, the underlying contrast between /ɑ/ and /ʌ/ appears in many environments. For example, [CaC] monosyllables can have two different behaviors when prefixed: sometimes stress shifts onto the prefix, sometimes it stays on the final syllable, as expected if apparent [CaC] instantiates either /CɑC/ or /CʌC/. The two behaviors are illustrated in (28) below.

(28) /ʌ/	*raq*	řʌkʷ	'long'	ářʌkʷɨn
	ñab	ŋʌb	'old; big'	éŋʌb
	par	pʷʌr	'fast'	ápʌr
	mwat	mʷʌt	'squeeze'	kámʷʌt
/ɑ/	*pan*	pʷɑn	'say'	apán
	wat	wɑt	'visit'	wawát
	kag	kɑg	'warn'	ekág

Next, there are certain situations where Nauruan appears to have a surface length contrast. For example, the regular [e] in words like *eri* [éři] 'jump' or *wero* [u̯éřo] 'rain' appears to contrast with a shorter [e] in *deri* [déři] 'funny'. Examples such as these led previous researchers (Nathan 1973a,b; Hough 1974) to set up an underlying length contrast for all vowels, but such a contrast is unnecessary in the present description. In [déři], the short [e] occurs in a fronting environment and so is underlyingly /dʌři/, while *wero* is [u̯eřo]. Under prefixation, stress shifts to the antepenult in the former but not the latter, confirming the analysis: [édeři] versus [ou̯éřo]. I am not aware of such short [e]s in environments that do not condition ʌ-fronting.

Another line of evidence supporting the analysis is supplied by the possessive paradigms of coronal-final stems like /witɨ-/ 'skin', /bʷodɨ-/ 'nose', /idɨ-/ 'sibling'. The following pattern was noted by Nathan (1973a); note the vowel difference between the 2SG and 3SG, and the affrication in 3SG.[13]

(29)	wíti-m	wítˢi-n	'skin'
	bʷódɨ-m	bʷódᶻi-n	'nose'
	ídɨ-m	ídᶻi-n	'sibling'
	2SG	3SG	

In the 2SG, the stem-final vowel surfaces intact; in the 3SG, it finds itself the fronting environment where it surfaces as [i] by rule (25). The 3SG column shows that this fronting process feeds affrication. The fronted /ɨ/ in these cases is not just phonetically but also phonologically front.

A similar pattern of affrication is observed in non-derived environments. The following near-minimal pair demonstrates affrication happens to underlying /tɨb/ and /dɨt/ but not /tɨbʷ/, because only in the former case the short vowel

13. My consultants replicate this pattern; Hughes (2020:116, fn. 47) reports variation in this pattern, with missing affrication in the 3SG as well as affrication in the 2SG. This variation probably reflects an ongoing change, which can be interpreted in various ways. Hughes suggests that forms with no affrication in the 3SG result from a reanalysis of the stems as C-final, /wit-/, rather than V-final /witɨ-/, and epenthesis in the /-t-n/ consonant cluster under affixation. In the present analysis, this epenthesis must be ordered after affrication. See also Blumenfeld (2022) on stem-final recovered vowels.

is surrounded by front consonants and thus fronts to [i]. In each case, the antepenultimate stress points to an underlying short vowel in the penult (and the final syllable, for that matter).

(30) *eitsiber* /eit͡ɨbʌř/ [éit͡ˢiberˇ] ‘prone’
Aditũr /ad͡ɨtɨr/ [ád͡ᶻitɨr] ‘green’
itũbwer /itɨbʷʌř/ [ítɨbʷʌřˇ] ‘mat’

Together, these facts attest to the self-consistency of the analysis: the stress rule, the vowel fronting rules, and the affrication correctly predict the observed facts, but only if an underlying contrast between /ɨ,ʌ/ and long vowels is permitted. The snapshot of the system described here probably represents a diachronic transition point from a system with a more perceptible surface distinction, especially in the case of [ʌ~ɑ], to a system where it is stress, not vowel quality, that carries the contrast.

4.6. STRESS RULE AND REDUPLICATION. Reduplicated words do not form single prosodic domains. The two reduplicants are stressed as two independent prosodic words (also noted by Hughes [2020:137]), resulting in what appears sometimes as irregular stress. Stress can fall on a final closed syllable with a short vowel, as in [bʷʌ́ŋʌ-bʷʌ́ŋ] ‘tame’, or on a penultimate short vowel in an open syllable, as in [bʷʌ́ŋʌ-bʷʌ́ŋe] ‘cover up’, neither of which would be possible if the stress rule applied to the entire form. More examples of both types are shown below. They also show that any prefixed material before the first reduplicant is outside the prosodic domain as well. I am not aware of clear evidence to distinguish the two stresses in these forms as primary versus secondary.

(31) *dagadag* dʌ́gʌ-dʌ́g ‘spiky’
edũmidũm e-dɨ́mi-dɨ́m ‘oily, greasy’
gõmõgõm gʌ́mʷʌ-gʌ́m ‘itchy’
gũrũgũr gɨ́ri-gɨ́r ‘grating’
itirũñirũñ itˢi-rɨ́ŋi-rɨ́ŋ ‘(ring) finger’
dũñidũñi dɨ́ŋi-dɨ́ŋi ‘cut, carve (repeatedly)’
ibũgibũgi i-bʷɨ́gi-bʷɨ́gi ‘grass’

5. DIFFERENCES WITH HUGES (2020). The present description agrees in its core features with that of Hughes (2020), but also differs from it in several respects. Some of these differences are cosmetic, such as transcription conventions (Cʷ vs. Cʸ). Because some of Hughes’ consultants are younger than the speakers I worked with, some differences may reflect changes in progress, notably the increased frication of the glide /j/ and of /t,d/ before /i/, leading Hughes to transcribe them as [tʃ,dʒ,ʒ/j] compared with my [tˢ,dᶻ,j]. Finally, there are some differences between the two descriptions that are more substantive in nature. They may involve genuine disagreements of analysis, but it is also possible that our different approaches reflect ongoing phonological restructuring.

5.1. AFFRICATES. Hughes (2020:53 and ff.) treats the coronal affricates [tʃ,dʒ] ([tˢ,dᶻ] here), as phonemic rather than as allophones of /t,d/ before /i/. He supplies two synchronic arguments for this treatment. First, in the items *idij* [idij] 'louse [at pupa stage]' and *edij* [edij] 'paddle', [d] appears before [i] instead of the expected [dᶻ]. Both of the cited cases have the palatal [j] in the next syllable. I am not aware of any other cases of surface [ti] or [di] sequences, nor of any other cases where /t,d/ precedes /ij/. Rather than setting up separate phonemes for the sake of these two words, it is simpler to refine the affrication rule, for example by blocking it in a dissimilatory context when the following syllable begins with a palatal.[14]

Second, Hughes notes the loanword [tʃape] 'sheep' (< German *Schafe*) with the affricate not before [i]. More broadly, it appears that the affricates have reached a greater level of entrenchment than ordinary allophones, permitting not only their use in loans, but also their graphic representation as <ts> and sometimes <ds> under both the Bible and the Dictionary spelling conventions.

There are ways of treating sounds as intermediate between full phonemehood and allophones, such as *quasi-phonemes*, or sounds introduced in the lexical phonology. In pretheoretical terms, this means that the affrication process is far along in its life cycle from automatic coarticulation to a lexical remnant.

5.2. IDENTITY OF RHOTICS AND THE [ɑ~ʌ] CONTRAST. Hughes treats the [ɑ~ʌ] distinction as allophonic, although he admits it may be of a quasi-phoneme type as well (2020:107). The only clear minimal pairs show these vowels before [r] (see (8) above), and Hughes makes the reasonable choice of assigning the contrast to the rhotic. In his analysis, words like *gar* /gɑr/ 'copy' have a plain /r/, but words like *gõr* 'travel', transcribed here as /gʌr/, have a front rhotic, /gař/.

First, I refer to section 4.5 above where stress evidence for the vowel distinction is presented. Without an underlying /ɑ~ʌ/ distinction, the facts in (32) are puzzling.

While Hughes' description may reflect an ongoing reshaping of the system, there is internal evidence that the contrast between *gar* /gɑr/ 'copy' and *gõr* [gʌr] 'travel' is at least historically located on the vowel, not the consonant. Specifically for this lexical item, *gõr* 'travel' is likely morphologically related to *gõrõ* 'run', and *gõgõrõ* 'crawl', which have plain [r]s, and are both cited as such by Hughes himself (p. 313) (the two sets are given different etymologies by Hughes, suggesting he does not see *gõr* and *gõrõ* as related).

Second, there are minimal pairs where both words demonstrably have [ʌ], but the rhotics are different. Compare *par* [pʷʌr] 'quick' and *pwer* [pʷʌř] 'false'. Their short vowels are evidenced under prefixation, where stress shifts to the initial syllable [ʌ́pʷʌr] versus [épʷʌř]. This shows that both kinds of

14. No dissimilation happens in adjacent /titi, didi/ sequences, for example, [tˢitˢín] 'cook', [dᶻidᶻipów] 'spotted'.

rhotics are possible after the short vowels, and thus the rhotics cannot *also* do the job of carrying the /ɑ~ʌ/ contrast. Compare also *emwar* [émmʷʌr] 'lei', *emwer* [émmʷʌř] 'bow, bend'.

There is a phonotactic complication. If there are two vowels [ɑ,ʌ] and two consonants [r,ř], we expect four possible VC sequences, but only observe three: [ɑr,ʌr,ʌř]. The complication is that [ɑ] does not seem to occur before front consonants, so there are no words ending in [-ɑř].

For Hughes, the distinction between 'quick' and 'false', or between 'lei' and 'bow', would be in the vowel, /a/ versus /e/. Indeed, many of the words where I set up underlying /ʌ/ in fronting environments are analyzed by Hughes as having /e/; cf. my /dořʌř/ 'speak' versus Hughes' [dorer] (2020:50). Hughes (2020:141) also lists [dædorér] with final stress (as would be necessitated by his stress rule, which stresses final closed syllables); I believe stress is penultimate, [dædóřeř].[15] The next natural move is to seek examples with final [-er] and [-eř] that are distinct from *pwer*. In my data there is only one such word, *õkõmaerer* 'reconcile'. It has final stress, indicating that the vowel is /e/ (and thus distinct from the vowel of *pwer*), but I am unable to determine the quality of the rhotic.

The argument given above depends on my own understanding of stress, which may be questioned, and stress may be diachronically unstable. However, I can offer an additional argument, independent of stress and the identity of the rhotics. In Hughes's analysis, final CVC syllables with a range of [a]- or [e]- like realizations have only two underlying vowels options, /a/ and /e/, and any additional apparent distinctions must be carried by the consonants such as the /r~ř/ contrast. In my analysis, there are three vowels /ɑ,ʌ,e/. Thus, my analysis but not Hughes' predicts the existence of three distinct CVC syllables, /CɑC, CʌC, CeC/, where the second consonant is *not* a rhotic. Such triplets exist. Compare the following examples. In vowel-final stems, such as [æge-] 'spouse' or [egʌ-] 'name', the 3SG affix attaches to the stem.[16] The final syllables if these two words are distinct. However, both are distinct from the applicative suffix *-õn* [-ɑn]. In these cases, the only possible location of the contrast between these three different CVC syllables are the vowels; there is no secondary articulation to carry the contrast this time.

(32)	*egen*	egʌn	name.3SG
	agen	ægen	spouse.3SG
	õmamõgõn	ʌmæmʷʌgɑn	make dry.APPL

This argument is independent of stress, but stress facts confirm it: stress is final in [ægén] 'spouse.3SG' and [ʌmæmʷʌgɑ́n] 'make dry.APPL', and penultimate in [égʌn] 'name.3SG'.

15. The front identity of the [ř] in this root was highlighted by one speaker to warn me not to confuse the initial syllable of *dorer* [dóřeř] 'speak' with *dor* [dor] 'penis'.
16. Alternatively, as in Hughes' analysis, the stem glossed as 'name' may be synchronically C-final [eg-], and the suffix vowel epenthetic.

The reasoning above can be taken in one of two ways: as a synchronic phonological argument for the distinction between /ɑ/ and /ʌ/, or as a weaker argument, a kind of shallow-depth internal reconstruction of a diachronically recent state of Nauruan, where a previous contrast between /ɑ/ and /ʌ/ has collapsed into the system described by Hughes.

6. NOTES ON MICRONESIAN PARALLELS. A full comparative account of Nauruan phonology and the systems in other Micronesian languages raises diachronic issues outside of the scope of this paper and is left for another day. Here, I briefly note three striking similarities and differences between the facts presented above and accounts of Nauruan's relatives.

First, the C-V interactions described in rules (23) and (25) above are typical of Micronesian languages. Such effects have been reported in Kosraean (Lee 1975:47ff.), Marshallese (Bender 1973; Bender, Capelle, and Pagotto 2016: 39ff.), Mokilese (Harrison 1976:34ff.), and Pohnpeian (Rehg 1981:43ff.). The fluidity of contrast location on vowels and consonants seems to be an areal Micronesian feature.

Second, the proposed stress rule shows a more distant resemblance to other Micronesian patterns. Rehg (1993) reconstructs Proto-Micronesian stress as falling on the penultimate mora, and proposes that a high pitch fell on the mora immediately preceding, that is, an HL* melody was aligned to the stressed mora. While the combined penultimate and antepenultimate prominence seems related to the Nauruan stress rule, this relationship is indirect. Like many Micronisian languages, Nauruan underwent final short vowel loss (Hughes 2020), and thus what used to be the penultimate mora became the final. It is possible that the high peak that Rehg reports was subsequently reanalyzed as stress, resulting in a new penultimate stress pattern. An account of the development of antepenultimate stress remains for the future.

Finally, the alternation in the final vowel between [rabada~rabaden] (see (8) and (27)) is reminiscent of similar alternations reported for Pohnpeian (Rehg 2001). There, the [a~e] alternation is due historically to low vowel raising in the context of a historic or synchronic high vowel in the following syllable. While this may be the diachronic origin of the Nauruan pattern, its synchronic account in the modern language is radically different, governed by rule (25) which has no relation to V-to-V assimilation.

7. NOTES ON NAURUAN SPELLING USED IN THIS PAPER. Once again, the Nauruan spelling used to represent data here is a matter of temporary convenience, not as a linguist's endorsement of an orthography for the language. This orthography somewhat systematically represents the consonant inventory, neutralizing some contrasts, notably the secondary articulation contrast on rhotics. The secondary articulation contrast on labials is represented orthographically in a complex way depending on the following vowels, as will be explained in the section on vowels below. The following gives the counts for

various consonant graphemes in the headwords in Jacob et al. (1996), which can serve as an approximate indication of the relative frequency of the corresponding phonemes in the lexicon. Notably, these counts show that /kʷ/ and the voiceless labials are relatively uncommon compared to other consonants. The glide /j/ is undercounted, because it can also be spelled as *i*.

(33)

p	350	/pʷ, p/	*m*	1584	/(m)mʷ, (m)m/
b	1208	/bʷ, b/	*n*	2454	/(n)n/
t	1338	/t/	*ñ*	887	/ŋ/
d	1618	/d/	*j*	786	/j/
k	1126	/k/	*w*	1774	/w,u̯/
g	870	/g/	*r*	2326	/(r)r, (r)ř/
q	213	/kʷ/			

The orthographic representation of vowels is complex and not entirely systematic. Thus, the following grapheme counts based on Jacob et al. (1996) are less informative about the relative frequencies of vowel phonemes than the consonant grapheme counts in (33) about the frequencies of consonants.

(34)

i	3190	/i,ɨ,i̯,j/	o	1193	/o,ʌ,u̯/
e	3834	/e,ʌ/	õ	2164	/ʌ,ɑ,o,u̯/
a	4039	/ɑ,æ/	u	1176	/u,ɨ/
ã	204	/e,i̯e/	ũ	946	/u,ɨ/

The spelling of the vowels in the context of secondary articulation of consonants is illustrated in the following table. It shows the typical spellings of the sequences of front and back labials with all vowel phonemes. Note in particular the twofold use of the grapheme *ũ* after labials: *ũ* spells both /bu/ and /bʷɨ/, thus indicating that the sequence differs from *bu* /bʷu/ either in its consonant or in its vowel.

(35)

	/i/	/e/	/æ/	/ɨ/	/ʌ/	/u/	/o/	/ɑ/
/b/	*bi*	*be*	*ba*	*bi*	*bõ, b(w)a*	*bũ*	*bõ,beõ*	*bõ*
/bʷ/	*bwi*	*bwe*	*ba,bwa*	*bũ*	*bõ, b(w)a*	*bu*	*bo*	*ba*

As the table above illustrates, for many labial-vowel combinations the orthography gives a clue about the quality of both the consonant and the vowel. This is not the case for /r,ř/, which are spelled identically in all vowel contexts.

APPENDIX

A SWADESH LIST. The numbers in the first column and the English meanings are taken from Greenhill, Blust, and Gray (2008). Nauruan forms are given in *surface representation*, with the effect of allophonic rules and stress shown. Underlying forms are recoverable using the information in this article. Directly possessed forms are shown with the affix *-n* (3SG or construct state) where possible.

1	hand	*ben*	ben
2	left	*damauw*	dʌmmʷów
3	right	*damarũm*	dʌ́mʷʌrɨm
4	leg/foot	*nanan*	nænǽn
5	to walk	*õd*	ɑd
5	to walk	*dũgidugo*	dɨ́gidɨ́go
6	road/path	*medena*	médenæ
7	to come	*re*	ře
7	to come	*õr*	ʌr
8	to turn	*iwid*	íwɨd
9	to swim	*eow*	éow
10	dirty	*mwarere*	mʷʌrére
10	dirty	*obaubo*	ʌbʷóbʷo
11	dust	*ibwijũbwij*	ibʷíjɨbʷíj
12	skin	*witin*	wítˢɨn
13	back	*mũrin*	mʷɨ́rɨn
14	belly	*jen*	jen
15	bone	*rõn*	řʌn
16	intestines	*bũriõũn*	bʷɨríʌ-n
17	liver	*aãn*	æi̯é-n
18	breast	*itin*	itˢ͡ín
18	breast	*ikimama*	i-kimʷɑ́mʷɑ
19	shoulder	*barauwen*	bærówʌn
20	to know	*tsiet*	tˢíet
21	to think	*kamarar*	kamærǽr
22	to fear	*miow*	míow
23	blood	*era*	éřřæ
24	head	*tũbwin*	tɨ́bʷɨn
25	neck	*teren*	teřřén
26	hair	*ewewen*	ewéwʌ-n
27	nose	*bodin*	bʷódᶻin
28	to breathe	*go*	go
29	to sniff, smell	*waij*	wei̯j
30	mouth	*mwin*	mʷin
31	tooth	*mwin*	mʷin
32	tongue	*eon*	i̯on
33	to laugh	*idõdõ*	ídɑ́dɑ
34	to cry	*eõñ*	éi̯ʌŋ
35	to vomit	*ean*	eɑ́n
36	to spit	*ura*	úra
37	to eat	*õn*	an
37	to eat	*jeiji*	jéi̯ji
38	to chew	*mama*	mǽmæ
39	to cook	*tsitsin*	tˢitˢín

40	to drink	*nim*	nim
40	to drink	*ren*	řen
41	to bite	*kamwit*	kæmʷíd
42	to suck	*kimama*	kimʷɑ́mʷa
43	ear	*ijũñ*	íjɨŋ
43	ear	*danũñ*	dénɨŋ
44	to hear	*kaiõt*	kei̯jɑ́t
45	eye	*men*	men
46	to see	*ãt*	i̯ed
47	to yawn	*mamae*	mæmǽi̯
48	to sleep	*mijimij*	míjimíj
49	to lie down	*mequõr*	mékʷʌr
50	to dream	*renimin*	řenɨmín
51	to sit	*megeda*	mégʌda
52	to stand	*weijo*	wéi̯jo
53	person	*eñame*	éŋʌme
54	man/male	*eman*	emmʷǽn
55	woman/female	*ãn*	i̯en
56	child	*ñain*	ŋei̯-n
56	child	*eoniñ*	i̯ónɨŋ
57	husband	*agen*	ægé-n
58	wife	*agen*	ægé-n
59	mother	*inen*	ínne-n
60	father	*etõñin*	étʌŋɨ-n
61	house	*eoag*	eu̯ɑ́g
63	name	*egen*	égʌ-n
64	to say	*pan*	pʷɑn
66	to tie up, fasten	*waij*	wei̯j
66	to tie up, fasten	*quõr*	kʷʌr
67	to sew	*jir*	jir
67	to sew	*tir*	tˢir
69	to hunt	*õnani*	ʌnʌ́nni
70	to shoot	*tsiwai*	dᶻiwéi̯j
71	to stab, pierce	*wataba*	wʌ́tʌbʷæ
72	to hit	*tamwit*	tʌmʷíd
72	to hit	*eña*	éŋæ
72	to hit	*ijatow*	ijɑ́tʌw
73	to steal	*are*	ářře
73	to steal	*torere*	tóřeře
74	to kill	*abi*	ǽbi
75	to die, be dead	*ema*	émæ
76	to live, be alive	*timor*	tˢimʷór
77	to scratch	*õrõr*	ɑrɑ́r
77	to scratch	*wũri*	wɨ́ri

78	to cut, hack	*tow*	tʌw
78	to cut, hack	*mwit*	mʷid
78	to cut, hack	*were*	wéře
79	stick/wood	*dabwike*	dʌbʷíke
79	stick/wood	*era*	éræ
80	to split	*baõ*	bʷæʌ
81	sharp	*eõkõñ*	i̯ʌ́kʌŋ
82	dull, blunt	*kabaãt*	kabe(i̯)ét
83	to work	*mõgũr*	mʌ́gɨr
84	to plant	*kiãõ*	kijáu̯
84	to plant	*magan*	mǽgʌn
85	to choose	*ij*	ij
86	to grow	*erõ*	éřʌ
87	to swell	*epwe*	épʷe
88	to squeeze	*mwat*	mʷʌt
89	to hold	*õgõg*	ʌ́gʌg
90	to dig	*eiri*	íri
91	to buy	*tuwab*	túwʌb
92	to open, uncover	*ba*	bʷæ
93	to pound, beat	*barũ*	bʌ́rɨ
93	to pound, beat	*ogoge*	ogóge
94	to throw	*jid*	jid
94	to throw	*orai*	arái̯j
95	to fall	*pudu*	pʷúdu
96	dog	*robar*	róbʷʌr
97	bird	*imin õeta*	íminʌu̯étʌ
98	egg	*apain*	apʷéi̯n
99	feather	*aiben*	ei̯bén
101	to fly	*(õ)eta*	(ʌu̯)étʌ
102	rat	*ikumudodo*	ikumʷodódo
103	meat/flesh	*duwen*	dúwʌ-n
104	fat/grease	*duweduw*	dɨ́wʌdɨ́w
105	tail	*iwin*	íwɨ-n
107	worm (earthworm)	*emwe*	émʷe
108	louse	*iwi*	íwi
108	louse	*idij*	idíj
109	mosquito	*demininer*	demín(i)nʌř
110	spider	*areow*	æřéow
111	fish	*iũ*	íɨ
112	rotten	*mwamwati*	mʷamʷatˢi
113	branch	*ran*	ræn
114	leaf	*ren*	řen
115	root	*awaran*	ǽwʌrʌn
116	flower	*ekauwe*	ekóu̯we

117	fruit	*quan*	kʷæn
118	grass	*ibũgibũgi*	i-bʷɨ́gibʷɨ́gi
120	stone	*epe*	épe
121	sand	*ibũbũ*	i-búbu
121	sand	*arõũrõ*	arʌ́u̯rʌ
122	water	*ebõk*	é-bʌk
123	to flow	*kaw*	kæw
124	sea	*ijited*	i-jíted
124	sea	*imago*	ímʌgo
125	salt	*barajited*	bʌrʌjíted
128	sky	*ianweron*	jænou̯eřón
129	moon	*maraman*	mʌ́rʌmen
130	star	*edetañ*	édetʌŋ
131	cloud	*denañ*	dénʌŋ
133	rain	*oerõn*	u̯eřón
134	thunder	*debaõ*	debǽʌ
135	lightning	*eid*	ei̯d
136	wind	*eñin*	éŋɨn
137	to blow	*jiw*	jiw
137	to blow	*tsiw*	tˢiw
138	warm	*kũñijow*	kɨ́ŋijow
139	cold	*(egara)mwamwe*	(egʌrʌ)mʷǽmʷe
140	dry	*mõg*	mʌg
141	wet	*eriare*	eříʌre
142	heavy	*roe*	řoi̯
143	fire	*ãe*	i̯ei̯
144	to burn	*õñ*	aŋ
145	smoke	*bajin*	bájin
145	smoke	*badetsi*	bʷædédᶻi
146	ash	*emarañata*	emʌrʌ́ŋʌtæ
147	black	*tañañ*	tæŋǽŋ
147	black	*tũr*	tɨr
148	white	*bũrũbũr*	bɨ́rɨbɨ́r
149	red	*mwirara*	m(ʷ)iřǽřæ
150	yellow	*ebabobo*	ebebʷóbʷo
151	green	*aditũr*	ádᶻitɨr
152	small	*kadudu*	kædúdu
152	small	*oniñ*	ónɨŋ
153	big	*ouwak*	ou̯wák
154	short	*ebo*	ébo
155	long	*raq*	řʌkʷ
156	thin	*nerõn*	neřán
157	thick	*emeij*	eméi̯j
158	narrow	*oroeõ*	orói̯a

159	wide	*ereãb*	eřei̯éb
160	painful, sick	*arak*	ářʌg
161	shy, ashamed	*maiũr*	mǽi̯ɨr
162	old	*ebwe*	ébʷe
162	old	*eñab*	éŋʌb
163	new	*tsimeduw*	tˢímeduw
164	good	*omo*	ómmʷo
165	bad, evil	*baka*	bǽkæ
166	correct, true	*eimwi*	éi̯mʷi
167	night	*bũm*	bʷɨm
168	day	*aran*	ařǽn
169	year	*obweni*	óbʷʌni
170	when?	*ijet*	ijét
171	to hide	*ewewin*	eu̯éu̯in
172	to climb	*anũ*	ánni̯ɨ
173	at	*ean*	i̯an
174	in, inside	*ia*	jæn
175	above	*itũga*	ítɨgæ
176	below	*ijõñ*	íjʌŋ
177	this	*ñune*	ŋúnne
177	this	*bitune*	bitúne
178	that	*bita*	bíta
179	near	*tũren*	tɨřʌn
180	far	*goeow*	gói̯ow
181	where?	*iña*	íŋa
182	I	*ña*	ŋa
183	thou	*wõ*	wʌ
185	we.INC	*ata*	ǽtæ
185	we.EXC	*ama*	ǽmmæ
186	you	*amie*	ǽmie
187	they	*ũra*	ɨu̯ræ
188	what?	*eda*	éda
189	who?	*ijen*	ijén
191	all	*memak*	memǽk
192	and	*me*	mV
193	if	*tsin*	tˢin
194	how?	*õten*	ʌ́ten
195	no, not	*eõ*	eʌ
196	to count	*õdũ*	ʌ́du
197	one	*aiquen*	éi̯kʷʌn
198	two	*aro*	ʌ́ro
199	three	*aeju*	éi̯ju
200	four	*aeoq*	ǽi̯ʌkʷ
201	five	*aejimõ*	éi̯jimʌ

202	six	*año*	áŋo
203	seven	*aeiu*	éi̯u
204	eight	*aoju*	óju
205	nine	*ado*	ádo
206	ten	*atae*	atái̯
209	one hundred	*abu*	ábʷu
210	one thousand	*araña*	árʌŋʌ

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