Phonetic realisations of /ʔC/ and /hC/ word-initial sequences in Jruq (Loven)

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1. Introduction

This paper presents my phonetic analyses of Jruq initial consonant sequences that begin with /h/ and /ʔ/[1]. Such sequences are common in Mon-Khmer languages, but their phonemic analysis is potentially ambiguous. One could analyse them as distinct series of 'preaspirated' and/or 'preglottalised' consonants (in contrast to 'plain' consonants), or as simple phonemic sequences. Perhaps the former approach is sometimes favoured because such sequences are often realised as coarticulated segments. In Jruq I treat them phonemically as a sequence of two consonant phonemes— /ʔ + C/ and /h + C/ which have a broad range of permissible phonetic realisations, consistent for individual speakers. I base this primarily on the fact that speakers are able in their careful speech to segment these two consonants with an intervening schwa or other low central vowel.

2. Method

2.1 Informants

My analysis of Jruq sounds is based on audio and video recordings of the speech of my principal Jruq informants, Mr. Lin and Ms. Toi, made during my fieldtrips in 1999 and 2000. Both informants were born in and still reside at Paksong on the Boloven Plateau. Both speak Jruq fluently although Toi learnt it as a second language when young, whereas Lin spoke Jruq before learning the Lao national language.

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[1]This analysis forms part of my grammatical description of Jruq (West Bahnaric language of the Lao P.D.R.)—a Masters of Philosophy dissertation (The Australian National University) submitted for examination in May, 2001. I was able to study the sounds of Jruq with the help of special recording equipment provided by the Department of Linguistics plus a generous fieldwork scholarship (awarded to me in 1999), which enabled me to take video recordings of my informants Toi and Lin. Special thanks go to Toi and Lin for their patience and willingness to help me learn their language. And thanks to Paul Sidwell who provided comments and advice during the writing of this paper.

2.2 Voice Recordings

In order to obtain comparable recordings of speech from my informants I prepared a list of 240 Jruq words for use in elicitation sessions. For both informants I elicited three repetitions of the target word produced in isolation and once within the frame *pnus jru? ?maŋ .... pnus law ?maŋ 'Jruq people say ... Lao people say'*. The recordings were made in the most quiet places possible in the field. In 1999 I used a flat microphone and the Sony TCM 5000 cassette recorder. In 2000 I used a cardioid microphone with the Sony TCV 250 cassette recorder. Half a dozen words on Toi's list in 2000 were subsequently added after the recording of Lin. These were words I learnt in the field and which provided additional minimal pairs. Both speakers were instructed to produce the target words at a normal speaking rate, although in particular with Lin's elicitation, I still found they were said slightly more slowly than the normal speech rate.

2.3 Spectrographic Analysis

The analysis of the recordings is based primarily on my examination of spectrograms. I consistently found that the second isolated utterance of the target word was made at the most normal speech rate and unmarked pitch contour[2]; these items were digitized with the Computerized Speech Laboratory (CSL) machine at 10 kHz sampling rate. Wide-band spectrograms were generated by CSL for these sound files, and pitch (F_0) and formant details were computed automatically. The spectrograms are typically 600ms in length for ease of comparison, although spectrograms of words with extra-short vowels are 500ms so that detail of formants is clearer. A selection of these spectrograms is included and discussed in this paper.

3. Results

Early in my investigation it became evident that the phonetic effects of glottal consonants on following segments varied greatly according to the natural classes of those segments. For example, in combination with voiceless oral stops and /s/ (symbolised with 'T') the effects are simpler than with other types of segments such as voiced stops and nasals or glides: I could hear a very strong laryngeal tenseness throughout the articulation and this is evident in spectrograms which indicate stronger glottal pulses at the release[3]. For voiced oral stops (symbolised with 'D'), there is often some associated laryngeal tenseness, but more perceptually salient is homorganic prenasalisation which accompanies both the /hD/ and /?D/ sequences. Before nasals, /l/ and glides (symbolised with 'N'), the effects are more complicated and vary significantly depending on whether the sequence is formed with /h/ or /?/.

[2]Jruq does not have word level pitch distinctions, only sentential pitch indicating phrase boundaries, focus, and interrogatives versus declaratives.

[3]Note that I do not treat sequences of /?h/ or /h?/ as these are always segmented in slow and fast speech with an intermediate schwa vowel and thus the phonetic effects which I address in this paper are not observed.

3.1 /ʔT/

Table 1 lists 18 words (from a list of 1500) that are analysed as beginning with /ʔT/-type sequences in Jruq.

Table 1. Jruq words with /ʔT/ type initial consonants.

/ʔtăŋ/ 'bitter, salty'	/ʔtăt/ 'tear, break'
/ʔtar/ 'string handle'	/ʔtɛʔ/ 'copulate'
/ʔtoʔ/ 'hot'	/ʔtəʔ/ 'vomit'
/ʔtuas/ 'shallow; piercing (voice)'	/ʔtuh/ 'hearth'
/ʔtuoŋ/ 'carry on shoulder pole'	/ʔtup/ 'burial hut'
/ʔtǎk/ 'small tortoise'	/ʔciəŋ/ 'lean on someone'
/ʔkŭŋ/ 'seed'	/ʔkăj/ 'child-in-law'
/ʔkaʔ/ 'rough'	/ʔkɛ/ 'injured, sprained'
/ʔkiet/ 'small green tree frog'	/ʔkur/ 'tree trunk'

In my four years of working on this language I have not found any word beginning with a /ʔp/ sequence. However, phonetic [ʔ͡p] does occur in certain environments, such as in /hp/ onsets (see §3.2).

There does appear to be a correlation between the frequency and strength of laryngealisation and the physical distance between the oral closure and the larynx: the shorter the distance between places of articulation, the stronger the effects. The best examples involve dorsal stops—these show several thick striations in spectrograms, indicating slowed/tensed glottal pulses, for up to 30ms after release, followed by normal glottal pulses for the vowel. This is in contrast to 'plain' initials which have a single or double striation at the release and a very short pause—about 5-10 ms duration—between the release and the onset of the following vowel. Sometimes the release may appear on the spectrogram accompanied by a thick striation suggesting a greater pressure release, e.g. in Fig. 2 [kət˺] 'have' (Toi) below, but this is not a distinctive feature. Compare /kət/ 'have' with /ʔkŭŋ/ 'seed' in figures 1 and 2, respectively.

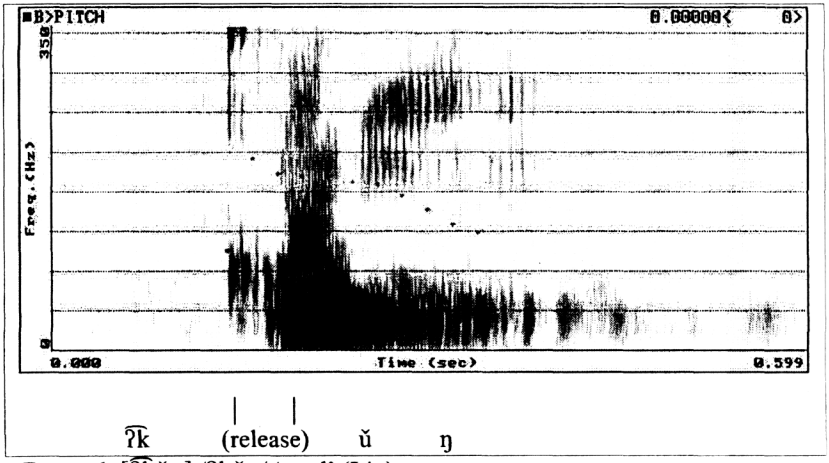

Figure 1. [ʔk͡ŭŋ] /ʔkŭŋ/ 'seed' (Lin)

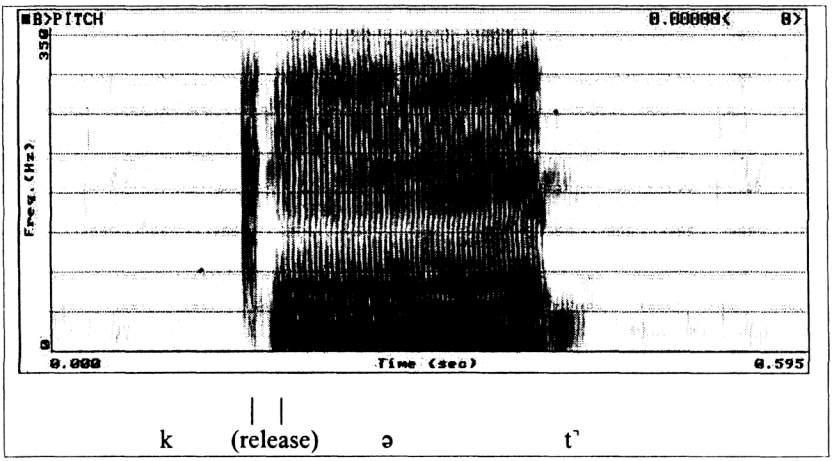

Figure 2. [kətˀ] /kət/ 'have' (Toi)

An example of a laryngealised laminal is [ʔc͡iəŋ] 'lean on someone' which is shown in figure 3, and is compared with /cŏŋ/ 'eat rice' in figure 4. With the /ʔT/ onset, several striations are visible, following the release. The effect is not as strong as with the dorsal [ʔk͡], yet it is articulated with a tenseness which is clearly audible.

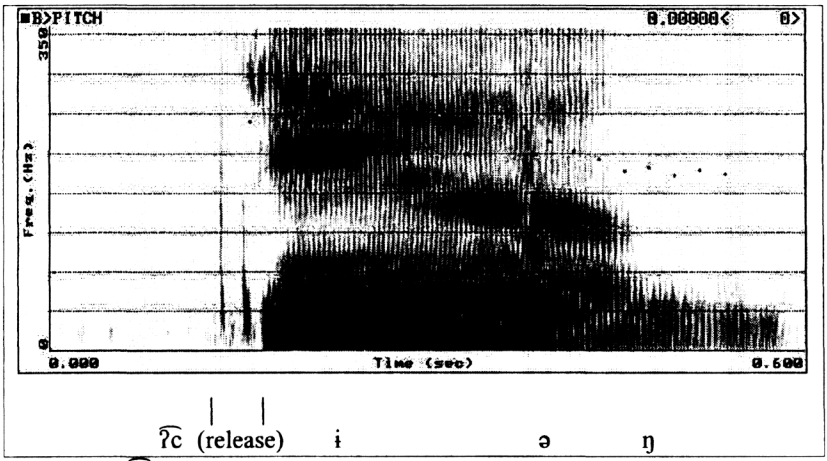

Figure 3. [ʔciəŋ] /ʔciəŋ/ 'lean on someone' (Toi)

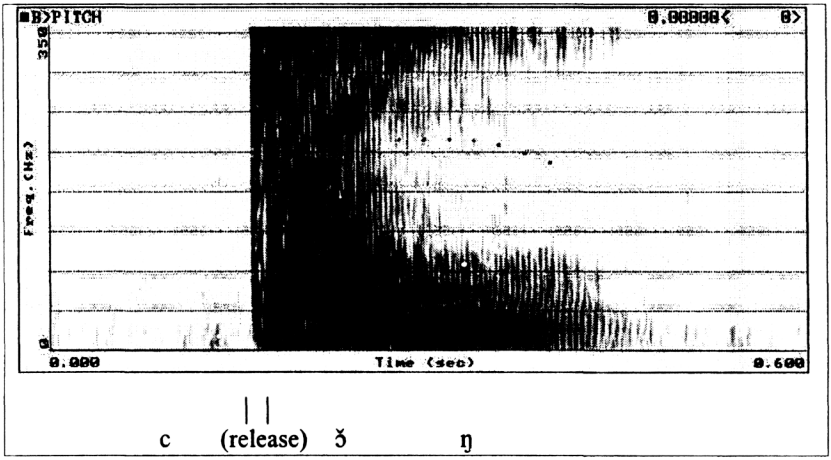

Figure 4. [cŏŋ] /cŏŋ/ 'eat rice' (Toi)

Significantly, laryngealised voiceless apicals show a much shorter period of post-release tension, less than 10ms, or only time enough for one of the slowed glottal pulses. Compare /ʔtǎk/ 'tortoise' in figure 5 with /tus/ 'head' in figure 6, where the laryngeal effect of the /ʔt/ sequence is more apparent in the vowel onset.

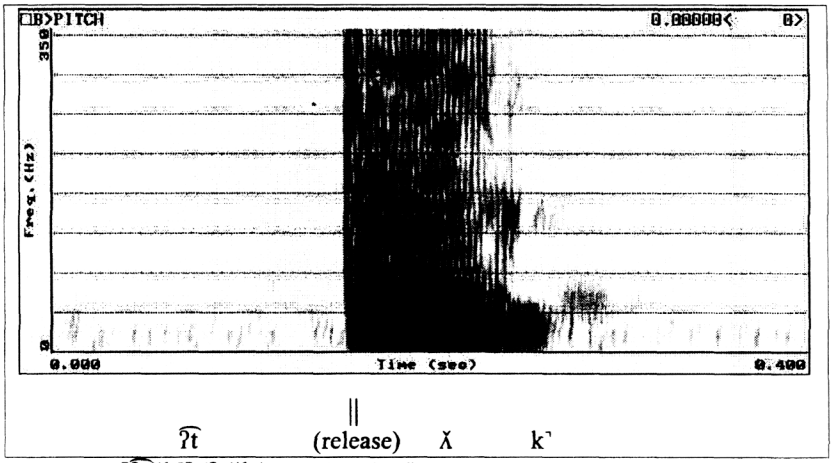

Figure 5. [ʔtʌkˀ] /ʔtʌk/ 'tortoise' (Toi)

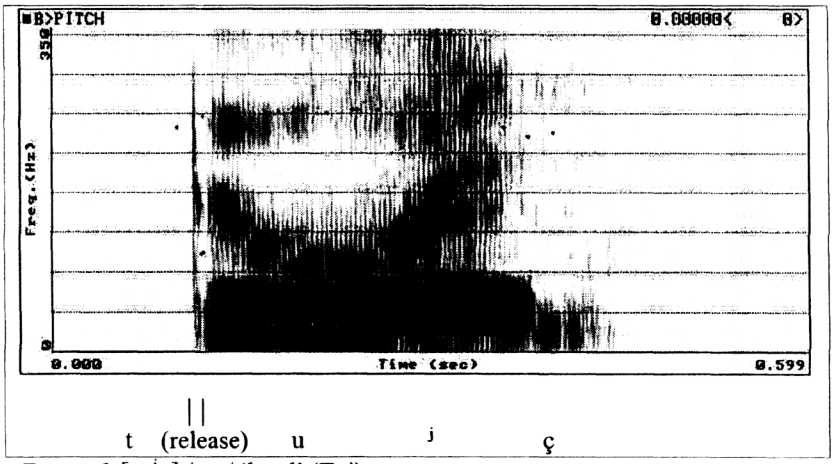

Figure 6. [tuʲç] /tus/ 'head' (Toi)

3.2 /hT/

Table 2 below lists 27 Jruq words (from a vocabulary of 1500) that begin with sequences of /h/ plus voiceless stop.

Table 2. Jruq words with /hT/ type initial consonants.

/hcit/ 'cluster of round fruit'
/hkăj/ 'fruit tree (*Mimosoidea Entada tonkinensis Gagn.*)'
/hkăw/ 'bear' /hkoc/ 'set alight, burn'
/hkoj/ 'mousedeer' /hkol/ 'knee'
/hkŏŋ/ 'carry a load (hanging)' /hkiat/ 'scabies, itch'

/hkrik/ 'snore'	/hkuan/ 'youth, children'
/hkuat/ 'back (of body)'	/hpaʔ/ 'blanket'
/hpak/ 'tree variety (*Lagerstroemia sp.* —*Lythraceae*)'	
/hpaŋ/ 'palm (of hand), sole'	/hpɔŋ/ 'fence'
/hpet/ 'unknown tree variety'	/hpit/ 'ear'
/hpŏŋ/ 'cucumber'	/hpuac/ 'finger'
/hta/ 'wash (hands)'	/htak/ 'bean, pea'
/htɔʔ/ 'lazy'	/htit/ 'similar'
/htŏk/ 'brain'	/htoŋ/ 'fern'
/htăp/ 'bury in grave'	/htʌ̆w/ 'hole in ground'

Sequences of the /hT/-type are usually homorganically prenasalised[4]. Like /ʔT/ sequences, the best elicited examples involve dorsal stops—these show several thick striations, indicating slowed/tensed glottal pulses, for up to 30ms after release, followed by normal glottal pulses for the vowel. Examples are given in figures 7 and 8.

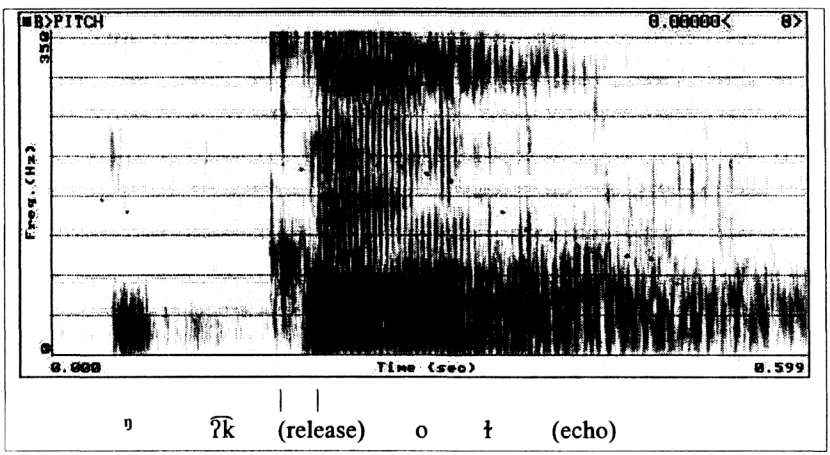

Figure 7. [ŋ͡ʔk͡ɔɬ] /hkol/ 'knee' (Lin)

[4]Many times in the field the occurrence of this prenasalisation was the only way I could establish whether the sequences involved a preceding /h/ or /ʔ/, as the latter never condition prenasalisation before voiceless oral stops. It appears that Ferlus (1969-70) observed the same phenomenon, as he recorded words such as [^{n}tŏw, ătʌ̆w] 'trou (hole)' in comparison to Huffman's (1971) [htʌw] 'lake (pond)'.

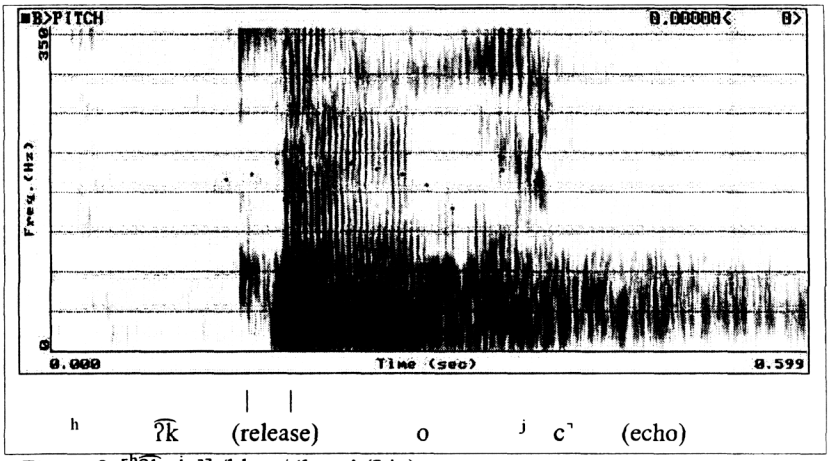

Figure 8. [$^{h}\widehat{ʔk}o^{j}c^{ˀ}$] /hkoc/ 'burn' (Lin)

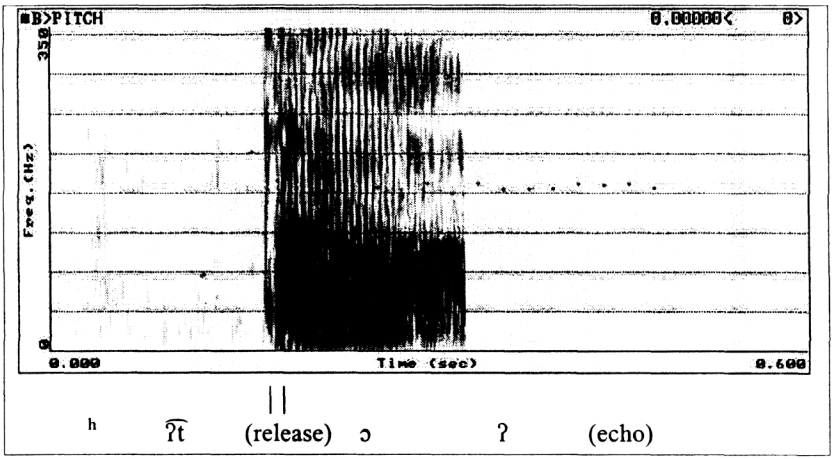

Figure 9. [$^{h}\widehat{ʔt}ɔʔ$] /htɔʔ/ 'lazy' (Lin)

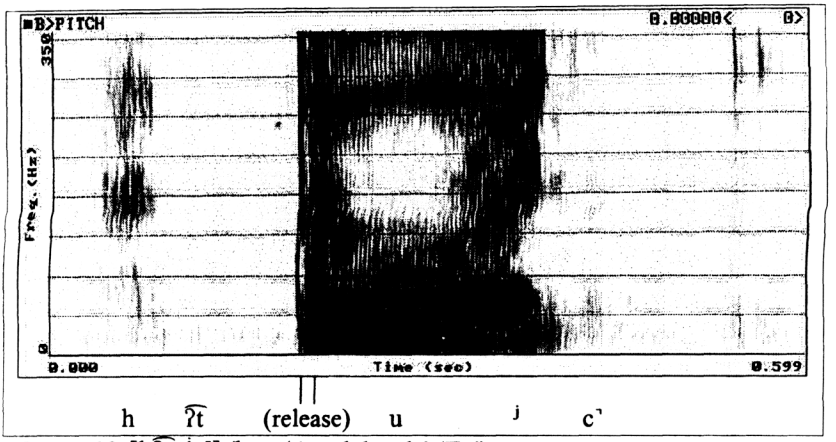

Figure 10. [hʔtuʲcˀ] /htuc/ 'wash hands' (Toi)

I found only seven words with /hp/ initial sequences, one of which is presented in figure 11. The spectrogram of [hʔpitˀ] 'ear' shows a very short period of post-release tension with only one or two slowed glottal pulses.

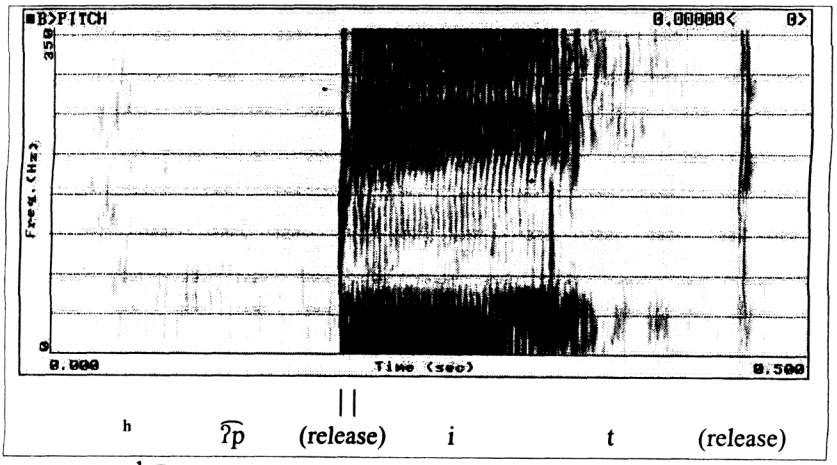

Figure 11. [hʔpit] /hpit/ 'ear' (Toi)

3.3 /ʔD/

Voiced oral stops are articulated with vocal cord vibration during the oral closure, although there seems to be some attenuation of voicing just before the release. Word initial 'D' consonants also have a tendency (perhaps half the time) to be homorganically prenasalised[5], albeit rather weakly. The

[5]The tendency to prenasalise voiced stops in word initial position is found for other Bahnaric languages such as Mnong Rolom (Blood 1976) and Sedang (Smith 1979).

nasal aspect of these articulations in Jruq is usually only 20-30ms duration (roughly a quarter to a third of a full nasal segment, see §3.5) and is often so weak that the higher formants (F2, F3) are absent or only partly visible in the spectrograms. This suggests that the velum is only partly lowered, which is evidence that the target for the consonant is oral rather than nasal. The spectrograms in figures 12 and 13 show the optional prenasalisation of 'D' onsets.

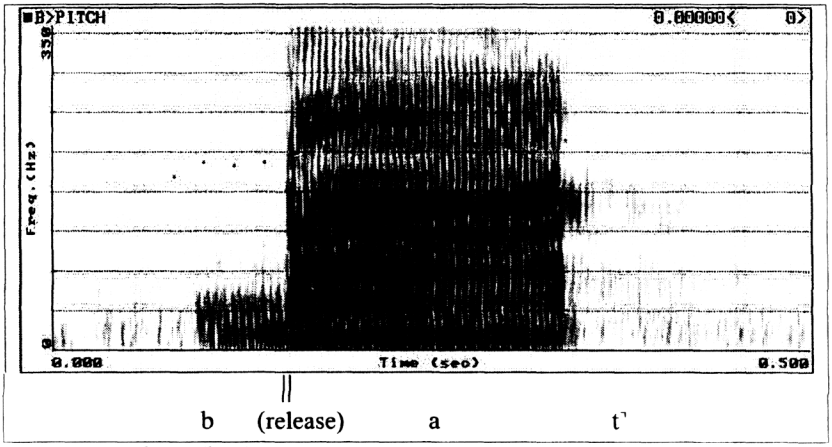

Figure 12. [bat'] /bat/ 'scar' (Toi)

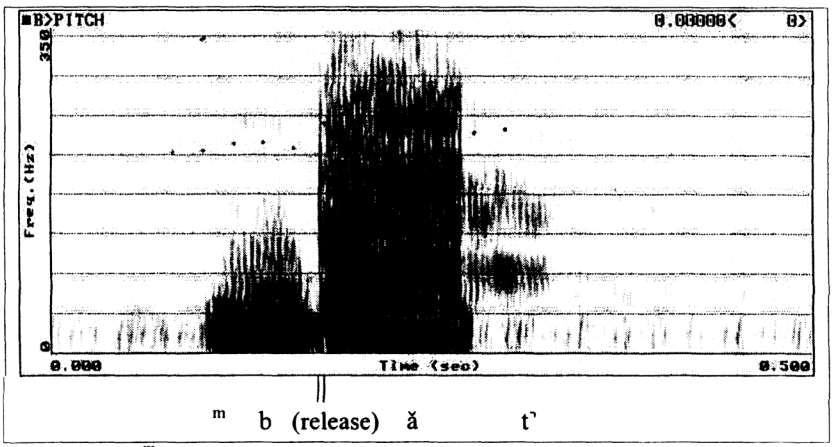

Figure 13. [^{m}băt'] /băt/ 'grass' (Toi)

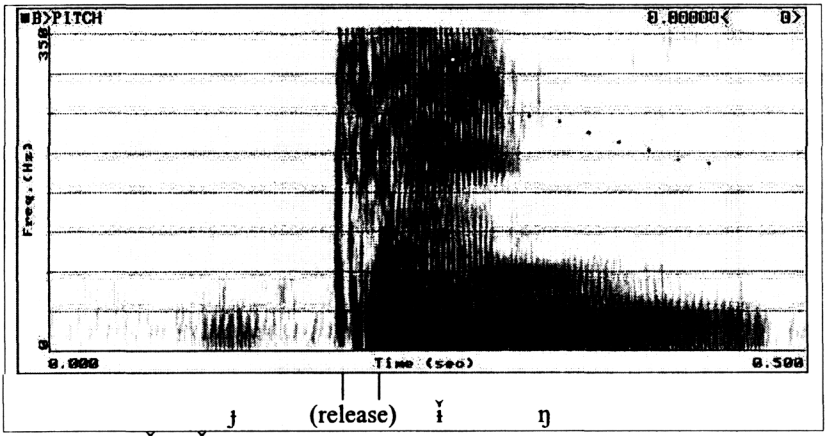

Figure 14. [ʄɨŋ] /ʄɨŋ/ 'foot' (Toi)

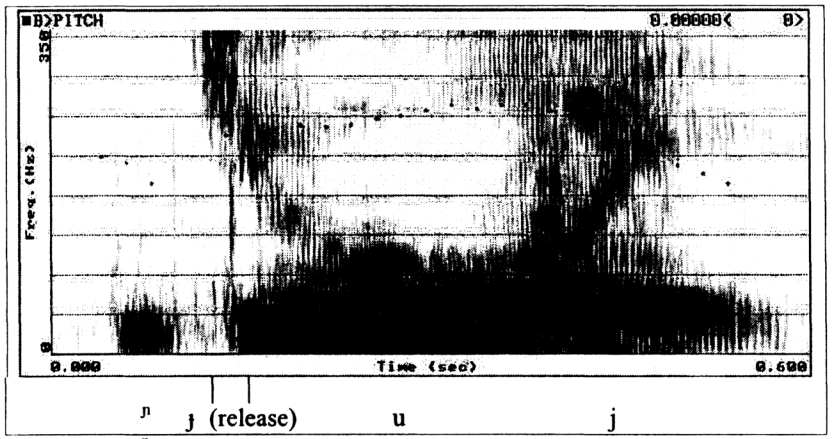

Figure 15. [ᶯʄuj] /ʄuj/ 'deer' (Toi)

'D' stops may be preceded by /ʔ/, creating a complex onset /ʔD/. Table 3 lists 16 Jruq words (from a vocabulary of 1500) which begin with /ʔD/-type onsets.

Table 3. Jruq words with /ʔD/-type initial consonants.

/ʔbaw/ 'dig (e.g. a grave)'	/ʔbɔk/ 'white'
/ʔbəʔ/ 'carry on back'	/ʔbʌt/ 'hit (v.tr.)'
/ʔbreʔ/ 'carry on shoulder pole'	/ʔdɛʔ/ 'different'
/ʔdɛh/ 'cold'	/ʔdəp/ 'short'
/ʔdr̆ɨt/ 'fish trap'	/ʔdrɨəʔ/ 'hiccup, belch'
/ʔgɔr/ 'dragonbean'	/ʔgoh/ 'long'
/ʔguar/ 'winnow basket'	/ʔglo/ 'howl (v.)'
/ʔʄɔ̆ŋ/ 'shrimp, prawn, lobster'	/ʔʄuoʔ/ 'sour'

This phonemic sequence is consistently realised as a laryngealised [ʔD͡] sound in normal speech and sometimes may be weakly prenasalised like modal voiced stops. There is very little observable difference between /D/ and /ʔD/ onsets in the spectrograms except for the closure which is consistently 10-20 ms shorter in duration in Toi's tokens. However, the strong laryngeal tenseness throughout the onset (sometimes even at the beginning of the vowel) is clearly audible.

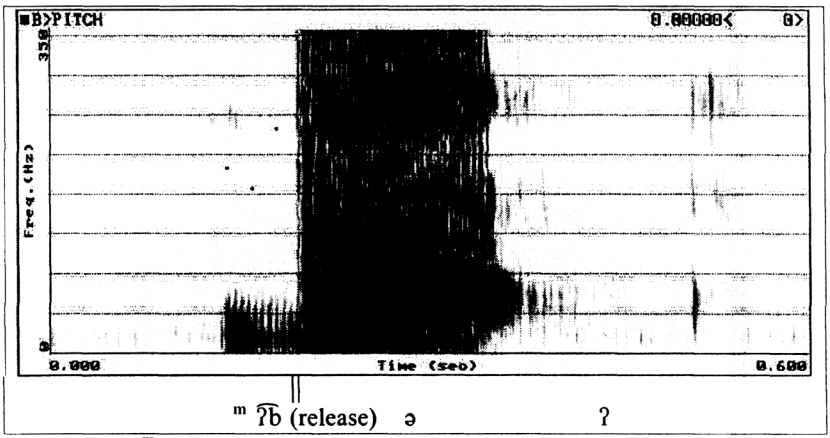

Figure 16. [ᵐʔb͡əʔ] /ʔbəʔ/ 'carry on one's back' (Toi)

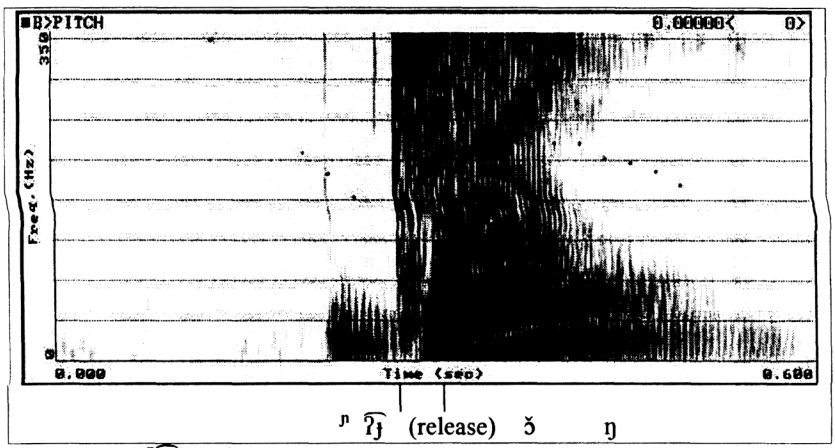

Figure 17. [ⁿʔʄ͡ɔ̌ŋ] /ʔʄɔ̌ŋ/ 'prawn, lobster' (Toi)

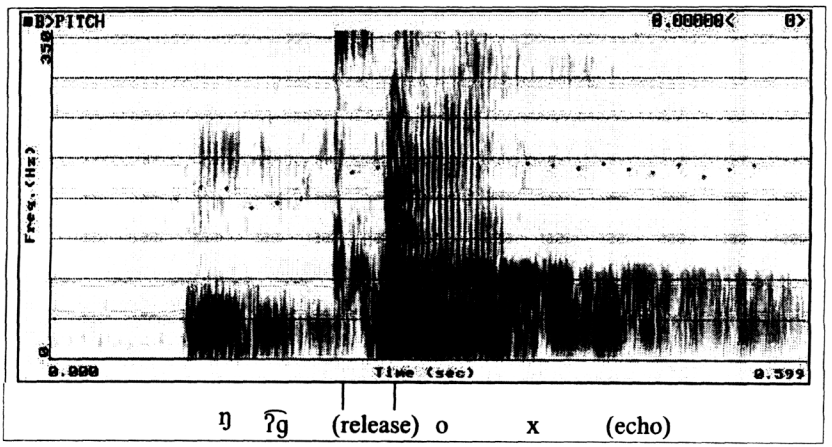

Figure 18. [ŋ͡ʔgox] /ʔgoh/ 'long' (Lin)

3.4 /hD/

Table 4 lists 27 Jruq words which begin with /hD/ consonant sequences.

Table 4. Jruq words with /hD/-type initial consonants.

/hbăj/ 'bean classifier'	/hbaj/ 'cloth, cotton'
/hbaŋ/ 'footstep'	/hbɔh/ 'bubble (v.)'
/hbiw/ 'tamarind'	/hbok/ 'buttocks'
/hbuac/ 'Tree variety (*Schima wallichii*—*Theaceae*)'	
/hbuot/ 'compress, squeeze'	/hbŏl/ 'tripod (metal)'
/hbiʔ/ 'evening'	/hbiəʔ/ 'trip and fall'
/hbroŋ/ 'papaya tree variety'	/hcit/ 'cluster of round fruit'
/hdăj/ 'borrow (& return)'	/hdăn/ 'tender, soft'
/hda/ 'span of thumb tip to middle finger tip'	
/hdat/ 'very short, stocky'	/hdɛ/ 'rattan'
/hdeŋ/ 'star'	/hdiac/ 'spurt, spit'
/hdiah/ 'noisy, raucous'	/hdieŋ/ 'rainbow'
/hdăw/ 'flee, leave'	/hgăl/ 'know'
/hgok/ 'small long-scaled fish'	/hɟuaʔ/ 'wet'
/hɟʌc/ 'light (weight)'	

Onset sequences of /hD/ are also consistently realised as laryngealised [ʔD̰] sounds in normal speech. In slow or careful speech these onsets are often segmented with a schwa vowel, e.g. [hᵊD], in which case the [D] element is rarely laryngealised. However, /hD/-type onsets are clearly distinguished from plain /D/ or /ʔD/ because homorganic prenasalisation is much stronger. The prenasalised segment typically lasts around 50 to 80 ms, sometimes even longer than the period of non-nasalised oral closure, and

involves much stronger nasal formants than those observed with the plain voiced stops. Spectrographic examples are given below.

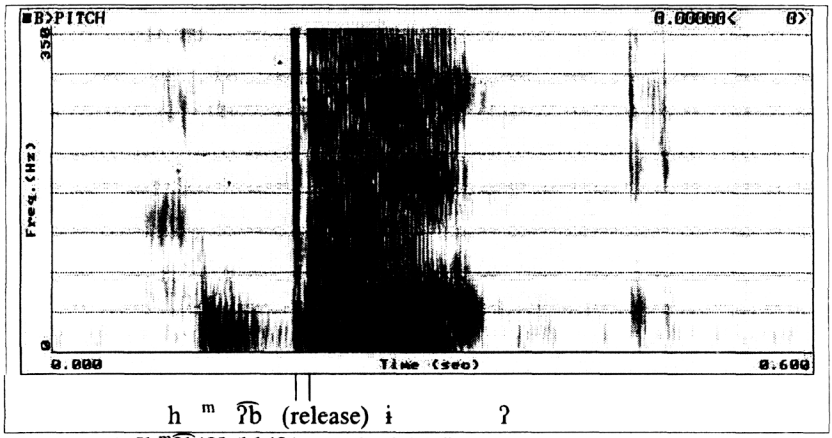

Figure 19. [h^{m}ʔb̥iʔ] /hbiʔ/ 'evening' (Toi)

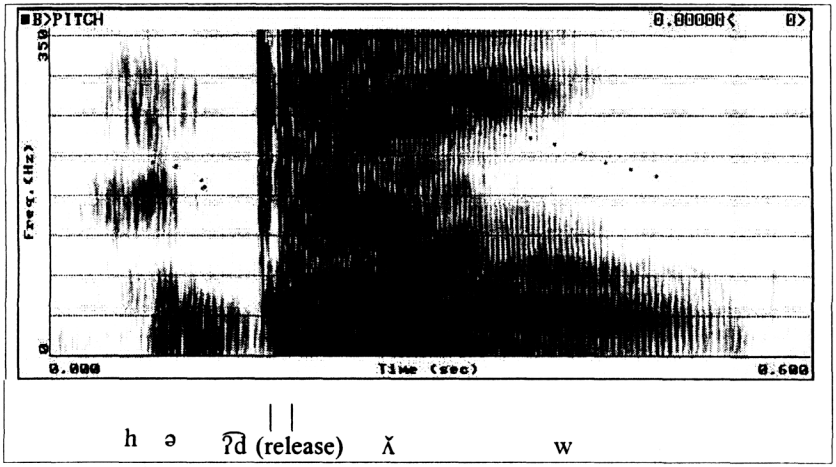

Figure 20. [həʔd̥ǰw] /hdǰw/ 'flee, run away' (Toi)

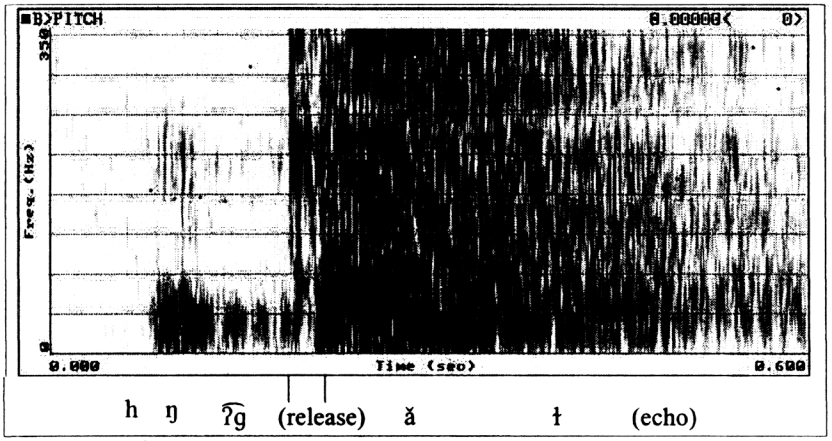

Figure 21. [^{h}ŋʔgăɬ] /hgăl/ 'know' (Lin)

The stronger prenasalisation of /hD/-type onsets surely correlates with the coarticulated laryngeal activity, such that the velum is lowered while the larynx is tensed in a complex gesture. A parallel effect in Jruq is where the /h/ regularly conditions prenasalisation with /T/-type consonants—single /T/ onsets are never prenasalised. This phenomenon was dubbed 'Rhinoglottophilia' by Matisoff (1975, and later by others such as Michailovsky 1975), who pointed out that the articulation of glottal consonants in Asian languages is often associated with nasalisation effects[6]. Although this is most commonly associated with nasalisation on vowels, the effect on consonants is also illustrated with modern Tibetan dialects, such as Lhasa Tibetan which has "a strong tendency to give a nasal articulation to orthographic prefixal ḥ- where it occurs in the second syllable of disyllabic compounds" (Matisoff 1975:274).

Table 5. Glottalically conditioned nasalisation in Lhasa Tibetan (from Matisoff 1975:275).

	Written Tibetan	Lhasa
'written prayer'	ḳa-ḥdon	> khan-dön
'to shudder'	sku-ḥdar skyon-pa	> kün-dar kyom-pa
'to query (hon.)'	bkaḥ-ḥdri gnaŋ-ba	> kan-dri nang-wa
'to settle a lawsuit out of court (hon.)	bkaḥ-ḥdum bnaŋ-ba	> kan-dum nang-wa

[6]Sprigg (1987) disputes this relationship, however, saying that the high occurrence of nasalisation with laryngeal/glottal consonants may be purely circumstantial and there is no articulatory explanation for any conditioning factor. Matisoff (1975) makes a rather questionable suggestion that the lowering of the velum is due to human 'laziness'.

Ohala (1975:301) offered the following (somewhat unsatisfactory) articulatory explanation based on his instrumental studies:

> Glottal and pharyngeal obstruents may be nasalized for two reasons: an open velopharyngeal port would not prevent the build up of air pressure behind the glottal or pharyngeal constrictions since it is in front of those constrictions, and the noise produced by voiceless glottal and pharyngeal obstruents is so diffuse that oral-nasal coupling would have little acoustic effect on it.

This explanation suggests that nasalisation is merely an accidental concomitant of laryngeal articulations. However, in Jruq the nasalisation is a regular/systematic feature of laryngealised stops. Its presence or absence reliably distinguishes between /hT/ and /ʔT/ (the latter is never prenasalised), and /hD/ and /ʔD/. Perhaps nasalisation is combined with laryngealisation by speakers to increase the perceptual salience of the /h/ feature.

3.5 /ʔN/

Table 6 lists 35 Jruq words (from a list of 1500) with /ʔN/-type onsets.

Table 6. Jruq words with /ʔN/-type initial consonants.

/ʔmaŋ/ 'speak, language'	/ʔmat/ 'very'
/ʔmɛ/ 'person'	/ʔmi̯ŋ/ 'impossible'
/ʔmiaŋ/ 'foster(child), gift'	/ʔmiə/ 'rain'
/ʔnăl/ 'half'	/ʔnăw/ 'again'
/ʔnaw/ 'new'	/ʔner/ 'large scoop net'
/ʔnuj/ 'earth worm'	/ʔɲɔŋ/ 'stop, don't!'
/ʔɲɛʔ/ 'this, that'	/ʔɲuj/ 'smoke (n.)'
/ʔɲuat/ 'fog'	/ʔŋa/ 'infant'
/ʔŋăl/ 'tree stump'	/ʔŋəm/ 'sweet'
/ʔlɔŋ/ 'tree, wood'	/ʔlɛ/ 'moment'
/ʔlɛ/ 'bamboo species (*Gramineae Gigantochi*)'	
/ʔlɛh/ 'just now'	/ʔliaʔ/ 'short (length)'
/ʔjăŋ/ 'what, reason; similar'	/ʔjaʔ/ 'ancestors'
/ʔjaʔ/ 'soup'	/ʔjan/ 'late morning'
/ʔjɔ/ 'grandfather'	/ʔjŏŋ/ 'black'
/ʔjuo/ 'female'	/ʔjuo/ 'what, (any)thing'
/ʔjuor/ 'follow'	/ʔjə/ 'awake, wake up'
/ʔwian/ 'wet ricefield'	/ʔwiet/ 'deserted, empty'

The phonetic effects of preceding /ʔ/ on nasals, glides and liquids is rather similar to that of /ʔD/ onsets. There is an audible tenseness throughout

the articulation of the stop (symbolised using the ligature [ʔ͡D]), although any evidence of laryngeal activity is difficult to see on the spectrograms. The most salient feature of /ʔN/-type onsets is that the duration of oral closure is almost half the length (40-50ms) of a 'plain' /N/ consonant onset (normally 70-80ms). In contrast with the average duration of a /ʔn/ sequence which is 40-50ms duration, the closure of single nasal consonants such as /ɲ/ are usually 70-80ms in duration (a single dot in the pitch contour in each spectrogram represents 20 ms), e.g.

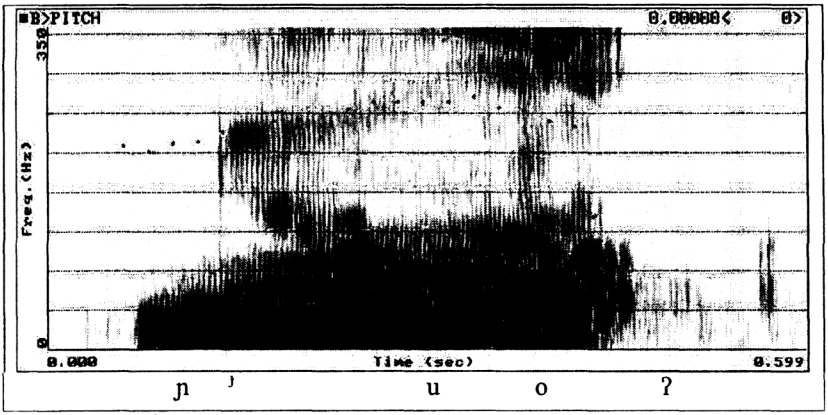

Figure 22. [ɲʲuoʔ] /ɲuoʔ/ 'attempt' (Toi)

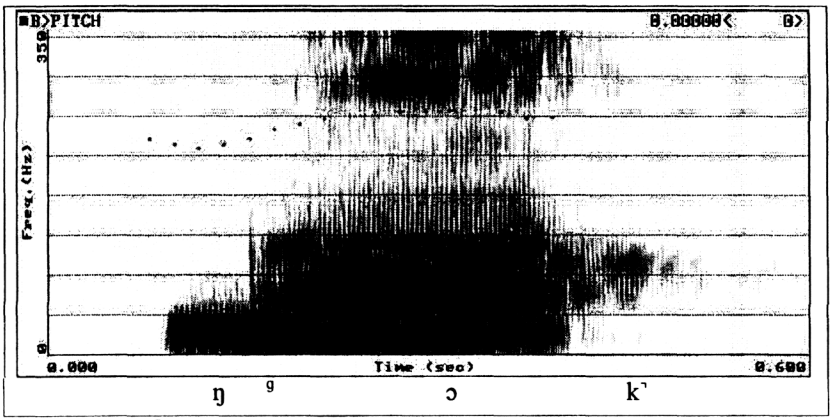

Figure 23. [ŋᵍɔkˀ] /ŋɔk/ 'sit' (Toi)

The 'plain' lateral /l/ onset closure is usually 80-90ms long (in contrast to /ʔl/ which is consistently 40ms in duration), and approximants /w/ and /j/ in single onset position are between 60-80ms duration (whereas /ʔj/ has a closure of only 20-30ms duration), e.g.

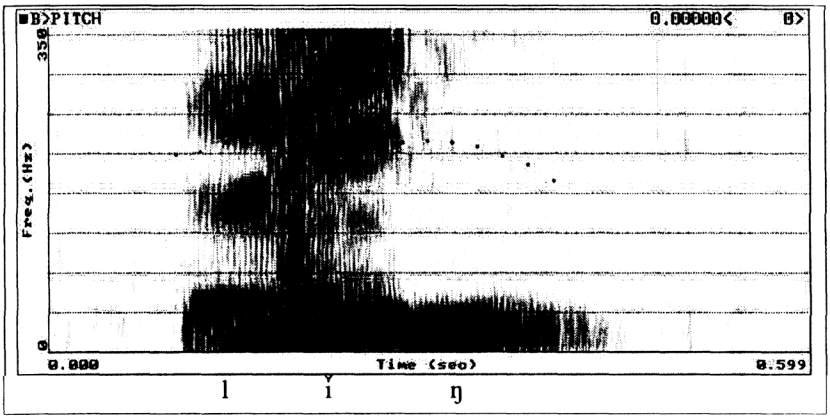

Figure 24. [l̆ɪŋ] /l̆ɪŋ/ 'misbehaved' (Toi)

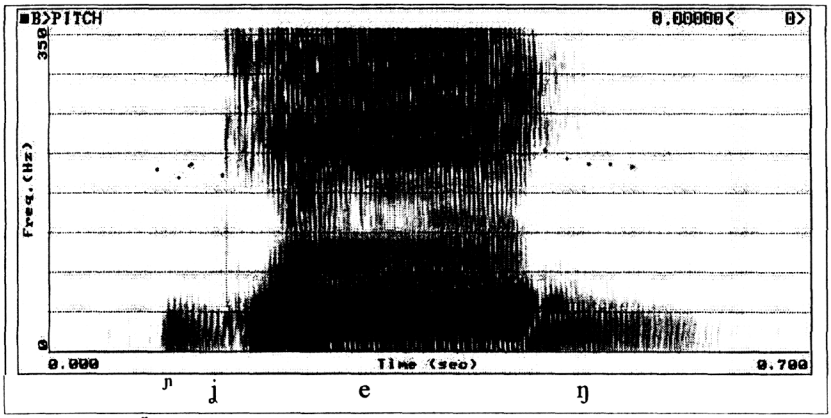

Figure 25. [ⁿj̊eŋ] /jeŋ/ 'gold' (Toi)

In addition to these phonetic cues, /ʔN/-type onsets are often orally released (e.g. [ʔn^{d}], [ʔɲ^{ʲ}], [ʔŋ^{ᵍ}], [ʔj^{ʒ}]). Although oral releases are common to single /N/-type onsets (see Toi's examples /ɲuoʔ/ 'attempt' and /ŋɔk/ 'sit' above), when accompanied by laryngealisation this articulatory effect tends to be much more salient. Spectrograms below illustrate the phonetic realisation of /ʔN/-type onsets.

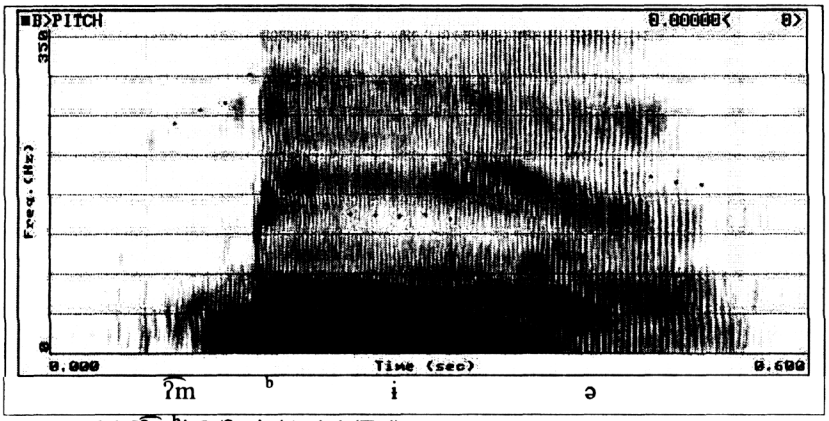

Figure 26. [ʔm^{b}iə] /ʔmiə/ 'rain' (Toi)

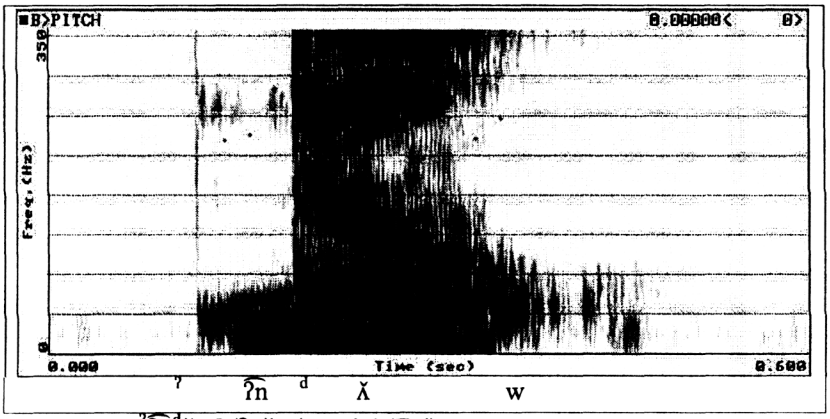

Figure 27. [ˀʔn^{d}ăw] /ʔnăw/ 'again' (Toi)

In some cases, as one can see from the spectrogram of /ʔnăw/ above, the initial /ʔN/ can justifiably be called 'preglottalised' because a barely audible glottal release is made before the nasal occlusion. In the example below /ʔɲɔŋ/ 'stop, don't!', it seems there is a period of creaky phonation at the onset of the nasal:

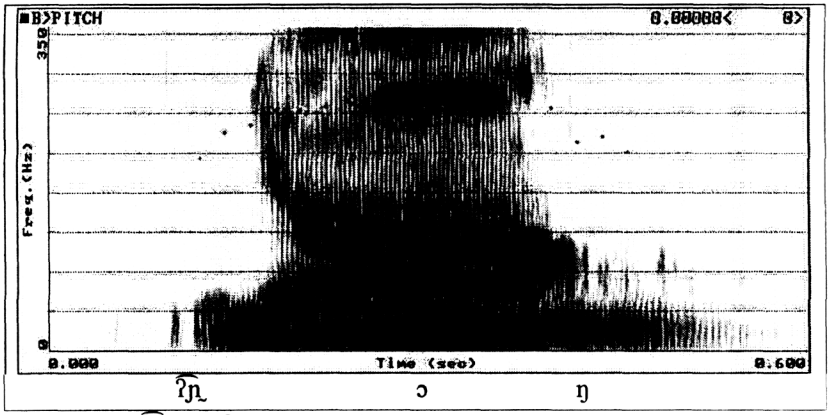

Figure 28. [ʔɲ̰ɔŋ] /ʔɲɔŋ/ 'stop, don't!' (Toi)

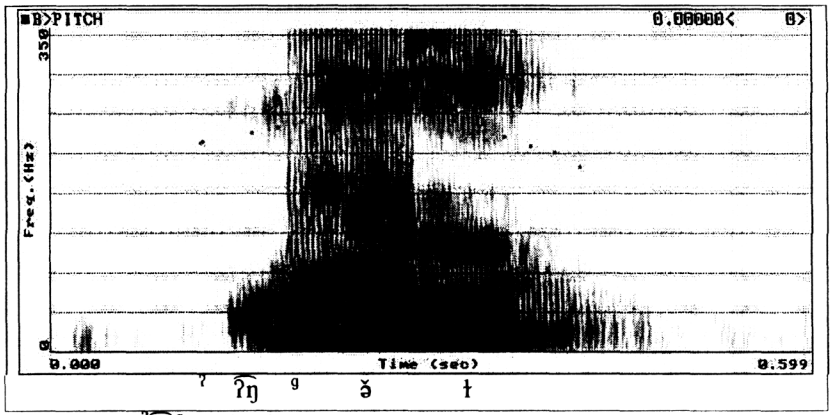

Figure 29. [ˀʔŋᵍəɬ] /ʔŋəl/ 'tree stump' (Toi)

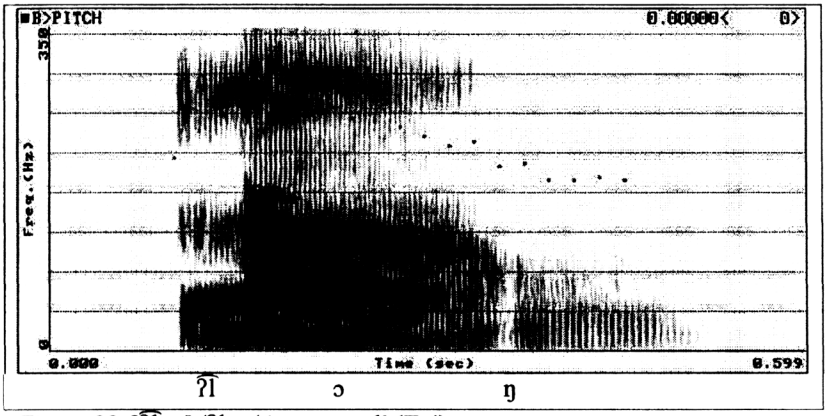

Figure 30. [ʔlɔŋ] /ʔlɔŋ/ 'tree, wood' (Toi)

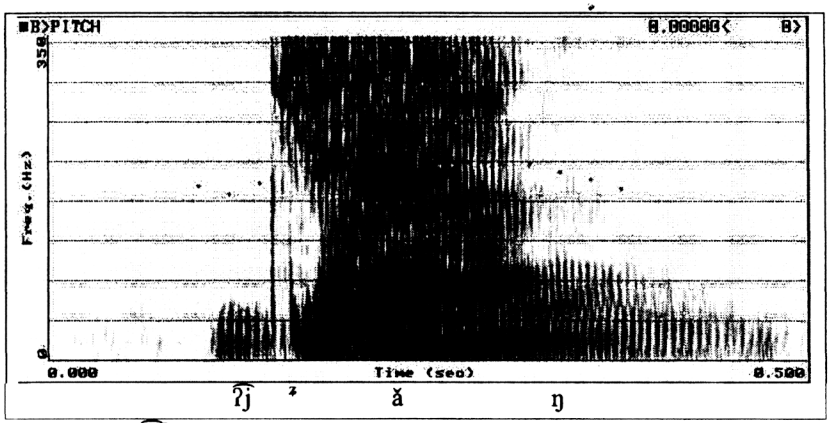

Figure 31. [ʔj̆ăŋ] /ʔjăŋ/ 'what, reason, similar' (Toi)

This great variation in the realisation of /ʔN/-type onsets is typical for the few languages that have such distinctions. Ladefoged & Maddieson (1996:108-9) describe the variation they found in laryngealised nasals for Native American languages:

> In Kwakw'ala...the laryngeal constriction gesture seems to be centered at the same point in time as the oral closure, so that creaky voice characterizes the middle part of the nasal, but in other languages the laryngeal constriction occurs at the beginning or the end of the nasal. In some cases the glottis may be entirely closed, temporarily preventing airflow through the nose.

3.6 /hN/

The /hN/-type onsets are perhaps the most interesting and distinctive sounds in the Jruq language. There is no associated laryngeal tenseness. Sometimes (especially in Toi's tokens) the /hN/ onset sequence is realised phonetically as an extra short [N̆] sound (40-50 ms duration of closure as opposed to an unmarked /N/ of 70-80ms). However, the tendency in normal speech, is to create voiceless nasals, laterals and approximants (e.g. [n̥], [l̥], [ɹ̥]). Table 7 lists 69 words with /hN/ onsets in Jruq[7].

Table 7. Jruq words with /HN/-type initial consonants.

/hjaw/ 'run'	/hjaw/ 'knapsack'
/hjuor/ 'leave behind, lose'	/hlăj/ 'to trap (on land)'
/hlăk/ 'Alak (people/language)'	/hla/ 'ask, demand'
/hla/ 'however'	/hlah/ 'clear (sound, voice)'
/hlaj/ 'overflow, fall over edge'	/hlap/ 'paint, dye'
/hlap/ 'scales (fish)'	/hlɔŋ/ 'neck'
/hlɔŋ/ 'bridge'	/hleh/ 'slip, fall over'
/hleŋ/ 'straw'	/hli/ 'corn'
/hliŋ/ 'ticklish'	/hliaŋ/ 'slippery, slide'
/hliew/ 'fruit tree (*Phyllanthus emblica* Linn.)'	
/hlieŋ/ 'cease, stop'	/hluoʔ/ 'ragged, torn'
/hluoŋ/ 'ear wax'	/hlŏp/ 'dark, cloudy'
/hluc/ 'flood'	/hma/ 'right (side)'
/hmaʔ/ 'ride'	/hmɔk/ 'bark (of tree)'
/hmɔh/ 'what (unseen), call'	/hmeh/ 'move, fidget'
/hmet/ 'yellow'	/hmoʔ/ 'fear, afraid'
/hmoc/ 'ant'	/hmŭn/ 'combine, jumble'
/hmuŋ/ 'suffering, suffer'	/hmŏl/ 'cloud'
/hmiə/ 'bat'	/hna/ 'rhinoceros'
/hnăŋ/ 'persimmon'	/hnăt/ 'pineapple'
/hna/ 'bow, crossbow'	/hnaj/ 'trousers'
/hnaŋ/ 'unknown fruit tree'	/hnas/ 'comb (n.)'
/hnat/ 'gun, rifle'	/hnɔh/ 'creek, stream'
/hnie/ 'type, variety'	/hnŏŋ/ 'sticky, glutinous'
/hnoc/ 'needle'	/hnuaj/ 'dibble stick'
/hnuor/ 'banana stalk'	/hnăm/ 'hammer (n.)'
/hn̆ĭm/ 'forge (n.); metal tripod'	/hnəm/ 'house'
/hŋaj/ 'far, distant'	/hŋɔ/ 'pine tree'
/hŋiəl/ 'forehead'	/hwăk/ 'change, turn'
/hwăl/ 'turn, revolve, dizzy'	/hwăl/ 'small back basket'
/hwa/ 'row (loose oar)'	/hwaj/ 'mango'
/hwar/ 'entwine, crawl (snake)'	/hwer/ 'wander'

[7]The number of these /hN/, and /hD/ onsets for that matter, is so high in Jruq because initial /h/ in onset sequences originates from various historical prefixes Proto-West Bahnaric **tə(r)-*, **cə(r)-*, **sə(r)-* which have merged to /h/ (Jacq & Sidwell 2000).

/hwĭt/ 'crazy'	/hwil/ 'confused'
/hwi/ 'cabbage'	/hwial/ 'turn, bend'
/hwiaŋ/ 'side'	/hwə̆r/ 'throw, discard'

The term 'voiceless' is actually a bit misleading—in normal circumstances the /N/ tends to be assimilated to the preceding /h/ by delaying the onset of voicing typically by around 40ms (although this varies greatly). Only very rarely is the entire /N/ component of the complex onset voiceless (as illustrated with /hŋiəl/ 'forehead' by Lin below). A short period of some voicing is typical for a 'voiceless' sound, and has been reported for Burmese 'voiceless' nasals and laterals (Dantsuji 1986; Maddieson & Emmorey 1985)—its presence is helpful "to maintain an audible difference between them" (Ohala 1975:296).

Spectrograms below illustrate the variation between speakers in articulating /hN/ onsets (note that Lin has devoiced onsets, while Toi simply shortens her nasal onsets):

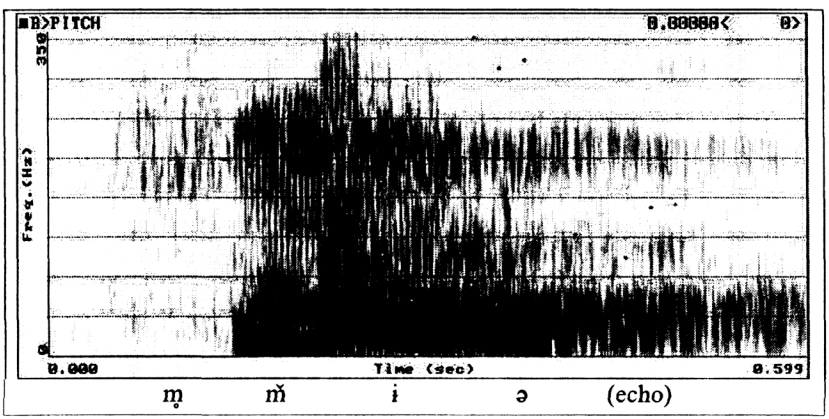

Figure 32. [m̥m̆iə] /hmiə/ 'bat' (Lin)

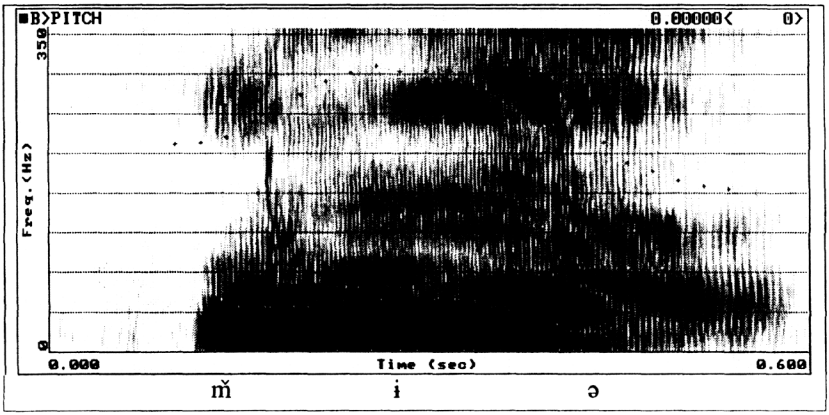

Figure 33. [m̆iə] /hmiə/ 'bat' (Toi)

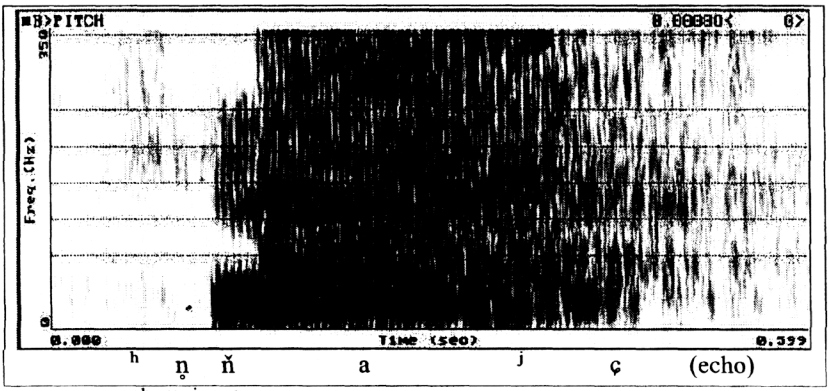

Figure 34. [^{h}n̥n̆a^{j}ç] /hnas/ 'comb(n.)' (Lin)

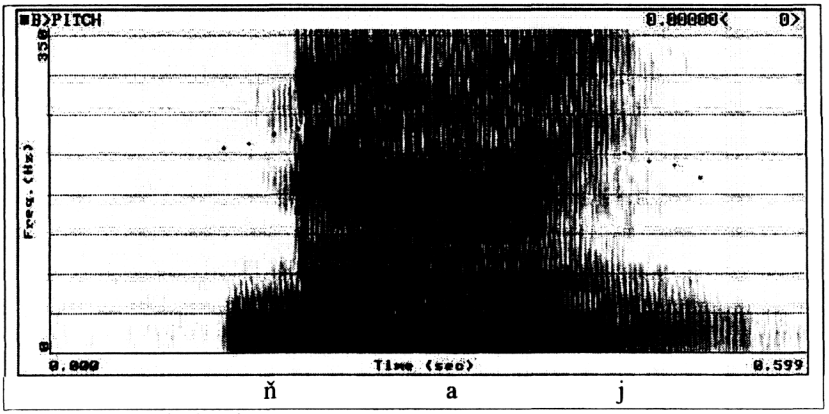

Figure 35. [ňaj] /hnaj/ 'trousers' (Toi)

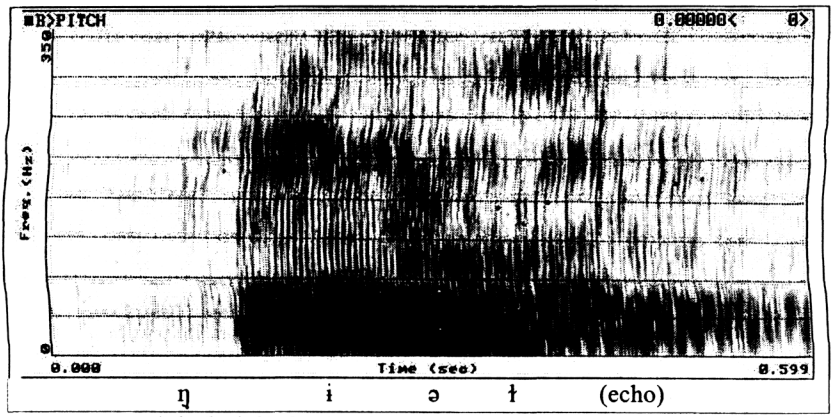

Figure 36. [ŋiəɬ] /hŋiəl/ 'forehead' (Lin)

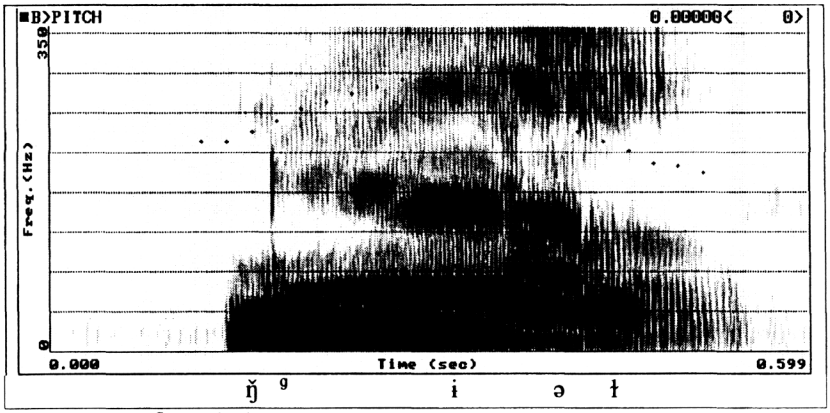

Figure 37. [ŋ̆ᵍiəɬ] /hŋiəl/ 'forehead' (Toi)

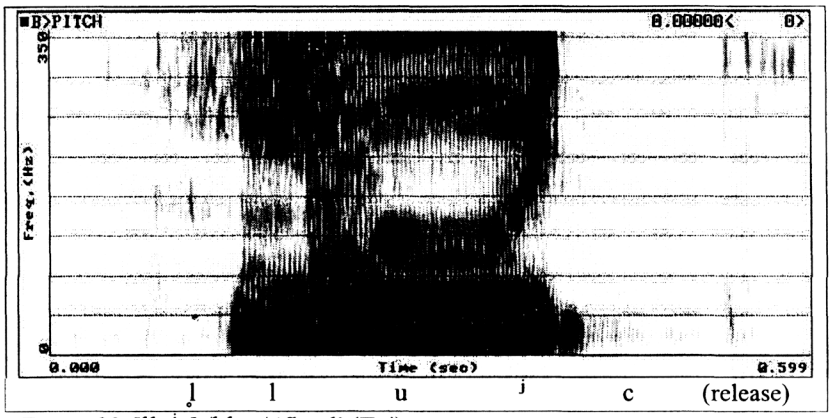

Figure 38. [l̥luʲc] /hluc/ 'flood' (Toi)

In the field I also heard /hl/ onsets articulated as a lateral fricative [ɬ] as an alternative to the voiceless or partly devoiced lateral[8], although I have no good spectrograms of these. The approximants /w/ and /j/ are also commonly realised as voiceless fricatives [f, ç] when preceded by /h/ in onset sequences[9], although like the lateral, they tend to be realised as partly devoiced approximants or semi-approximants [ʍ̥, j̥]. Spectrograms below show the phonetic variation in the realisation of /hw/ and /hj/ sequences:

[8] According to Ladefoged and Maddieson (1996), no known language has a minimal contrast between voiceless lateral approximants and the lateral fricative, although like in Jruq, both sounds can appear in the same language as allophones of the same phoneme.

[9] Lyman (1979:8) reports the phonetic value of /hw/ sequences as [f] and the /hy/ sequences as [ç, ɕ] in Mong Njua (Green Miao).

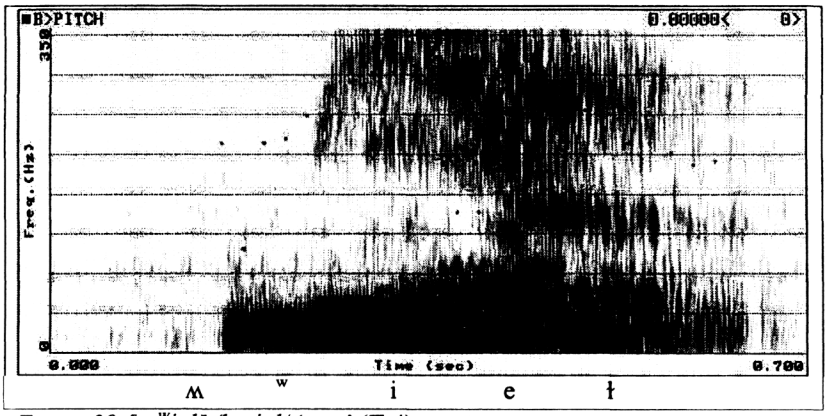

Figure 39. [ʍ^{w}ieɬ] /hwiel/ 'turn' (Toi)

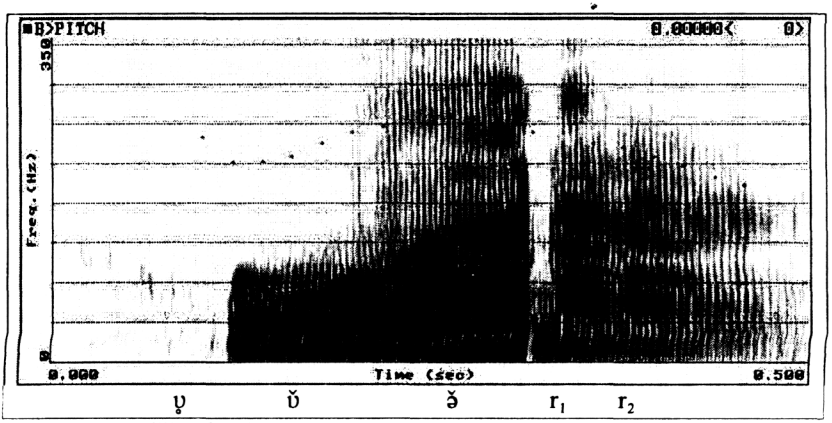

Figure 40. [ụŭər] /hwər/ 'throw' (Toi)

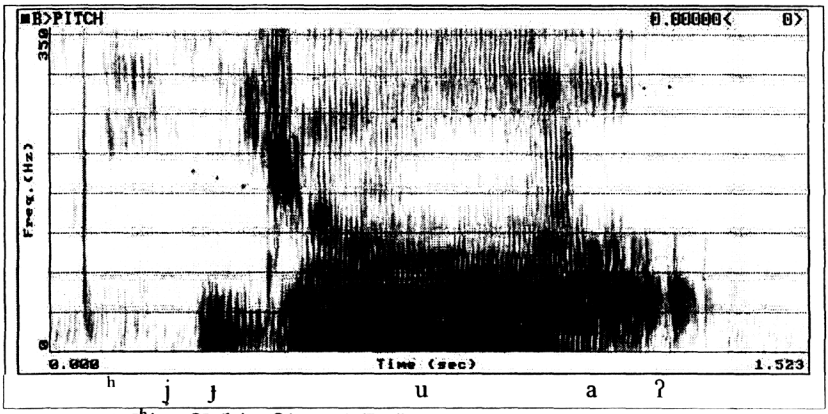

Figure 41. [^{h}ɟua?] /hjua?/ 'wet' (Toi)

The /hj/ onset sequence is sometimes realised in the same way as a /hɟ/ onset, suggesting a possible merger. Compare the spectrogram of /hjua?/ 'wet' above with the following repetition by Toi below.

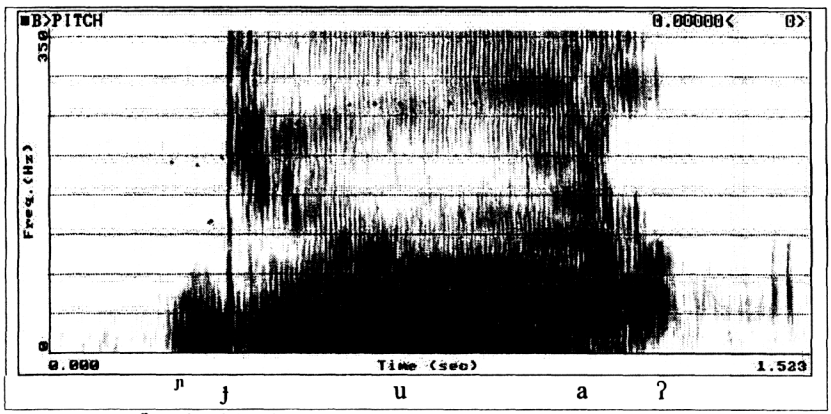

Figure 42. [^{ɲ}ɟua?] /hjua?/ 'wet' (Toi)

4. Conclusion

The data I have collected, and presented in part here, demonstrate the different ways that onset sequences beginning with /ʔ/ and /h/ are realised in Jruq. The patterns vary according to the natural classes of the second consonant C, that is, /hN/ is realised with modal voice, /hT/ and /hD/ tend to be laryngealised and homorganically prenasalised; /ʔN/ is realised as laryngealised [ʔ͡N]; /ʔT/ and /ʔD/ are also laryngealised but have weak or no prenasalisation. Therefore, it is the systematic patterning, rather than the surface phonetics, which determine the presence of /ʔ/ or /h/. Such systemic

considerations must be addressed when attempting phonemic analyses of languages of the Mainland Southeast Asian linguistic area.

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