THE PHONETIC DESCRIPTION OF THE ŽU'HÔASI CLICKS: A CONFUSION OF SOUNDS?

J. Snyman

INTRODUCTION

The recently published *African linguistic contributions* (Gowlett, 1992) honouring E.O.J. Westphal, contains a contribution by Tony Traill, entitled “A confusion of sounds: the phonetic description of 'Xu clicks” (pp. 345–362). In his contribution Traill (1992:345–350) summarises the transcriptional differences between Vedder, Lloyd, Bleek, Maingard, Köhler and Westphal and then proceeds (Traill 1992:351:361) to draw a detailed comparison between his personal data on Tsumkwe Žu|hôasi with Snyman’s (1975) findings.1 This seems rather inappropriate as he was aware (Traill 1992:347) of Snyman’s latest views on clicks, namely *The clicks of Žu|hôasi* published in Baumbach (1978). For some reason this publication was not closely studied while Traill concentrated on the contents of Snyman (1975) where some of the click articulations were less elegantly explained. This led him to conclude that he had the answer to the “recurrent confusions between sounds found in over a century (sic) of study”, and that he had provided “an objective basis for their correct description” (Traill 1992:361). A closer analysis of his data, however, reveals that he did not take cognisance of all relevant sections in both Snyman (1975) and Snyman (1978). His misinterpretation and consequent misrepresentation of Snyman’s (1975:19) alternate application of the apostrophe in this language spawned a detailed argument bent on proving that Snyman regarded click accompaniments with *delayed aspiration*, viz. |'h [|'h], + 'h [+h], !'h [!*h] and ||'h [||'h] as being *ejected* (Traill 1992:347, 355, 356). This is not however, the correct interpretation of Snyman (1975:20,
92–97, iii) where the offending “tydelike dating in frekwensie” (a temporary fall in (fundamental?) frequency) (Traill 1992:347), only refers to a period of decreased articulatory energy or amplitude in the case of three types of sounds. Snyman (1975:19) accounted for this period of low amplitude in the practical orthography of Žu|hôasi by means of an apostrophe and a superscripted hyphen in the phonetic orthography. The hyphen was used in three instances, namely for:

(a) a period of ‘silence’ followed by the **progressively increasing** air flow for the articulation of the delayed glottal fricatives as in |'h [|=h], !'h [|=h] and ||'h [|=h];

(b) the **glottal stop** following on clicks like |' [|?] as well as **ejectives** like |x' [|x'], |x' [+x'], !x' [!x'] and ||x' [||x'];

(c) the **glottal attenuation** in the case of glottalised vowels and nasals, e.g. dâ’a [dâ?a] – fire, nlôm’m – navel.

Snyman (1975:19) is therefore basically in agreement with Traill (1992:348) that in the case of [|=h] we are dealing with “the regulation of the pulmonic pressure”. There is therefore no “phonetically spurious and phonologically irrelevant glottal stop” contained in Snyman’s data on !'h [|=h], as erroneously interpreted by Traill (1992:356). As for Snyman’s (1975:19, 94) n|’h [g|=h], n+=h], n!’h [g|=h] and n||’h [g||h] Traill (1992:357) failed to take cognisance of Snyman’s (1978:157, 158) revised interpretation of these click accompaniments. Snyman regards them as examples of nasal pre-voiced clicks and explains his use of the phonetic symbol [|] for oral prevoicing and [|] for **nasal prevoicing**. There was therefore no need for Traill “to ponder the weird prospect of nasalized ejected aspirated segments!” (Traill 1992:357). Even in Snyman (1975:19, 94) these click accompaniments had not been described as “ejected aspirated segments”. They had been regarded as examples of click releases characterised by “a period of silence” or, more elegantly phrased, a period of low amplitude, which was phonetically represented as [|], e.g. [g|=h].

Traill’s (1992: 351) main concern however was, with the transcriptional differences in the documentation of the field notes of these researchers. Apparently he was convinced that he had an explanation for this state of affairs, because he sets up an elaborate experiment “to explore the mechanism responsible for the difference between the audible and silent release of the velar closure”. This led Traill (1992:347, 357) to find that:
(i) the four click releases consist of: \[n!h\] and \(n!h\) with a silent release of the velar closure and \(\!kh\) and \(g!kh\) with an audible release of the velar closure.

(ii) Snyman's \(!'h\) \([!'h]\) and Westphal's \(!'h\) are characterised by a "voiceless nasal flow prior to the release of the click" (1992:353) which he represents it as \(n!h\). According to Traill (1992:357) "This breaks with the tradition of !Xù studies, none of which describe \(n!h\) as nasalised, ..." This is of course only partially correct as Beach (1938:85) (See quote in Snyman (1975:133, 134)) as well as Snyman (1975:133, 134) observed the "slight nasal efflux" which is "never used if the click is initial in a breath group".

Traill (1992:357) then implements the principles, mentioned in (i) and (ii) above, in "A revised phonological classification of clicks" which he proposes as his solution to the "confusion of sounds".

However, the questions arise as to whether:

(i) Traill's findings on "the audible and silent release of the velar closure" have been empirically validated?

(ii) the inaudible nasal flow, which forms the basis of Traill's "revised phonological classification of clicks", only applies to Snyman's (1975, 1978) \(!'h\) \([!'h]\) etc and Snyman's (1978) \(n!h\) \([?'h]\) etc?²

If any doubts exist about the validity of these two issues, the premises on which Traill based his "confusion of sounds" become suspect. This, however, does not explain all the transcriptional differences documented by Traill (1992:349, 350) in the dialectal notes of Snyman, Maingard, Köhler and Westphal. Snyman (1978) did offer an empirically substantiated interpretation of the clicks of Tsumkwe Žu|'hôasi, but similar contributions are lacking in the work of the other researchers. A solution to the impasse may be found in:

(i) a close scrutiny of Snyman (1978) and a comparison with Snyman’s revisiting of the same topic as documented in the rest of this article;

(ii) a comparison of Snyman's (1997) dialectal transcriptions with the published field notes of Maingard, Köhler and Westphal.³

This would present us with a better explanation for the transcriptional discrepancies observed by Traill.

In order to focus clearly on the clicks of Tsumkwe Žu|'hôasi, the rest of this contribution will refrain from referring to the work of Khoesanists other than
Snyman and Traill. By presenting an acoustic analysis of the Žu|'hōasi clicks, based on a cassette (available from the Unisa Library), scholars are afforded the opportunity to study this phenomenon at their leisure and make their own comparisons between Snyman’s interpretation of the clicks of Žu|'hōasi and Traill’s impression that !Xùu click phonetic description, prior to 1992, was a mere “confusion of sounds”.

THE CLICKS OF TSUMKWE ŽU|'HŌASI

Unlike Beach (1938:75, 82), Snyman (1978) did not classify the clicks according to influx and efflux types but according to the place of articulation as well as the number of airstreams involved in the articulation of a particular click. In the present revision of Snyman (1978) the place of articulation (i.e. influx) and manner of egressive release (i.e. efflux or click accompaniment) will serve as parameters for classification.4

Žu|'hōasi has four basic clicks and their respective active and passive articulators are:

- [[]] - lamino-dental
- [] - lamino-palatoalveolar
- [!] - apico-postalveolar
- [||] - apico-alveolar

Traill (1985:113) found that the volume of rarefied air at the moment of articulation was smaller for [[]] and [++.]. This explains why these clicks are experienced as higher pitched than [!] and [||]. As the clicks [++] and [!+] have an instantaneous influx reminiscent of a plosive. Snyman calls them inplosive, while the clicks [[]] and [||] have a fricative influx which inspires the term infricative.

When spoken in isolation the wave forms and spectrograms of the four clicks are:
The lamino-dental click []

The lamino-palatoalveolar click [+]
The apico-postalveolar click [!]
The articulation of clicks can either be basic, i.e. only the lingual airstream is used, e.g. [\|], [\|=], [\|=] and [\|=], or complex when the lingual airstream and (i) either the pulmonic, (ii) the laryngeal, (iii) or both these airstreams are simultaneously involved in the articulation of a number of effluxes like the nasal efflux, i.e. [\|=] and the ejected velar fricative efflux, i.e. [\|=]. The basic click as well as the following complex clicks will be discussed in more detail:

(i) the glottal plosive accompaniment, e.g. [\|=], [\|=], [\|=] and [\|=];
(ii) the voiced accompaniment, e.g. [\|=], [\|=], [\|=] and [\|=];
(iii) the velar fricative accompaniment, e.g. [\|=], [\|=], [\|=] and [\|=];
(iv) the ejected velar fricative accompaniment, e.g. [\|=], [\|=], [\|=] and [\|=];
(v) the voiced and velar fricative accompaniments, e.g. [\|=], [\|=], [\|=] and [\|=];
(vi) the prevoiced and ejected velar fricative accompaniments, e.g. [\|=], [\|=], [\|=] and [\|=];
(vii) the glottal fricative accompaniment, e.g. [\|=], [\|=], [\|=] and [\|=];
(viii) the delayed glottal fricative accompaniment, e.g. [\|=], [\|=], [\|=] and [\|=];
(ix) the prevoiced and glottal fricative accompaniments, e.g. [\|=], [\|=], [\|=] and [\|=];
(x) the nasalised accompaniment, e.g. [\|=], [\|=], [\|=] and [\|=];
(xi) the nasal prevoiced and glottal fricative accompaniments e.g. [\|=], [\|=], [\|=] and [\|=].

The following discussions of the !Xuu clicks, according to the basic and complex parameters mentioned above, will focus on spectrograms and wave forms of the lamino-dental and lamino-palatoalveolar clicks, the reason being that the click in the spectrograms of these two clicks seldom reaches frequencies lower than 800 Hz while the fundamental frequency of their various voiced and nasalised accompaniments do not exceed 500 Hz. This allows for an unambiguous analysis of the simultaneously articulated voiced/nasalised and click segments. The examples due to be analysed, as well as
A SPECTROGRAPHIC AND WAVE FORM ANALYSIS OF LAMINO-DENTAL AND LAMINO-PALATOALVEOLAR CLICKS

The following wave forms and spectrograms were printed on the DSP Sonagraph, model 5500, and obviously lack supporting data available from air flow measurements. In the case of the wave forms of the words containing clicks, the attention was focused on the click segments of each word by expanding the click wave form and by adding the amplitude graph below it. The degree of expansion depended on the nature of the acoustic data under discussion. Together with the spectrographic tracings one has sufficient data on which to base an account of the Zu|hôasi clicks. The spectrographic tracings of the words, displaying the frequency ranges of the clicks, were kept at the standard time setting of 50 ms.

The choice of the illustrative material used in the rest of this article depended on what had been found as a norm pronunciation for a particular click. Some of the examples on the cassette will obviously deviate from the norm but are nevertheless relevant as they illustrate the variety of pronunciations found in the speech of individual speakers of the language.

1. THE BASIC CLICK ARTICULATION

The basic articulation of clicks does not involve the pulmonic and laryngeal airstream mechanisms. These clicks are therefore produced by means of the lingual airstream mechanism only. In figure 1 this is evidenced by the wave form and spectrogram of the lamino-dental click [] in |oara (baboon).
Figure 1. [ ] in |oara (baboon)

The numbered phonetic segments in figure 1 are interpreted as follows:

Segment 1  =  a voiceless click onset  
Segment 2  =  a lamino-dental click  
Segment 3  =  the vowel [o]

The waveform of [ ], expanded to 3.12 ms./div., displays a lengthy aperiodic commencement with number of amplitude peaks leading to a high amplitude peak. The spectogram displays the frequency of the click concentrated between 3 000 and 4 000 Hz. This is followed by a sharp decline in amplitude with the aperiodic wave fading into the onset of the periodic wave of the vowel [o].

2. THE COMPLEX CLICK ARTICULATION

The complex articulation of clicks is characterized by the fact that they have accompaniments (effluxes) resulting from either (i) the pulmonic, (ii) the laryngeal (i.e. glottalic) or (iii) a combination of both of these egressive airstream mechanisms.
Clicks with a glottal plosive accompaniment

Clicks with a glottal plosive accompaniment are characterised by the fact that the rarefactive phase of the click articulation is accompanied by a glottal closure which is maintained till after the articulation of the click. The result is a vowel initiated by a glottal plosive onset.

In figure 2 this is attested by the wave form and spectrogram of [ʔ] in 'a (to give)

![Wave form and spectrogram](image)

**Figure 2.** [ʔ] in 'a (to give)

The numbered phonetic segments of figure 2 are interpreted as follows:

- **Segment 1** = a voiceless click onset
- **Segment 2** = a lamino-dental click
- **Segment 3** = the occlusion phase prior to the articulation of the glottal plosive
- **Segment 4** = the vowel [a].

The wave form of [ʔ], expanded to 3.12 ms./div., shows the long aperiodic commencement of the click. The acoustic energy is spread over a wide range of frequencies with concentrations at 2 500–3 000 and 6 000–7 000 Hz.
respectively. The click is followed by zero frequency and low amplitude associated with the vocal cord adduction prior to the glottal plosive onset of the vowel [a].

(ii) Clicks with a voiced accompaniment

This category of clicks is characterized by a negative voice onset which is audible despite the occlusion of the speech tract. The occlusion of the speech tract results in the voice onset being acoustically similar to the fundamental frequency. The articulation of the click is immediately followed by the glottal pulses initiating the vowel [o].

In figure 3 this is discernable in the wave form and spectrogram of [g] in g|oa (Combretum sp.).

![Figure 3. in g|oa (Combretum sp)](image)

The phonetic segments demarcated in figure 3 represent:

Segment 1 = a normal voiced click onset
Segment 2 = a lamino-dental click
Segment 3 = the vowel [o]
When expanded to 25 ms./div., the wave form of [g |] clearly displays a periodic low amplitude onset similar to the fundamental frequency. The duration of the voice onset depends on the supraglottal pressure which acts as a regulating factor of the pulmonic airflow. This is followed by the wide frequency wave associated with the lamino-dental click. The click segment of the wave displays a clear amplitude peak. The spectrogram shows a concentration of acoustic energy at 3000–4000 Hz. This is followed by a sharp decline in amplitude to allow for the readjustment of the articulatory organs prior to the production of the periodic wave of the vowel [o].

(iii) Clicks with a velar fricative accompaniment

These clicks are characterized by a voiceless onset immediately followed by a click and a velar fricative. The rarefaction for the click articulation occurs simultaneously with the pressurising of the pharyngeal cavity behind the velar and velic closures. The click and velar fricative segments are released in close succession and are immediately followed by the vowel [u].

In figure 4 this sequence of events is discernable in the wave form and spectrogram of [x] in |xani (guinea fowl).
The phonetic segments in figure 4 represents:

Segment 1 = a voiceless click onset
Segment 2 = a lamino-dental click
Segment 3 = velar fricative noise
Segment 4 = the vowel [n]

The waveform of [\text{x}], expanded to 12.5 ms./div., illustrates the aperiodic wave of the click moving through a few amplitude peaks. The frequency of the click ranges from 500–7000 Hz with a concentration of acoustic energy between 1000 and 3500 Hz. The click is followed by the aperiodic wave of the glottal fricative, with frequencies ranging from 1000 to 4500 Hz fading into the periodic waves of the vowel [n]. Segment 3(a) of the aperiodic wave of the velar fricative displays oscillations which even out to the more usual wave form of a velar fricative. A similar oscillation occurs in the case of clicks with an ejective velar fricative accompaniment as well as clicks with a glottal fricative accompaniment.\textsuperscript{8}

(iv) Clicks with an ejective velar accompaniment

These voiceless clicks are typically followed by an ejected velar fricative. The rarefaction for the click and the pharyngeal pressurisation, behind the velar and velic closures, occur simultaneously and the click and ejected segment are released in close succession. This, as a natural consequence, is followed by the glottal plosive release of a following vowel.

In figure 5 this sequence of events can be witnessed in the wave form and spectrogram tracings of [\text{x}'] in \text{x'uri} (iron).\textsuperscript{9}
The phonetic segments mentioned in figure 5 represent:

Segment 1 = a voiceless click onset
Segment 2 = a laminal dental click
Segment 3 = a sharp ejected velar fricative noise.
Segment 4 = the glottalic occlusion phase following on the production of the ejected velar fricative and prior to the articulation of the glottal plosive before the vowel [u].
Segment 5 = the vowel [u]

The expanded wave form of [\(\text{x}'\)] to 12.5 ms./div. shows the aperiodic wave of the click with a few amplitude peaks. The spectrogram displays click frequency ranges from 1 000 Hz to over 7 000 Hz with a clear concentration of acoustic energy at 2 000–4 000 Hz. The click is followed by a typical aperiodic high frequency wave associated with ejected fricatives. The initial stages of the aperiodic wave show the oscillations mentioned in endnote 8. The aperiodic wave fades into a period of zero frequency and low amplitude. This is followed by a sharp increase in amplitude coinciding with the periodic wave pattern of the vowel [u] commencing in a glottal plosive.
(v) **Clicks with a voiced as well as a velar fricative accompaniment**

Characteristically these clicks have a negative voice onset followed by a click and ending in a velar fricative. This set of clicks is the voiced counterpart of the voiceless clicks with a velar fricative accompaniment, e.g. [θ] discussed in section (iii) above. The velar and velic closures of these clicks close off the speech tract thus allowing for the production of a voice onset which is similar to the fundamental frequency. The production of this voice onset lasts as long as the supraglottal pressure allows an inflow of air. This process occurs while the lingual airstream is being produced. On reaching a suitable degree of rarefaction the articulation for the click is released and is immediately followed by a voiced velar fricative.\(^\text{10}\)

In figure 6 this sequence of events can be verified against the wave form and spectrogram of [g|θ] in g|θam (urine).

![Figure 6. [g|θ] in g|θam (urine)](image)

The phonetic segments of [g|θ] in figure 6 consist of:

- **Segment 1** = a normal voiced click onset
- **Segment 2** = a lamino dental click
Segment 3 = velar fricative noise
Segment 4 = the vowel [v]

When expanded to 25 ms./div., the wave form of [g|x] shows the periodic low amplitude wave similar to the fundamental frequency. This wave clearly shows an increase in amplitude which is characteristic of normal voicing. It is followed by the typical wide frequency aperiodic click wave with its high amplitude peak and a frequency concentration at 2 200–3 100 Hz. The click is followed by a wide frequency aperiodic wave of the velar fricative with frequency concentrations at 800–2 000 Hz and 2 800–3 100 Hz respectively. The aperiodic wave then blends into the periodic wave of the vowel [v].

(vi) Clicks with a prevoiced as well as an ejected velar fricative accompaniment

This set of clicks have as their voiceless counterpart the set of clicks with an ejected velar fricative efflux, e.g. [x?] discussed in section (iv) above.

The clicks with a prevoiced as well as an ejected velar fricative accompaniment consist of a negative prevoiced onset, followed by a click, and ending in an ejected velar fricative. The velar and velic closures obstruct the speech tract thus creating the circumstances for the production of the prevoiced onset. The wave form of the prevoiced onset resembles the wave form of the fundamental frequency but displays less acoustic energy – fading before the anterior release of the click. This fading occurs because of the decrease in air flow through the glottis as the pressure increases in the enclosed pharyngeal cavity. The rarefaction for the click release, and the laryngeal pressurisation occur simultaneously. The pharyngeal pressure is maintained when the glottis closes in preparation for the articulation of the ejected velar segment. The click and the ejected velar segments are released in close succession. The ejected velar fricative is naturally followed by the glottal plosive onset of a following vowel.

In figure 7 this sequence of events is illustrated by the wave form and spectrogram tracings of [x’] in g’x’ui (to twist around, to wind).
The phonetic segments demarcated in figure 7 represent:

**Segment 1** = a prevoiced click onset viz [d] 
**Segment 2** = a lamino-dental click 
**Segment 3** = a sharp ejected velar fricative noise 
**Segment 4** = the glottalic occlusion phase following on the production of the ejected velar fricative and prior to the articulation of the glottal plosive before the vowel [u]. 
**Segment 5** = the vowel [u] 

The click wave of [d | x'], expanded to 25 ms./div., displays the rising amplitude of the prevoiced onset as well as its declining amplitude before the commencement of the wide frequency aperiodic click wave. The prevoiced onset resembles the wave pattern of the fundamental frequency and lasts as long as the supraglottal pressure allows for a voiced pulmonic air flow.

The actual click wave has a number of amplitude peaks as well as concentrations of acoustic energy at 2 000 – 3 000 Hz. The click is followed by the oscillation (see endnote 8) and the aperiodic wave of the ejected fricative.
continues into a period of near zero frequency and low amplitude. This is followed by an increase in amplitude corresponding with the periodic wave of [u] commencing in a glottal plosive.

(vii) Clicks with a strong glottal fricative accompaniment

These clicks are phonetically characterized by a voiceless onset, followed by a click, a glottal fricative and a vowel.

In figure 8 this sequence of phonetic segments is illustrated by the wave form and spectrogram tracings of [+h] in +hai (many).

![Waveform and spectrogram](image)

**Figure 8.** [+h] in +hai (many)

The numbered phonetic segments in figure 8 represent:

- **Segment 1** = a voiceless click onset
- **Segment 2** = a lamino-palatoalveolar click
- **Segment 3** = a voiceless glottal fricative
- **Segment 4** = the vowel [ə].
The wave form of [⁺h], expanded to 12.5 ms./div., displays zero amplitude and zero frequency prior to the articulation of the voiceless click. The click wave itself is characterized by a higher than normal amplitude and a wide range of frequencies from 300 to 7 000 Hz with a concentration of acoustic energy at 2 100–4 000 Hz. This is followed directly by an initially oscillating aperiodic wave (as explained in endnote 8) which gradually diminishes in amplitude but never approaches zero amplitude until it merges with the vowel [v]. Perceptually this click is experienced as strongly aspirated.

(viii) Clicks with a weak glottal fricative accompaniment

Clicks belonging to this category are distinguished by a voiceless onset, followed by the click and continuing into a barely audible glottal fricative. The extremely low level of friction may be ascribed to either cavity friction or an abducted glottis.

In figure 9 these articulatory events are depicted by the wave form and spectrogram tracings of [⁺ʰ] in ʰha (to gather veldkos).

Figure 9. [⁺ʰ] in ʰha (to gather veldkos)
The numbered phonetic segments in figure 8 represent:

- Segment 1 = a voiceless click onset
- Segment 2 = a lamino-palatoalveolar click
- Segment 3 = a glottal fricative gradually increasing in amplitude
- Segment 4 = the vowel [ä]

When expanded to 12.5 ms./div., the wave form of \( [\pm^*h] \) displays low amplitude and zero frequency prior to the articulation of the voiceless click. The wave of the click shows the normal rise in amplitude with frequencies ranging from 200 to 7,000 Hz and a concentration of acoustic energy between 1,000 and 4,000 Hz. The click is followed by an aperiodic wave which falls significantly in amplitude and levelling near zero. It then rises gradually in amplitude well in advance of the onset of the vowel [ä].

Because the initial sudden drop in amplitude is sustained up to the amplitude gain just before the onset of the vowel, this category of clicks was previously perceived as clicks with “a period of silence” or as clicks with a “delayed glottal fricative efflux” (Snyman, 1978:154). This view can now be revised in the light of the fact that the aspiration is not delayed but barely audible for the greater part of its articulation.\(^{14}\)

(ix) Clicks with a prevoiced as well as a glottal fricative accompaniment

This category of clicks has a limited distribution in the lexicon of this dialect and is characterized by a prevoiced click onset, a click and a glottal fricative accompaniment.

In figure 10 this articulatory sequence is demonstrated by the wave form and spectrogram tracings of \([\pm h]\) in g±huí (dog).
The demarcated phonetic segments in figure 8 represent:

Segment 1 = a prevoiced click onset  
Segment 2 = a lamino-palatoalveolar click  
Segment 3 = a voiceless glottal fricative  
Segment 4 = the vowel [ū].

The wave form of [ū + h], expanded to 12.5 ms./div., displays a periodic onset gradually increasing in amplitude and then decreasing in both amplitude and frequency. The prevoiced onset resembles the wave pattern of the fundamental frequency and lasts only as long as the pressure in the supraglottal cavity allows for a voiced pulmonic airflow. This is followed by the wide frequency wave of the lamino-prepalatal click with frequency concentrations at 1 000 and 2 000 Hz. The click is followed by an initially oscillating glottal aperiodic wave (as explained in endnote 8) with a steep drop in amplitude. The low amplitude is sustained and starts rising well in advance of the vowel onset. The aperiodic wave gradually merges with the periodic wave of the vowel [ū].
(x) Clicks with a nasal accompaniment

This set of clicks has a voiced nasal onset, followed by a click and a vowel. The nasalisation continues throughout the click articulation.

This articulation is illustrated in figure 11 by the wave form and spectrogram tracings of [ŋ+] in n=anghaše (honey badger).

The phonetic segments mentioned in figure 11 represent:

Segment 1 = a voiced velar nasal click onset
Segment 2 = a lamino-prepalatal click
Segment 3 = the vowel [β]

The wave form of [ŋ+], expanded to 12.5 ms./div., shows a nasalised periodic wave gradually increasing in amplitude and merging with the high frequency aperiodic click wave. The frequency of the click wave ranges from ± 200 to 7 000 Hz with a concentration of acoustic energy below and above 3 000 Hz. The click is followed by the periodic wave of [β].
(xi) **Clicks with a nasal prevoiced as well as a glottal fricative efflux**

This group of clicks is made up of a prevoiced nasal onset, followed by a click and a glottal fricative.

In figure 12 this series of phonetic segments is evident in the wave form and spectrogram tracings of \[\text{[l+h]}\] in \(n+h\ai\) (to sneeze).\(^{15}\)

![Waveform and spectrogram](image)

**Figure 12.** \[\text{[l+h]}\] in \(n+h\)ai (to sneeze)

The phonetic segments demarcated in figure 12 represent:

- **Segment 1** = a prevoiced nasal onset
- **Segment 2** = a lamino-prepalatal click
- **Segment 3** = a voiceless glottal fricative
- **Segment 4** = the vowel [\(\text{u}\)]

Segments 2 and 3 of both figure 8 and 12 depict a comparable sequence of phonetic segments.\(^{16}\)

The wave form of \[\text{[l+h]}\], expanded to 25 ms./div., shows a nasalized prevoiced periodic wave slightly increasing in amplitude and fading into a few aperiodic
cycles before the articulation of the click. The wide frequency click wave shows concentrations of acoustic energy between 2 000 and 3 000 Hz followed by an oscillating aperiodic wave (endnote 8) merging with the periodic wave of the vowel [v].

CONCLUSION

This exposition of the clicks of Žu|hôasi is not intended to be definitive in any way. It merely aims to reopen the debate by refuting past misrepresentations and misinterpretations. By making a cassette recording of click data available at the Unisa Library, other scholars may develop an interest in this language with an extremely complex sound system.

ENDNOTES

1. The major portion of Snyman’s research was based on the Žu|hôasi or Southern dialect cluster of the !Xûu language.
2. According to Snyman (1975:133, 134) Traill’s voiceless nasal venting should also apply to [‘], [=<‘], [‘=)], [‘=)], [‘=]], [‘=]], [‘=]], [‘=]], [‘=]], [‘=]], as well as [‘=]]. Traill’s (1992:357) “revised phonological classification of clicks” is therefore in all probability incomplete – and therefore flawed?
3. Snyman (forthcoming) draws a detailed comparison between Doke’s (1923-6) and Snyman’s (1997) published field notes.
4. Generally speaking the articulation of clicks presupposes a negative intra-oral pressure created by the downward suction of the tongue. This implies that the tongue is the initiator of the rarefied intra-oral volume of air required for the articulation of clicks. This rarefied volume of air is produced as follows:

(i) the edges as well as the back of the tongue are lifted to form an airtight closure along the edges of the alveolus, palate and velum, thus enclosing a small volume of air;
(ii) the middle of the tongue is lowered without releasing the this airtight closure;
(iii) this results in the enlargement of the enclosed volume of air and consequently the lowering of the pressure inside the enclosed cavity.

On release of the anterior lingual articulation, the higher atmospheric pressure rushes into this cavity, equalising the difference in pressure between the higher extra-oral and the lower intra-oral pressures. This influx or ingressive flow of air is experienced as a click sound. The anterior part of the tongue therefore acts as the active articulator of clicks. The anterior part of the roof of the mouth is obviously the passive articulator. From this general description it is clear that the tongue has a dual role in the production of click sounds. It functions as the initiator of the rarefied airstream as well as the articulator of clicks. One should therefore distinguish between these two distinct roles of the tongue when discussing the articulation of clicks. The release of the post-dorsal contact is therefore incidental
to the production of the rarefied airstream and is not relevant for the click articulation. It is therefore not necessary to include an inaudible voiceless velar [lk] or [kl] in click transcriptions. The velar negative V.O.T. of voiced and nasal clicks on the other hand is audible as [g] and [g̊] respectively because of the time overlap between the production of the lingual airstream and the negative V.O.T. of voiced and nasalized clicks.

5. The text of this recording as well as the cassette itself is available on interlibrary loan from the University of South Africa in Pretoria.

6. Orthographically the glottal plosive is written as an apostrophe.

7. The normal voiced click onset, [g], is in contrast with the prevoiced click onset, viz. [g̊], to be discussed in figure 7 [g̊] as well as the nasal prevoiced onset to be discussed in figure 12 [g̊].

8. In a personal communication with Ian Maddieson, Peter Ladefoged and Keith Johnson (25/7/93; Columbus, Ohio) it was suggested that this inaudible oscillation can be ascribed to the strong air flow noise recorded when an informant is too close to a microphone.

9. Orthographically the ejection is written as an apostrophe.

10. Both Snyman (1975:93) and (1978:159) regard the velar fricative as voiced. This is not in all instances supported by the latest research.

11. A negative prevoiced onset wave displays a lower amplitude version of the glottal tone. It is further characterized by the fact that the amplitude drops before the onset of the click. In some instances this latter stage of the periodic wave may even acquire characteristics of an aperiodic wave.

12. The prevoicing is phonetically transcribed by the symbol [g̊]. In the conventional orthography the ejection is represented by an apostrophe.

13. The prevoiced click onset, i.e. [g̊], differs in a number of instances from the normal voiced click onset, i.e. [g], discussed in figure 3, i.e. [g̊x] above.

14. This observation has a bearing on the orthographic conventions applied to this click. The apostrophe should be retained in the conventional orthography to distinguish [h] [h] from [h] [h]. The diacritic ['] applies to the salient feature of low amplitude glottal friction as opposed to [h] where a strong glottal air flow is discernable throughout the fricative segment. These observations are supported by Traill’s (1992:352–354) audio and oral flow readings.

15. In Snyman (1978:158) this series of clicks was no longer regarded as characterized by a voiced nasalised as well as a delayed glottal fricative accompaniment and was consequently no longer written with the apostrophe and the diacritic ['], e.g. n+h [n+h]. There was therefore no need for Traill (1992: 1992:357) “to ponder the weird prospect of nasalized ejected aspirated segments!”

16. The aspiration, in the [k+h] series is not as pronounced as in the [h] series. This observation is supported by Traill’s (1992: 352–355) findings in respect of the examples n’haba and !ha.
REFERENCES

Doke, C.M. (1925):


Traill, A. (1985):  
*Phonetic and Phonological studies of !Xóó Bushman*. Hamburg: Buske Verlag.

Traill, A. (1992):  
1 INTRODUCTION

A common property of the phonology of Bantu languages is the minimality restriction, where words must contain at least two syllables or two moras. A fairly transparent instance of such a bisyllabic minimum is found in the Zezuru dialect of Shona. Excluding ideophones, words in Zezuru always have at least two syllables in their surface form. However, the underlying form of some words may contain a single syllable. For instance, the imperative of a verb is formed from the plain stem, containing a root, optional extensions, and the final vowel -a. Thus the imperative and infinitive pairs for ‘plough’ and ‘read’ in (1) simply involve the prefixation of ku- in the infinitive, whereas the imperative gives just the plain verb stem. For monosyllabic verbs like -pa ‘give’, the matter is complicated by the fact that *pa would be an illicit monosyllable, which is prohibited in this dialect. In order to remain in conformity with the bisyllabic minimality condition, the vowel i is inserted in the imperative.

(1) Shona (Zezuru dialect)

<table>
<thead>
<tr>
<th>Verb</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>ku-rima</td>
<td>‘to plough’</td>
</tr>
<tr>
<td>rimá</td>
<td>‘plough!’</td>
</tr>
<tr>
<td>ku-vereketa</td>
<td>‘to read’</td>
</tr>
<tr>
<td>verékétá</td>
<td>‘read!’</td>
</tr>
<tr>
<td>ku-pá</td>
<td>‘to give’</td>
</tr>
<tr>
<td>i-pá</td>
<td>‘give’</td>
</tr>
</tbody>
</table>

While such a minimality requirement is very common in Bantu languages, it is not universal, as witnessed by the fact that in the Karanga dialect of Shona, monosyllables such as pá ‘give!’, mbwá ‘dog’ and bwe ‘stone’ do exist.

The Interlacustrine Bantu language Kikerewe, spoken on the Ukerewe Islands of Lake Victoria in Tanzania, provides interesting data bearing on the question of how pervasive such minimality requirements are. We will see that Kikerewe does exhibit minimal-size effects; and yet such effects in this language are
neither uniform nor universal. Thus one must do a certain amount of digging to uncover these effects. We will see that in fact there is more than one minimal size requirement in the language.

As in so many Bantu languages, the morphological structure of words conspires to prevent the creation of underlying monosyllables. Nouns typically are composed of an initial vowel, a class prefix and a stem, so by design nouns typically cannot be less than two syllables long.

(2) o-mu-káma 'chief' a-má-tá 'milk'
    IV-NCP-stem     IV-NCP-stem
i-tí 'tree' e-n-da 'stomach'
    IV+ NCP-stem     IV-NCP-stem

However, monosyllabic nouns can be created under certain circumstances by elimination of the initial vowel. The distribution of the initial vowel morpheme is subject to complex rules, but one can roughly state that when the noun is indefinite and modified by a numeral or a wh-word, the initial vowel morpheme is not used; nor is the initial vowel used in vocatives. This creates the potential for monosyllabic words: a monosyllabic stem in class 9–10 in one of these constructions would be expected to be monosyllabic. As the following data show, monosyllables are possible: no epenthesis is found, as it would be in Zezuru Shona.

(3) ba-kámá 'báibli 'some two chiefs' mbwá mwéenda 'some nine dogs'
    ba-kámá baangahá 'how many chiefs' mbwá zii'ngahá 'how many dogs'
    mu-káma 'chief!' mbwá 'dog!'

Adjectives provide a better source of monosyllables. Unlike nouns, adjectives do not generally select the initial vowel morpheme, so the class 9–10 form of a monosyllabic adjective is monosyllabic.

(4) bá-ké 'few (cl. 2)' n-ké 'few (cl. 10)'

These data might seem to suggest that Kikerewe and Zezuru Shona differ in that there is no bisyllabic minimality requirement in Kikerewe. A deeper look at aspects of the phonology of Kikerewe shows that this is not the case, for there are indeed many examples of the minimality requirement in Kikerewe. Kikerewe simply differs from Zezuru in that it is partially tolerant of subminimal structures.
2 REDUPLICATION

One robust area for investigating minimality effects in Kikerewe is in the realm of reduplication. Nouns, adjectives, numerals and verbs all reduplicate in slightly different ways (see Odden 1996 for detailed discussion of reduplication in Kikerewe), and yet each pattern of reduplication shows important traces of the minimality effect. Noun reduplication is illustrated in (5), where we can see that the entire stem of a noun is reduplicated, but the noun class prefix is not.

(5) o-mu-gôlê 'queen' o-mu-golê!-gôlê 'real queen'
e-ki-swêêla 'biting ant' e-ki-sweela!-swêêla 'real biting ant'
e-bi-miinâ 'scorpions' e-bi-miiná!-miiná 'real scorpions'
o-lu-paapûlâ 'paper' o-lu-paapulá-pâá!pûlâ 'real paper'

An exception to this pattern is found when the noun stem is monosyllabic, in which case the noun class prefix reduplicates.

(6) Noun Reduplicated noun Gloss
---
e-ki-sa e-ki-sá-ki-sa *e-ki-sá-sa mercy
e-ki-ná e-ki-ná!-ki-ná *e-ki-ná-ná fungal ringworm
o-bû-lô o-bu-lô!-bû-lô *o-bu-lô-lô millet
a-má-tí a-ma-ti!-ma-ti *a-ma-ti-ti trees

It would seem that this unexpected copying of the class prefix is a manifestation of a minimality requirement in the language. Notice, however, that even the ill-formed pattern *e-ki-sá-sa would result in a quadrisyllabic word, not a monosyllabic word. Thus the minimality restriction found under noun reduplication is not imposed on the entire word, but rather a part of the word, specifically it is the reduplicant which must be at least bisyllabic. Since the bare stem is monosyllabic, the noun class prefix must be exceptionally recruited to result in a reduplicant with an appropriate size.

It is tempting – and ultimately correct for nouns – to explain this condition on the reduplicant by requiring the reduplicant to itself form a phonological word (p-word). There is independent evidence that the reduplicant in a noun acts as though it forms an independent p-word. As is commonly the case in Bantu languages, long vowels cannot appear at the end of the word. However, vowels are always long when preceded by the sequence consonant plus glide. This leads to an inherent contradiction in words with a final syllable of the form CGV. On the one hand, the requirement for length after CG would dictate that the vowel should be long, but on the other hand the prohibition against long vowels at the end of the word requires that vowel to be short. It is the ban on
final long vowels that wins out in this struggle, as shown by forms like *okabásya* ‘you caught’.

Certain words, such as *ki* ‘which’, *ga* ‘who’ are clitics, and form a single phonological word with the preceding grammatical word – clitics are discussed further below. The examples in (7) show that the expected lengthening of vowels after the sequence CG is found in words such as *okabásya* and *émbwá* when they are followed by a clitic, for the final vowel in these words is lengthened just in case a clitic follows, because in that case the vowel is not at the end of a phonological word.

(7) okabóna ‘you saw’ okabó'ná-gá ‘who did you see?’
énká ‘home’ nká'-ki ‘which home?’
okabásya ‘you caught’ okabá’syáá-gá ‘who did you catch?’
émbwá ‘dog’ mbwáá'-ki ‘which dog?’

The examples in (8) show the expected result that monosyllabic noun stems of the form CGV have a long vowel, which is manifested on the surface when the vowel is not at the end of the p-word.

(8) mu-hyoó'-ki ‘which knife?’
ku-twú'-ki ‘which ear?’
ma-hwáá-ki ‘which thorns?’
ki-swáá-ki ‘which anthill?’
lu-lá’byóó-ki ‘which lightning?’

Consider now the reduplicated examples in (9).

(9) o-mu-hyó'-mú-hyó ‘knife’
o-ku-twi’-kú-twí ‘ear’
a-ma-hwá-má-hwa ‘thorns’
e-ki-swá-ki-swa ‘anthill’
olu-lábyó’-lábyo ‘lightning’

Here, we see that the vowel after CG is not long, despite the general fact that vowels are always long after CG. However, if, as we have previously hypothesized, the reduplicant forms a phonological word (symbolized as w), then the failure of a long vowel to appear at the end of the reduplicant is nothing more than an instance of the general ban on long vowels at the end of a word.

(10) o-mu-hyö mu-hyö ‘real knife’
The picture becomes more complex when adjective reduplication is considered. Like nouns, adjectives generally reduplicate by copying just the stem.

(11) ba-haango ‘big (Cl. 2)’ ba-haango-haango ‘kind of big’
    mu-gazi ‘wide (Cl. 1)’ mu-gazi-gazi ‘kind of wide’
    bi-bisi ‘raw (Cl. 8)’ bi-bisi-bisi ‘kind of raw’

When an adjective stem is monosyllabic, the agreement prefix must exceptionally copy, just as it does with reduplicated monosyllabic noun stems.

(12) bi-hya ‘new (Cl. 8)’ bi-hya-bi-hya ‘kind of new’
    ba-bi ‘bad (Cl. 2)’ ba-bi-ba-bi ‘kind of bad’
    tu-kê ‘few (Cl. 13)’ tu-kêê-tu-ke ‘kind of few’
    mu-tô ‘young (Cl. 1)’ mu-tôô-mû-to ‘kind of young’

Reduplication of subminimal adjective stems presents two related complications. As the form bihyâa-bi hya shows, the vowel of the reduplicant is not subject to systematic shortening, which indicates that the reduplicant does not behave like a p-word, unlike the situation with nouns. Second, an adjectival reduplicant is subject to a further minimality condition: the stem portion of the reduplicant must be longer than monomoraic. Notice that the final vowel of a monosyllabic adjective stem is lengthened under reduplication. This is not merely a matter of retaining underlying vowel length. CV adjectives all have underlying short vowels, as is shown by the fact they also have short vowels when followed by a clitic (the adjective hya on the other hand has a long vowel before a clitic because of its preceding CG sequence).

(13) ba-hyâa’-ki ‘which new (Cl. 2)?’
    ba-bi’-ki ‘which bad (Cl. 2)?’
    mu-tô’-ki ‘which young (Cl. 1)?’
    bi-kê’-ki ‘which few (Cl. 8)?’

This leads to two conclusions. First, noun and adjective reduplication differ in that the reduplicant must form an internal phonological word in nouns, but the reduplicant does not form a p-word in adjectives. Thus, we have the following structural contrast.

(14) o mu-hyo mu-hyo ‘real knife’
    o-mu-hyo mu-hya mu-hyaa mu-hya ‘kind of new (Cl. 3)’

What follows further from this contrast – and the constant fact that the reduplicant exhibits a bisyllabic minimal size condition – is that enforcement of the minimal size requirement is not necessarily mediated through the
phonological word. Instead, there must be a condition on the reduplicant specifically, that it must be at least two syllables long. Moreover, there is a separate size condition on just the portion of the reduplicant which corresponds to the stem, namely it must be at least two moras in size. Viewed from the perspective of minimality effects across languages, such vowel lengthening is one way to satisfy a bimoraicity requirement. Generally, vowel lengthening would not be an effective strategy for satisfying a minimal size requirement in Bantu languages, since mere vowel lengthening would be countermanded by the more powerful requirement that word-final syllables should not be long. Under special circumstances such as reduplication, where the unit subject to a size constraint is not always word-final, simple vowel-lengthening would also be appropriate. And yet, vowel lengthening is still not sufficient to satisfy the separate bisyllabic requirement.

The reduplication pattern of numerals provides further evidence for this second size condition, that the stem portion of the reduplicant must be at least bimoraic. Numeral reduplication is different from noun and adjective reduplication, since the entire word is reduplicated, not just the stem, and thus the reduplicant copies any class-agreement prefix, no matter what the size of the stem is.

(15) babili-bábili  
   'basatu-básatu  
   bataanu-bátáanu  
   mukaaga-mukáaga  
   mweenda-mwêenda  
   ‘two by two (Cl. 2)’  
   ‘three by three (Cl. 2)’  
   ‘five by five (Cl. 2)’  
   ‘six by six’  
   ‘nine by nine’

If the stem is monosyllabic, the reduplicated copy of the stem is long, as was the case with adjective reduplication.

(16) gu-mó  
   ká-mó  
   bá-ná  
   bi-ná  
   ‘one (Cl. 3)’  
   ‘one (Cl. 12)’  
   ‘four (Cl. 2)’  
   ‘four (Cl. 8)’  
   ‘one by one (Cl. 3)’  
   ‘one by one (Cl. 12)’  
   ‘four by four (Cl. 2)’  
   ‘four by four (Cl. 8)’

This argues that the reduplicant of numeral reduplication does not form an independent p-word, and that it is subject to stem-lengthening in order to force the stem part of the reduplicant to be long enough. Presumably, nouns would be subject to this same stem-lengthening condition, save for the fact that the reduplicant in nouns always forms a p-word, and thus long vowels are independently impossible at the end of a noun’s reduplicant.

The final category of reduplication to consider is verb reduplication. When a verb reduplicates, the whole stem is copied.
If the stem is monosyllabic, one finds the final vowel of the stem being long, but there is no exceptional copying of prefixes.

Notice that we do not find *ku-gwa-ku-gwa, with exceptional copying of a prefix to satisfy a minimality requirement. This might appear to indicate a flagrant disregard for minimality under verbal reduplication. However, a closer look reveals that there is still a subtle trace of the bisyllabic minimality condition. When the stem is monosyllabic as in (18), the final vowel of the reduplicant is long. Lengthening of a vowel after such roots is the general rule in the language, and occurs independently of surface CG sequences or reduplication, as shown by ku-h-aan-a 'to give each other' (cf. ku-bal-an-a 'to count each other'). However, the fact that the vowel remains long at the end of a monosyllabic reduplicant indicates that the reduplicant does not form a separate p-word. Yet other data, given in (19), contradictorily indicates that the reduplicant does end a p-word, since the vowel following CG in the reduplicant is short.

The short vowels in (19) cannot be explained by simply assuming that, contra naturem, such CG sequences do not cause vowel lengthening, because when a clitic follows such a sequence, the expected vowel lengthening is found.
What this indicates is that the reduplicant of a verb should form a phonological word, unless that would result in a monosyllabic p-word. This condition can be explained in terms of three more basic principles. First, the reduplicant of a verb absolutely must begin with the stem – recruitment of prefix material is not allowed, unlike the situation with nouns, adjectives and numerals. Second, all things being equal, the reduplicant should form a p-word, as is the case with nouns as well. Third – and here is where all things are not equal – p-words must be at least bisyllabic. Given a monosyllabic stem, it is impossible to satisfy all of these conditions, since there is not enough material in the stem alone to form a proper bisyllabic p-word. The resolution of this conflict is simply that when the stem is monosyllabic, the reduplicant does not form a p-word.

There is one last piece of evidence for minimality conditions coming from the domain of reduplication, and that comes from possible asymmetric patterns of reduplication. Two freely-varying variants of verb reduplication exist, one where the reduplicant exactly matches the stem, and one where the reduplicant has the default final tense-aspect suffix -a instead of the final suffix typical for the tense-aspect. Examples of these two patterns of reduplication drawn from the subjunctive, with the final vowel -e, are seen in (21).

(21) ni-tu-lim-ê
     ni-tu-lim-a-lim-ê   ni-tu-lim-e-lim-ê
     noo-habúúl-ê        noo-habuul-e-habúúl-ê
     ni-ba-tafún-ê      ni-ba-tafun-e-tafún-ê
     ‘we should cultivate’
     ‘you should advise’  ‘they should chew’

Analogous examples of full-copy and asymmetrical copy involving the perfective suffix -ile are given in (22).

(22) ku-bis-a
     a-bis-ilê              a-bis-ile-bis-ilê
     ku-bánik-a            a-banik-ilê
     a-banik-a-banik-ilê   a-banik-ile-banik-ilê
     ku-hágâm-a           a-hagam-ilê
     a-hagam-a-hagam-ilê   a-hagam-ile-hagam-ilê
     ‘he concealed a fact’
     ‘he roasted’          ‘he was too big’

Looking just at monosyllabic verb stems in the subjunctive, we can see in (23) that both full-copy and asymmetric-copy reduplications are possible.

(23) ni-tú-gwé
     ni-tu-gwéé-gwé        ni-tu-gwáá-gwé
     ‘we should fall’
ni-tú-zé
ni-tu-zée-zé
ni-tú-nwé
ni-tu-nwée-nwé
ni-tú-té
ni-tu-tée-té

‘we should go’
‘we should drink’
‘we should release’

But only the full-copy pattern of reduplication is possible if the final suffix is the perfective -ile.

(24) ku-gwa
a-gwiile-gwiillé
ku-za
a-zííle-zíílé
ku-mwa
a-mweele-mwéélé
kú-lyá
a-liile-liílé
kú-nwá
a-nweele-nwéélé
kú-tá
a-teele-teeéle

*a-gwaa-gwiillé
*a-zaa-zíílé
*a-mwa-mwéélé
*a-lyaa-liilé
*a-nwaa-nwéélé
*a-taa-teeélé

‘to fall’
‘he fell’
‘to go’
‘he went’
‘to shave’
‘he shaved’
‘to eat’
‘he ate’
‘to drink’
‘he drank’
‘to release’
‘to release’

This rather specific restriction against asymmetric-copy reduplications of monosyllabic stems, just in the perfective, is a reflection of more general principles involving minimality. When the verb stem is bisyllabic or longer, there is no compelling phonological reason to prefer either the full-copy or asymmetric-copy patterns of reduplication, since under either option, the reduplicant can easily be structured as a minimally bisyllabic p-word. When the verb stem is monosyllabic but the final vowel suffix is -e, both patterns of reduplication suffer the same defect, that they result in a monosyllabic reduplicant (gwee or gwaa). However, with a monosyllabic verb and a choice between final -ile versus -a, a significant difference emerges: if the reduplicant follows the asymmetrical-copy pattern which selects the final inflection -a, the resulting reduplicant (gwaa-) is monosyllabic, but if it follows the full-copy pattern, the reduplicant (gwiillé) is bisyllabic. When there is no choice within the paradigm but to have a monosyllabic reduplicant, for example in ku-gwaagwa or ni-tu-gwiillé-gwé–ni-tu-gwáá-gwé, we find free variation between the two patterns of reduplication, since no matter what, a sub-minimal reduplicant results. When selection of the longer mode of reduplication yields a better verb
form in terms of the size of a reduplicant, then use of that longer form is enforced.

3 CLITICS

There are two other areas of the grammar which show signs of a bisyllabic minimality condition, apart from reduplication. One of these involves clitics. In Kikerewe monosyllabic words behave as clitics, leaning phonologically on the preceding word. As we have seen, a consequence of having a clitic follow a grammatical word is that the clitic effectively immunizes the preceding word from the effects of word-final shortening, and thus long vowels can surface word-finally after CG sequences. Examples of this behaviour of clitics is seen below.

(25) okabô'na-ki
      okabásyáa-ki
      nkáláá'lá-yó
      nkabó'nwáa-yó
      ekakaná-mó
      akabú'zyáá-mó
      akanági'lá-hó
      nkanálááganyáá-hó
      ‘what did you see?’
      ‘what did you catch?’
      ‘I slept there’
      ‘I was seen there’
      ‘it was more pronounced a bit’
      ‘he was silent for some time’
      ‘he slept in (specific)’
      ‘I spread a bit’

The reduction of monosyllables to clitic status is another manifestation of bisyllabic minimality; when a monosyllable reduces clitic status and becomes part of the preceding word, it avoids being an illicit monosyllabic word.

This reduction of monosyllables to clitic status results in a paradigmatic alternation in the form of wh-pronouns. The stem -ga ‘who’ has a zero inflection for noun class in the singular, and thus it becomes a clitic. However, the plural form has the class 2 agreement prefix baa-, so together, báágá results in a well-formed (bisyllabic) word.

(26) okabásyáá-gá
      okabó'ngá
      okábásyá' báágá
      okabóná' báágá
      ‘who did you catch?’
      ‘who did you see?’
      ‘who pl. did you catch?’
      ‘who pl. did you see?’

4 IMPERATIVES

The final domain where minimality plays a role is in the formation of the imperative, thus bringing us back to the point where we began with Zezuru
Shona. As with nouns, there is a general conspiracy in the morphology to avoid constructing monosyllabic verbs. For example the infinitive has the prefix *ku-* which together with even the shortest stem provides at least two syllables. Other inflected verbs have a subject prefix which generally forms a syllable, except in the case of the 1 sg. subject *n-;* but even in the perfective, the perfective affix *-ile* is bisyllabic, again making it difficult to construct a potentially monosyllabic word.

(27) **Infin.**

<table>
<thead>
<tr>
<th>Hesternal past</th>
<th>Recent past</th>
</tr>
</thead>
<tbody>
<tr>
<td>SP-stem-ile</td>
<td>SP-a-stem-a</td>
</tr>
<tr>
<td>a-lílélé</td>
<td>yá-lyá</td>
</tr>
<tr>
<td><em>'he ate (hest.)'</em></td>
<td><em>'he ate'</em></td>
</tr>
</tbody>
</table>

There is one context where a monosyllabic form can be created, and that is in the habitual tense. This tense is formed with the subject prefix, no suffix other than the default final vowel *-a,* and no tense-aspect prefix. Thus when the stem is monosyllabic and the subject prefix is the nonsyllabic 1st sg. *n-,* a monosyllabic word results.

(28) **Habitual**

<table>
<thead>
<tr>
<th>SP-stem-a</th>
</tr>
</thead>
<tbody>
<tr>
<td>á-lyá</td>
</tr>
<tr>
<td><em>'he eats'</em></td>
</tr>
<tr>
<td>n-dyá</td>
</tr>
<tr>
<td><em>'I eat'</em></td>
</tr>
</tbody>
</table>

Thus it might seem that the morphology can create monosyllabic words, without restriction.

However, a look at possible imperative forms shows that the matter is more complex than this. As is commonly the case in Bantu languages, the imperative and subjunctive are closely connected, so that one can freely use a subjunctive in place of the imperative (though not vice versa).

(29) **Imperative**

<table>
<thead>
<tr>
<th>Subjunctive</th>
</tr>
</thead>
<tbody>
<tr>
<td>noobálélé</td>
</tr>
<tr>
<td><em>'count!'</em></td>
</tr>
<tr>
<td>nookaláángé</td>
</tr>
<tr>
<td><em>'fry!'</em></td>
</tr>
</tbody>
</table>

When an object prefix other than the nonsyllabic 1st sg. *n-* is used, the imperative uses the final suffix *-e.*

(30) kí-lyé
    tu-bále
    tu-limile
    ba-kalaangile
    *'eat it!'*  
    *'count us!'*  
    *'cultivate for us!'*  
    *'fry for them!'
With the 1st sg. object prefix, the final vowel -a is used.

(31) mbála
    ndimila
    nkalaangila

‘count me!’
‘cultivate for me!’
‘fry for me!’

We now face the question of monosyllables and possible imperatives. While there are no restrictions on the imperative when the stem is polysyllabic, it is impossible to use the imperative with a monosyllabic verb, and the subjunctive must be used instead. When an object prefix is present, however, the imperative of a monosyllabic stem is possible: except, when the subject prefix is 1st sg, the imperative cannot be used, and instead the subjunctive is used.

(32) *lyá
    kilye
    *ndyá

nóólyé
nookílyé
nóóndyé

‘eat’
‘eat it’
‘eat me’

The generalization explaining when the imperative can and cannot be used is very simple: the imperative is disallowed just in case the resulting form would be monosyllabic.

Given that one can create monosyllabic forms like ndyá ‘I eat’ in the habitual tense, the question remains why the imperative is singled out for obedience to the bisyllabic minimality condition. The answer, it seems, lies in making the best choice available. In the habitual, there simply is no other way to express what the habitual expresses, and thus one is sometimes forced to live with the consequence, which is a monosyllabic verb. With the imperative, on the other hand, there is always a choice between the imperative and a functionally equivalent subjunctive. Thus, faced with a choice between phonologically ill-formed *lyá and *ndyá versus phonologically well-formed nóólyé and nóóndyé, the phonologically better solution is selected.

5 CONCLUSION

We have seen above that minimal size requirements are active in Kikerewe, even though these requirements are not universally enforced in the language. In fact, there are two minimality requirements in the language, one being a more specific bimoraic minimality requirement which is enforced in certain patterns of reduplication, the second being the more general bisyllabicity requirement. While minimal-size conditions are well known throughout the languages of the world, their character tends to be rather uniform and thus less interesting: typically there simply are no undersized words in such languages, either because the relevant kinds of stems are missing (e.g. there are no CV stems in
Latin) or because potential undersized words are uniformly repaired, as they are in Zezuru Shona. Cases like that found in Kikerewe are interesting for understanding word-size conditions, because they show that such effects still pervade language even when they are not universal.

ENDNOTES

* I would like to thank Deo Tungaraza for providing the data for this article. Research for this article was supported by NSF Grant SBR-9421362.

1 The reduplicant is the leftmost string which copies the stem, thus the first *kisa* in *e-ki- *sa-*ki-*sa*. Odden 1996 shows, based on tonal evidence, that the reduplicant is a prefix.

2 Hyman and Katamba 1990 discuss the complex grammar of clitics, final shortening, and vowel lengthening in Luganda, and show inter alia that monosyllabic stem vowels are long before a clitic, as in *kibi *mi* 'rather bad'. The facts of Kikerewe and Luganda are thus radically different on this and a number of other points, for in Kikerewe there is no sign of monosyllabic lengthening in unrepeated words.

REFERENCES
