Phonology of T'ap'anta Abaza: examples from Inzhig-Chkun and Gumlokt

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Contents

1	Intro	oduction	2			
	1.1	General information about Abaza	2			
	1.2	State of research	2			
2	Phor	nological inventory	3			
	2.1	Consonants	3			
	2.2	Vowels	5			
3	Stres	rs ·	6			
Аp	pendi	x 1: List of consonant examples	7			
Аp	pendi	x 2: Post-alveolar/retroflex correspondences to Inzhig-Chkun's post-alveolars in Gumlokt	9			
Аp	pendi	x 3: List of monosyllabic words for the vowel space research	12			
Аp	pendi	x 4: List of minimal pairs for the stress research	15			
Re	eferences 16					

1 Introduction

1.1 General information about Abaza

In this article we describe two varieties of Tapanta dialect of Abaza (ISO-639-3 abq, glottocode abaz1241) spoken in two villages in the Karachay-Cherkess Republic: Inzhig-Chkun (in Abaza /jənˈdʒəgj-tʃk'wən/) and Krasniy Vostok (in Abaza /gwəmˈlokt/). Abaza is a language of the Abkhaz-Abaza group of Northwest Caucasian family of languages. After the Caucasian War (1817–1864) a lot of Abaza, Abkhaz, Ubykh and Adyghe people were forced either to resettle from higher mountains or to immigrate to the Ottoman Empire. As a result Abaza people were split into those who remain in Russia (mostly in the Karachay-Cherkess Republic, see Figure 1 created with lingtypology (Moroz 2017)) and who moved to Turkey. According to the 2010 Russian census, there are slightly less than 38 thousand speakers of Abaza in Russia. The exact number of speakers in other countries, mainly in Turkey (Chirikba 2012: 21–23), is unknown. The data analyzed in this study were collected in 2018, 2019 and 2021 during a field trip to the villages. Even though traditionally Abaza is treated as a separate language with two dialects T'ap'anta and Shkharawa (Genko 1955: 5–7; Tabulova 1976: 3–4; Lomthathidze 2006: 98), some of the researches consider Abkhaz and Abaza to be a dialect continuum (e. g. Hewitt 1979: 1; Colarusso 1988: 7–9; Chirikba 1996). However varieties of Inzhig-Chkun and Gumlokt belong to the same dialect, those lects have their own differences, e. g. Abaza language is /abaza bəzŝa/ in Inzhig-Chkun and /abaza bəzṣa/ in Gumlokt.

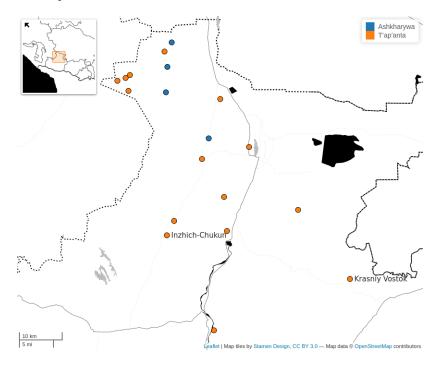


Figure 1: Abaza settlements of the Karachay-Cherkess Republic colored by the dialect (mostly based on (Chirikba 2020)). In Abazakt, Adyge-Khabl, Ersakon, Khumara, and Psauche-Dakhe Circassians are predominant. In Koydan Karachay are predominant.

1.2 State of research

Phonological inventory of Abaza can be found in multiple sources (Bouda 1940; Lomthathidze 1944, 2006; Genko 1955; Allen 1956; Tabulova 1976; Colarusso 1988; O'Herin 1992, 2021; Chirikba 1996; Arkadiev 2019), however more detailed phonological description is limited to (Bouda 1940; Lomthathidze 1944; Genko 1955; Catford 1972; Tabulova 1976; Colarusso 1988; Arkadiev 2019) and lack any acoustic analysis that appears just recently (Mamonova, Moroz 2019). It is also worth mentioning works by V. Chirikba (Chirikba 1985, 2020), where he provides data from huge amount of Abaza settlements, explores correspondences of post-alveolar sibilants among them and compare obtained data with data from Abkhaz and Adyghe.

2 Phonological inventory

2.1 Consonants

Phonological inventory of T'ap'anta is present in Table 1. I illustrate consonant inventory with some examples in Appendix 1.

Table 1: Joint consonant system of Inzhig-Chkun and Gumlokt. Parenthesis denote the system that is common for Gumlokt, where the vast mojority of speakers use labialised post-alveolar segments.

	aspirated plosives	ejective plosives	voiced plosives	voiceless affricates	ejective affricates	voiced affricates	voiceless fricatives	voiced fricatives	nasals	approximant	tap	laterals
labial	ph	p'	b			_	f	v	m	w		
dental	th	ť	d	ts	ts'	dz	S	z	n			
alveolar											ſ	
post-alveolar (labialized)				tŝ(w)	tŝ'(w)	dâ(w)	ŝ(w)	$\hat{\mathbf{z}}(\mathbf{w})$				
retroflex				tş	tş'	dz	ş	z				
alveolo-palatal				tç	t¢'	dz	Ç	Z				
lateral												l lj
palatal	ch	c'	j				ç			j		
plain velar	kh	k'	g									
labialized velar	khw	k'w	gw				xw					
plain uvular	qh	q'					χ	R				
palatalized uvular		q' ^j					χ ^j	$\mathbf{R}_{\mathbf{j}}$				
labialized uvular	qhw	q'w					χ ^w	R _M				
plain pharyngeal	_						ħ	ſ				
labialized pharyngeal							ħw	ςw				
glottal		?										

The main difference between Inzhig-Chkun and Gumlokt consonant systems is in post-alveolar consonants. All speakers of Inzhig-Chkun and some minority in Gumlokt use non-labialized post-alveolars (e. g. \hat{s} , see Figure 2). The majority of speakers in Gumlokt use labialised post-alveolars (e. g. \hat{s}^w). Everything become even more complicated, since some post-alveolars in Inzhig-Chkun correspond to retroflex segments in Gumlokt. It looks like there is some proto-phonemes that merged together in most Abaza dialects except Gumlokt and Apsua (Ashkharywa dialect, (Lomthathidze 2006: 47, 445–446)): in Apsua in the same position labialized retroflex fricatives are observed (cf. 1–2).

 $^{^1}$ In this work we will use two transcription systems. First system is our interpretation of Abaza phonology using IPA. Second is standard Abaza orthography. The IPA transcription used in this work differ from traditional Caucasian transcription, however Northwest Caucasian researchers still can retrieve desired information from orthographic correspondences. Unfortunately IPA alphabet still allows a lot of space for interpretation, so my system is differ from other recent phonological phonetic discriptions illustration of Northwest Caucasian languages (see (Gordon, Applebaum 2006; Andersson, Vaux, Pysipa (Şener) 2021)). I refuse to use symbols like \int , \Im , \Im or π one can find in the literature for special post-alveolars sounds present in all Northwest Caucasian and continue to use symbols \Im after the following sources (Ladefoged, Maddieson 1996: 161–164; Catford 1997; Testelets et al. 2009; Applebaum, Gordon 2011; Paschen 2015).

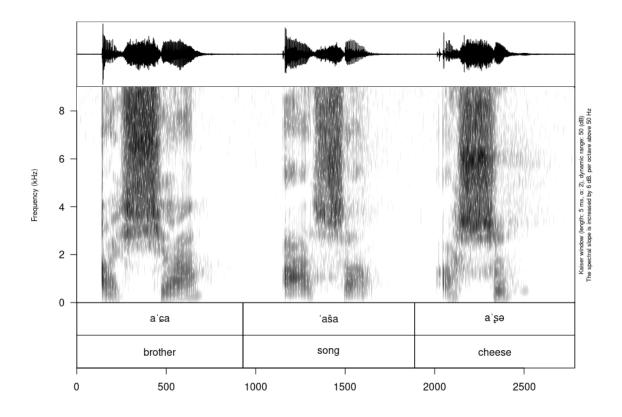


Figure 2: Fricatives by female speaker with non-labialised post-alveolars.

Presented examples show that the post-alveolar correspondences between Inzhig-Chkun and Gumlokt not predictable without Gumlokt or Apsua data (see Table 2), so we decided to collect some lexicon that could be useful for further historical and dialectal investigation (see Appendix 2).

Table 2: Post-alveolar correspondences between Inzhig-Chkun and Gumlokt.

	Inzhig-Chkun	minority in Gumlokt	majority in Gumlokt	orthography
bullock	tŝə	tŝə	tŝ ^w ə	чвы
apple	tŝ'a	tŝ'a	tŝ' ^w a	чІва
one person	zaˈd͡zə	zaˈdźə	zaˈd͡zwə	заджвы́
you (2pl)	ŝa'ra	ŝaˈɾa	ŝ ^w aˈɾa	швара́
cow	źә	źә	ź ^w ə	жвы
hay	tŝa	tşa	tşa	чва́
oak	d z tŝ'ə	dztş'ə	dztş'ə	джьчІвы
to go out	w'dâəlts'	wˈdzəlts'	w'dzəlts'	уджвы́лцІ
door	ŝə	ŞӘ	Şə	ШВЫ
old	źә	zə	zə	жвы

It is worth mentioning that in (Chirikba 2020) based on different resources Vyacheslav Chirikba discovered even bigger variation. There are four sibilant subsystems in (ibid.: 27), however our field data support only two types: with labialised postalveolars (majority) and with non-labialised post-alveolars (minority). In order to check my hypothesis I performed small experiment asking 31 Gumlokt speakers (15 female and 16 male speakers) for two words: $\hat{z}(w)$ 'cow' and $t\hat{s}'(w)$ a 'apple'. As

I found indeed there is a variation across speakers I worked with, however only Gumlokt 2 (with labialised post-alveolars, 25 people) and Gumlokt 1 (with non-labialised post-alveolars, 6 people) sibilant subsystems from (ibid.) were attested (see Figure 3). It also visible from the experiment results that non-labialised post-alveolars are tend to appear in speach of older females, but this is just a preliminary result that should be checked with greater number of stimuli and speakers.

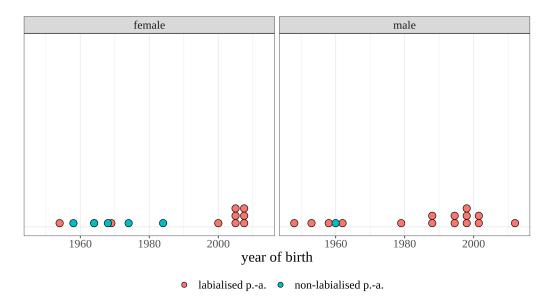


Figure 3: Results of experiment. Each dot represents one person colored by result and faceted by gender.

Except of my interpretation of alveolar and retroflex consonants (see the footnote on the page 3) the main difference between my phonological description and older ones is in the palatal area: I treat segments c^h , c', and j as palatal, however more traditional interpretation is palatalized velars: k^j , k', and g^j .

Articulation of labialization in T'ap'anta is different for different places of articulation (see (Catford 1972) for the similar observations for Abkhaz):

- \cdot /w/-labialisation this kind of labialization is more or less independent of the main place of articulation. This kind of labialisation is typical for velar and uvular places fricatives and stops;
- \cdot / η /-labialisation this kind of labialization is typical for pharyngeals. It looks like the tongue body is retracted (due to pharyngeal place of articulation) and raised, that results / η /-like sound;
- · /y/-labialisation this kind of labialization is typical only for post-alveolars in Gumlokt. The main place of articulation somehow merged with the additional place of articulation that produces a long hole for /y/-like sound.

There is also so called weaken labialised post-alveolars mentioned in literature (Chirikba 1985, 2020; Lomthathidze 1944), but we didn't noticed such sounds neither in Inzhig-Chkun nor Gumlokt.

2.2 Vowels

The vowel inventory traditionally analized as two core vowels a (low) and ϑ (mid) (see (Bouda 1940; Lomthathidze 1944, 2006; Genko 1955; Allen 1956; Tabulova 1976; Colarusso 1988; O'Herin 1992, 2021; Chirikba 1996; Arkadiev 2019)). There are additional vowel colors that appear in numerous loanwords or due to contraction of vowel and glide (cf. (1)–(4)):

- (1) $i < \partial j$ or $j\partial$;
- (2) e < aj;
- (3) $u < \partial w$ or $w\partial$;
- (4) o < aw.

In order to analyze vowel space we collected a list of monosyllabic words with 6 speakers from Inzhig-Chkun and 5 speakers from Gumlokt (see Appendix 3).

3 Stress

T'ap'anta Abaza stress was discussed in G. Moroz's unpublished report from previous expeditions and became a basis for (Arkadiev 2019). Unfortunately we've changed our opinion, so I will try to sum up my current opinion on the topic. Our stress model based on the ideas presented in (Dybo 1977; Spruit 1986).

Stress in Abaza is distinctive (see example (5) and other examples in Appendix 4).

(5) sa'ra 'I' vs. 'sara 'lamb'

Each Abaza morpheme (even borrowed) can be represented by combination of open syllables with vowel a or a. According to some test discussed bellow each syllable assigned to one of the accentual classes: dominant or recessive. The main stress rule is formulated in (Spruit 1986: 37–40): stress falls on the first D element followed by R or word boundary (see () and ...), otherwise stress is on the first syllable (see ...).

In order to analyze acoustic effect of the stress on vowels we collected a list of 50 minimal pairs for stress with 7 speakers from Inzhig-Chkun and 6 speakers from Gumlokt (see Appendix 4).

Appendix 1: List of consonant examples

 $Example \ words \ for \ consonants \ from \ Table \ 1. \ First \ example \ before \ slash \ is \ from \ Inzhig-Chkun \ and \ some \ speakers \ from \ Gumlokt, \ example \ after \ slash \ are \ common \ for \ most \ speakers \ from \ Gumlokt.$

		translation
transcription	orthography	
p ^h a	па пІай	dirt
p'aj	-	
ba fa'ra	ба	you (2sgf)
	фара́	to eat
ma	ма	here you are (giving something)
Wa	ya	you (2sgm)
ˈtʰaba	та́ба	frying pan
't'at'a	тІа́тІа	soft
da	да	tendon
tsa	ца	barn
ts'a	цІа	louse
dza	дза	rib
sa	ca	I
'Υwaza	гІва́за	twins
na'Sa	нагIá	slope
ba'ra	бара́	you (2sgf)
tŝa / tŝ ^w a	чва	skin
tŝ'a / tŝ'wa	чІва	apple
dâa'ra / dâ ^w a'ra	джвара́	vomiting
ŝa / ŝ ^w a	шва	you (2pl)
a'ĉa / a'ĉ ^w a	ажва́	word
'tṣaba	тша́ба	gelding
tş'a	шІа	mouth
'pʰadzੑa	па́джа	firstborn
şa'ba	шаба́	dried-up
'zac'a	жа́кІьа	beard
tça'ra	чара́	to eat
't¢'at¢'a	чІа́чІа	kidney
'dzadza	джьа́джьа	curly
ça	ща	blood
za'ra	жьара́	to deceive
la	ла	dog
l ^j a'g ^j an	льагьан	basin
'mac ^h a	ма́кьа	grindstone
'c'ana	кІьа́на	lump
' j aba	гьа́ба	(body) side
'çap ^h ad	тлапа́д	stocking
jaˈɾa	йара́	he (3sgm)
k ^h ət ^h	кыт	village
k'aˈɾa	кІара́	something
'gara	га́ра	cradle
k ^{hw} a	ква	rain
k' ^w a	кІва	bosom
g ^w a'ban	гваба́н	mattress
'x ^w at ^h a	хва́та	rug
q ^h a	хъа	head
_ •	I	I .

transcription	orthography	translation
q'a'la	къала́	town
χaˈra	xapá	to give a present
_r rara	гъа́гъа	broad, wide
'q' ^j ara	къьара́	to wave
χ ^j a'ra	хьара́	to give birth
r _j a'sa	гъьаса́	nutwood
q ^{hw} a	хъва	ashes
q' ^w a'ra	къвара́	to stay too long
χ ^w a	хва	mountain
tŝ ^w a'ʁ ^w a	чвагъва́	ploughed up
ћа	xIa	we
a'Sa	arIá	raw leather
ћ ^w а	хІва	pig
ςwa	гІва	dry
a'?aca	аъа́ща	situation

Appendix 2: Post-alveolar/retroflex correspondences to Inzhig-Chkun's post-alveolars in Gumlokt

transcription	orthography	translation
za'dâwə	заджвы	one person
dâwdâwə		saliva
hadâw	джвджвы	stack
ŝ ^w a'ra	хІаджв	
	швара́	you
alarŝ ^w a'ra	аларшвара	to turn on
'aŝ ^w a	а́шва	song
gwlaŝw	гвлашв	indifferent
ˈjaŝ ^w a	гьа́шва	orphaned
k'aŝ ^w aˈɾa	кІашвара́	to fall
k ^w rəŝ ^w	кврышв	patch
laŝ ^w	лашв	blind
marat ^h a'ŝ ^w art ^h a	мараташва́рта	west
nab'raŝ _m	набгъа́шв	one year old foal
p ^h əŝ ^w t ^h amamk' ^w a	пышвт ама́мкІва	without break
wəˈdzəŝ ^w a	удзышва	green
wəˈnaŝʷa	уна́шва	advice
q ^h ŝ ^w a	хъвшва	food (cooked)
ts'a'ŝ ^w a	цІашва́	trump card
'ŝ ^w abəz	шва́быж	very
'ŝ ^w apχa	шва́пха	example
'ŝ ^w aχ ^j a	швахьа́	Monday
ŝwwoch	швуокь	gun
îwər	швыр	fruit
şə	шы	door
aˈsə	ашы	cheese
aj 'şa	айша	traditional table
'ajşa	áйша	bitter
bza'şə	бжашы	not fully painted
şk'ə	шкІы	hundred
bəz'şa	бызша́	
		language
gwaş	гваш	gate
la'şan	лаша́н	time for weeding
mşə	мшы	bear
rşa'ra	ршара́	to scare
nəş	ныш	clay
tharaş	тара́ш	gate
q ^{hw} şə	ХЪВШЫ	medicine
q ^h əş	ХЪЫШ	window
tcaş	чаш	patty
şa'Υ̂wə	шагІвы́	fearful
şaga'la	шагала́	pack of jackal
şp'a	шпІа	thick
şʔa	шъа	document
Sət	шыр	animal
tŝ'wa	чІва	apple
amts'tŝ'wa'ra	амцІчІвара́	to rob
a'q ^h atŝ ^w ra	ахъа́чІвра	to stitch
1	F	

transcription	orthography	translation
ja'tŝ ^w a	йачІва́	star
jaˈtŝ' ^w a	йачІва́	grey
k ^w aj'tŝ' ^w a	квайчІва́	black
mətş'w	мычІв	shy
p ^h ətŝ' ^w	пычІв	initial
wa'tŝ'wə	уачІвы́	tomorrow
tŝ'wɾa	чІвра	to turn sour
tŝ'wə	чІвы	bolt
tŝ ^w ə	чвы	bullock
'tŝ ^w aĝ ^w ara	чва́жвара	to speak
an'tŝ ^w az	анчва́жь	birthmark
'aq ^h atŝ ^w açara	а́хъачващара	to find respectable
a'tŝ ^w ədzra	ачвы́дзра	to lose something
bnatŝ ^w	бначв	aurochs
tŝ ^w a	чва	skin
tŝ ^w ra	чвра	to cut (wood)
tŝ ^w a	чва	color
dzətŝ ^w	дзычва	swan
źwtśwa	жвчва	overdone (about food)
'q'ətŝ ^w ga	къы́чвга	hatchet
maˈtŝ ^w ə	мачвЫ	finger
ma'tŝ ^w əsra	мачвы́сра	glare (about lightning)
an'tŝ ^w a	анчва	God
'nətŝ ^w a	ны́чва	
p ^h ərtŝ ^w		hemp
	пы́рчв пша́чвгьа	mane strong wind
ˈpṣatŝʷɟa tŝʷaˈɾa		strong wind dream
tsa ta tsa'tŝwa, tħa'tŝwa	чвара́ тгІачва́, тхІачва́	family
q ^h ətŝ ^w	хъы́чв	bird comb
tŝ ^w a		skin
tŝ ^w a'ba	чва чваба́	
tŝ ^w a'ħ ^w a	чваоа чвахІва́	wax
		stripe
tŝ ^w bza	чвбза	lover evil
tŝ ^w ja tŝ ^w c ^h a¢	чвгьа	
tŝ ^w ts'a'ra	чвкьа́щ	shabby
	чвцІара́	to scatter
tŝ ^w əş	ЧВЫШ	pale
alar'tşa	алартшА	alloyed
la'tṣa	латшА	ferment
ma'tşa	матшА	dishes
psla'tşa	пслатша	fish
'ak ^w tṣaga	а́квтшага	watering-pot
t ^h atşa'ra	татшара́	to pour
tşa	тша	hay
atş'şa'ra	ашІшарА	to be afraid of
ˈakʰwtṣʾara	а́квшІара	to sit down
a'tş'əja	ашІы́йа	what
bəlˈtʂ'ə	былшІы	fuel
dztş'ə	джьшІы	oak
nq'wga'tş'ə	нкъвгашӀы́	sick person

transcription	orthography	translation
pssʕaˈtʂ'ə	псстІашІы́	bird
χa'tṣ'ə	хашІы́	task
źwə	жвы	cow
aˈâʷa	ажва́	word
baŝ ^w	бажв	abundant
ˈgʷə͡ɛwk'ra	гвыж́вкІра	to be angry
ĝʷba	жвба	nine
ĝwς̂wa'qha	жвгІвахъа́	shoulder
ĝ ^w Ῡ ^w a	жвгІва	cow that didn't gave birth
ĝwʕwand	жвгІванд	sky
ĉ ^w p'a	жвпІа	thick
ź ^w ra	жвра	drink
źwts'ә	жвцІы	swallow
ts'əâ ^w	цІыжв	tick
χts'ə̂ż ^w	хцІыжв	accidental bullet
'tŝ ^w aĉ ^w ara	чва́жвара	to speak
ˈca͡zwəʕw	ща́жвыгІв	bloodsucker
p ^h əâ ^w 'bana	пыжвба́на	hedgehog
ź ^w ra	жвра	to boil, to drink
â ^w tŝ ^w a	жвчва	overdone (about food)
a'zə	ажы	old
'Satş'zara	гІа́шІжара	to tear off
za'ba	жаба́	ten
'zzaga	жжа́га	harrow
t ^h az _t	таж	grandmother
wasa'raz _t	уасара́ж	wise
wzə	ужы́	now

Appendix 3: List of monosyllabic words for the vowel space research

mва мгы thorn mza мза lamp mza мзы moon mza мзы moon mza мзы tree pitch mza мзы tree pitch myde мха sterile mts мцы lie mts ми lie mts мцы lie mts sterile mts mts let let mts let let mts let let mts let let phud my chead body ps mts seat pt	transcription	orthography	translation
mzə мзы moon mzətc мзыч tree pitch myde мхьа sterile mtsa мца fire mtsa мцы lie mtsa мцы strong mtsa мцы day mtsa мцы day msa мы day mtsa belt day msa belt dead body psa ncs dead body psa ncs dead body psa ncs ncs pyda nxa heat pyda nxa heat		МГЪЫ	thorn
mzəte мзыч tree pitch my/ae мхьа sterile mtsa мца fire mtsa мцы lie mtsa мцы lie mtsa мцы strong mtsa мшт strong mtsa мшт piece of wood mga мшы day mya musa belt mpa мшы day mya musa belt mya musa belt pha na son phae neu room sbab cosi6 blister psqha ncxba dead body psa ncus soul ptya ncxba dead body psa ncus soul pya nxa heat pya nxa heat pya nxa heat pya nmua wind	mza	мза	lamp
my/ee мхьа sterile mtsa мца fire mtsa мцы lie mtsa мцы lie mtsa мцы strong mtsa мшти piece of wood msa мши day msa мши day msa belt pp msa belt pp msa belt pp pha na son phee neut room sbab c6ыб blister psa neut soul psqha ncsa dead body psa ncs soul ptstgsa ntus broken pyda nxa heat pyda nxa heat pyda nxa heat pyda nxa heat pyda nxa beautiful psa nma soft	mzə	мзы	moon
мтва мцы fire mtsэ мцы lie mts мчы strong mts мы day m²a мьа belt pha па son phee пещ room sbəb сбыб blister psqha псхьа dead body psa псы soul ptştşə птштшы broken ppada псхьа dead body psa псы soul ptştşə птштшы broken ppud пуд cheap pya пка heat pydza пха heat pydza пхы scab pyaz пхы sleep psa пша wind pşadza пша soft pşadza пша buckle phad пыджь buckle phad пыджь buckle <td< td=""><td>mzətç</td><td>мзыч</td><td>tree pitch</td></td<>	mzətç	мзыч	tree pitch
mtsə мцы lie mtcı мчы strong mtş¹tşət мшІтшыт piece of wood mşə мшы day m²a мъа belt p³a мъа belt p³a мъа belt p³a па son p³a пещ room sbəb сбыб blister psq³a пещ room psq³a псы soul pşq³a пка heat pyda пха seep pya пха heat pya пха heat pya пта soft pya пта soft	mχ ^j æ	мхьа	sterile
тител мини мы дау туда мини дау туда мъва ден	mtsa	мца	fire
тура мины day тура мины day тура та belt ра та son ра та dead body ра де dead body р	mtsə	мцы	lie
mşə мшы day m²a мъа belt p³a па son p³a па soul p³a па soul p³a па soul p³a па soul p³a па broken p³u па cheap p¾a па heat p¾a па seat p¾a па wind p¾a па wind </td <td>mtçı</td> <td>мчы</td> <td>strong</td>	mtçı	мчы	strong
m?a мъа belt pha па son phee пещ room sbab сбыб blister psqha псхъа dead body psa псы soul ptstsa псы soul ptstsp птитшы broken phud пуд cheap pta пха heat pyda пха seat пха sleep seat pya пина wind pyaz пхыз sleep pyaz пина soft pyaz пина soft pyaz пкы buckle	mtş'tşət	мшІтшыт	piece of wood
pha па son phee пещ гоот sbab сбыб blister psqha псхьа dead body psa псы soul ptgts птитшы broken ptgta пха heat pya пха heat pydza пха heat pydza пха heat pydza пха seep psa пша wind pyaz пхыз sleep pyaz пхыз sleep pyaz пхыз sleep psa пша wind pyaz пхыз sleep psa пша wind pyaz пхыз sleep psa пша soft psax пшба four phat пыда four phat пыда four pyaz кын four	mşə	мшы	day
phes пещ room sbəb сбыб blister psqha псхъа dead body psa псы soul ptştşə птштшы broken phud пуд cheap pya пха heat pydza пха heat pydza пха sweat pyta пха heat pydza пха seep psa пша wind psa пша soft psa пша year skhwşa сквшы year	m?a	мъа	belt
sbəb сбыб blister psq ^h a псхъа dead body psə псы soul ptştşə птштшы broken phud пуд cheap pxa пха heat pxdzə пхдзы sweat pxtə пхты scab pyaz пхыз sleep pşa пша wind pşdza пшдза beautiful pşdza пшдза breeze pcba пщба four phədz пыджь buckle phats пыц tooth sa ca I skhwşə сквшы year skhwşəzch сквшы year skhwşəzch сквшызкь thousand years ssa cca small staz стажь let me come down sə сыс lamb tc'i ткІьи strict tdzə тдэы hous thoph топ ball tşbəg тшбах to change (imp) tşpax тшлыц to rest (imp) tşpats тшлыц to dip into something (imp) tşteə тштыы forage	pha	па	son
psqha псы soul ptsts птыты broken phud пуд cheap pxa пха heat pxdza пха heat pxdza пхазы sweat pxaz пхыз sleep pxaz пхыз sleep pxaz птыз scab pxaz пхыз sleep pxaz птыз scab pxaz птыз scat psaz птим soft psaz птим breeze pcba пщба four phadz птыджь breeze pcba пщба four phadz птыджь breeze pbaz птыц tooth sa ca I skhwsa ckbшы year skhwsa ckbшы year skhwsa ckbшы year skhwsa cca <td< td=""><td>phec</td><td>пещ</td><td>room</td></td<>	phec	пещ	room
ркаторный псы soul рфуда птитины broken рми пуд cheap рха пха heat рха пха heat рха пха sweat рха пха scab рха пха scab рха пха scab рха пха scab рха пха scep ра пша wind ра пша pautiful ра пша	sbəb	сбыб	blister
рұқұра птштшы broken рүии пуд cheap рха пха heat рха пха sweat рха пхаы sweat рха пхаы scab рха пхыз sleep рра пша wind рра пша soft рра пша soft рра пша soft рра пшба four рра пшба four рра пшба four рра пша ton ка са I ка са I ка са ка ка са <td>psq^ha</td> <td>псхъа</td> <td>dead body</td>	psq ^h a	псхъа	dead body
phud пуд cheap pxa пха heat pxdza пхдзы sweat pxb пхты scab pxaz пхыз sleep psa пша wind psdza пша wind psdza пша wind psdza пша soft psdza пшка soft	psə	псы	soul
phud пуд cheap pxa пха heat pxdza пхдзы sweat pxta пхты scab pxa пхыз sleep ppa пша wind ppa пша wind ppa пша wind ppa пша wind ppa пша soft ppa пшба four ppa тша to cha ppa тша to cha ppa тша to cha ppa тша to cha ppa	ptştşə	птштшы	broken
рхда пхдзы sweat рхда пхты scab рха пхыз sleep рха пша wind рха пша wind рха пша wind рха пша beautiful рха пшда beautiful рха пшда four рха пыджь buckle ра рха рха рха пыджь buckle ра ра ра ра пыджь buckle ра пыджь thoush ка са I ка		пуд	cheap
рхда пхдзы sweat рхда пхты scab рха пхыз sleep рха пша wind рха пша wind рха пша wind рха пша beautiful рха пшда beautiful рха пшда four рха пыджь buckle ра рха рха рха пыджь buckle ра ра ра ра пыджь buckle ра пыджь thoush ка са I ка	рха	пха	heat
рхть пхты scab рха пхыз sleep рха пша wind рха пша wind рха пша beautiful рха пша soft рха пшка soft рха пшка breeze рса пшба four рха пыджь buckle рха пыджь buckle рха са I skhwsa са I skhwsa сквшы year skhwsa сса s		пхдзы	sweat
рха пхыз sleep рха пша wind рха пшдза beautiful рха пшдза beautiful рха пшка soft рха пшка breeze рсва пщба four рад пыджь buckle рад тыб уеаг skhwşa сквшыз thousand years ssa сса small staz стажь let me come down sa сы зnow sa сы тыбы tc'i ткбы hous tфор тыбы scythe tgра тшб		пхты	scab
р§dza пшдза beautiful р§bkha пшка soft р§bxj пшыхь breeze рсba пщба four рhədz пыджь buckle рhəts пыц tooth sa ca I skhwşə сквшы year skhwşəcch сквшызкь thousand years ssa cca small staz стажь let me come down sə сы snow səs сыс lamb tc'i ткІьи strict tdzə тдзы hous thoph топ ball tşbəg тшбыг scythe tşzı тшжьы horse meat tşpsax тшпы to change (imp) tşpeæ тшпы horse tooth tşrədz тшты to disappear (imp) tşcə тшты to dip into something (imp) tşylæ тшхьа		пхыз	sleep
ряда пшда beautiful рядуй пшыхь breeze рядуй пшыхь breeze ряда пшда four ряда пыджь buckle ряда пыд tooth яа са I якния уеаг якни	pşa	пша	wind
руба пшыхь breeze реба пщба four р ^h эdz пыджь buckle р ^h эts пыц tooth sa ca I skhw gə сквшы year skhw gəzch сквшызкь thousand years ssa cca small staz стажь let me come down sə сы snow səs сыс lamb tc'i ткІьи strict tdzə тдзы hous thoph топ ball tşbəq тшбыг scythe tşzi тшжы horse meat tşpsax тшпы to rest (imp) tşpats тшпыц horse tooth tşrədz тштын horse tooth tşradz тштыы to disappear (imp) tşxiæ тштыы forage	pędza	пшдза	beautiful
руба пшыхь breeze реба пщба four р ^h эdz пыджь buckle р ^h эts пыц tooth sa ca I skhw gə сквшы year skhw gəzch сквшызкь thousand years ssa cca small staz стажь let me come down sə сы snow səs сыс lamb tc'i ткІьи strict tdzə тдзы hous thoph топ ball tşbəq тшбыг scythe tşzi тшжы horse meat tşpsax тшпы to rest (imp) tşpats тшпыц horse tooth tşrədz тштын horse tooth tşradz тштыы to disappear (imp) tşxiæ тштыы forage	pşk ^h a	пшка	soft
phodz пыджь buckle phots пыц tooth sa ca I skhwşə скышы year skhwşəzch скышызкь thousand years ssa cca small staz стажь let me come down sə сы snow səs сыс lamb tc'i ткіьи strict tdzə тдзы hous thoph топ ball tşbəg тшбыг scythe tşzı тшжьы horse meat tşpsax тшпсАх to change (imp) tşpeæ тшпыд to rest (imp) tşrədz тшрыдз to disappear (imp) tşcə тштцЫ to dip into something (imp) tşviæ тшхьа forage		пшыхь	breeze
phəts пыц tooth sa са I skhwşə сквшы year skhwşəzch сквшызкь thousand years ssa сса small staz стажь let me come down sə сы snow səs сыс lamb tc'i ткІьи strict tdzə тдзы hous thoph топ ball tşbəg тшбыг scythe tşzı тшжьы horse meat tşpsax тшпсАх to change (imp) tşpeæ тшпыц horse tooth tşrədz тшрыдз to disappear (imp) tştcə тштцЫ to dip into something (imp) tşxiæ тшхьа forage	pcba	пщба	four
sa ca I skhwşə сквшы year skhwşəzch сквшызкь thousand years ssa cca small staz стажь let me come down sə сы snow səs сыс lamb tc'i ткІьи strict tdzə тдзы hous thoph топ ball tşbəg тшбыг scythe tşzı тшжьы horse meat tşpsax тшпсАх to change (imp) tşpeæ тшпыц horse tooth tşrədz тшрыдз to disappear (imp) tştcə тштцЫ to dip into something (imp) tşxiæ тшхьа forage	p ^h ədz	пыджь	buckle
skhwgə сквшы year skhwgəzch сквшызкь thousand years ssa сса small staz стажь let me come down sə сы snow səs сыс lamb tc'i ткІьи strict tdzə тдзы hous thoph топ ball tşbəg тшбыг scythe tşzı тшжьы horse meat tşpsax тшпсАх to change (imp) tşpeæ тшпыц horse tooth tşrədz тшрыдз to disappear (imp) tştcə тштщЫ to dip into something (imp) tşx'æ тшхьа forage	p ^h əts	пыц	tooth
skhwspzch сквшызкь thousand years ssa сса small staz стажь let me come down span сы snow span сыс lamb tc'i ткіьи strict tdzpan тдзы hous thoph топ ball tspag тшбыг scythe tszi тшжьы horse meat tspsax тшпсАх to change (imp) tspeæ тшпыц horse tooth tspats тшпыц horse tooth tsradz тштщЫ to disappear (imp) tstca тштыы to dip into something (imp) tsx/æ тшхьа forage	sa	ca	I
ssa cca small staz стажь let me come down sə сы snow səs сыс lamb tc'i ткІьи strict tdzə тдзы hous thoph топ ball tşbəg тшбыг scythe tşzi тшжьы horse meat tşpsax тшпсАх to change (imp) tşpeæ тшпыц horse tooth tşrədz тшрыдз to disappear (imp) tştcə тштщЫ to dip into something (imp) tşxjæ тшхьа forage	skʰw̞sə	сквшы	year
staz стажь let me come down sə сы snow səs сыс lamb tc'i ткІьи strict tdzə тдзы hous thoph топ ball tşbəg тшбыг scythe tşzi тшжьы horse meat tşpsax тшпсАх to change (imp) tşpeæ тшпыц to rest (imp) tşpəts тшпыц horse tooth tşrədz тшрыдз to disappear (imp) tştcə тштщЫ to dip into something (imp) tşxiæ тшхьа forage	sk ^{hw} şəzc ^h	сквшызкь	thousand years
sə сы snow səs сыс lamb tc'i ткІьи strict tdzə тдзы hous thoph топ ball tşbəg тшбыг scythe tşzı тшжьы horse meat tşpsax тшпсАх to change (imp) tşpeæ тшпыц horse tooth tşrədz тшрыдз to disappear (imp) tştcə тштцЫ to dip into something (imp) tşxjæ тшхьа forage	ssa	cca	small
səs сыс lamb tc'i ткІьи strict tdzə тдзы hous thoph топ ball tşbəg тшбыг scythe tşzı тшжьы horse meat tşpsax тшпсАх to change (imp) tşpeæ тшпщА to rest (imp) tşpəts тшпыц horse tooth tşrədz тштщЫ to disappear (imp) tştcə тштыы to dip into something (imp) tşylæ тшхьа forage	staz	стажь	let me come down
tc'i ткІьи strict tdzə тдзы hous thoph топ ball tşbəg тшбыг scythe tşzı тшжьы horse meat tşpsax тшпсАх to change (imp) tşpææ тшпщА to rest (imp) tşpəts тшпыц horse tooth tşrədz тштыдз to disappear (imp) tştcə тштыы to dip into something (imp) tşylæ тшхьа forage	sə	СЫ	snow
tdzə тдзы hous thoph топ ball tşbəg тшбыг scythe tşzı тшбыг horse meat tşpsax тшпсАх to change (imp) tşpeæ тшпщА to rest (imp) tşpəts тшпыц horse tooth tşrədz тшрыдз to disappear (imp) tşteə тштщЫ to dip into something (imp) tşxje тшхьа forage	səs	сыс	lamb
thoph топ ball tşbəg тшбыг scythe tşzı тшжьы horse meat tşpsax тшпсАх to change (imp) tşpeæ тшпщА to rest (imp) tşpəts тшпыц horse tooth tşrədz тшрыдз to disappear (imp) tşteə тштщЫ to dip into something (imp) tşx³e тшхьа forage	tc'i	ткІьи	strict
tşbəg тшбыг scythe tşzı тшжьы horse meat tşpsax тшпсАх to change (imp) tşpeæ тшпщА to rest (imp) tşpəts тшпыц horse tooth tşrədz тшрыдз to disappear (imp) tşteə тштщЫ to dip into something (imp) tşxiæ тшхьа forage	tdzə	тдзы	hous
tşzi тшжы horse meat tşpsax тшпсАх to change (imp) tşpæe тшпщА to rest (imp) tşpəts тшпыц horse tooth tşrədz тшрыдз to disappear (imp) tştcə тштщЫ to dip into something (imp) tşylæ тшхьа forage	t ^h op ^h	топ	
tspsax тшпсAx to change (imp) tspeæ тшпщA to rest (imp) tspets тшпыц horse tooth tsredz тшрыдз to disappear (imp) tstee тштщЫ to dip into something (imp) tsxjæ тшхьа forage	tşbəg	тшбыг	scythe
tspeæ тшпщА to rest (imp) tspəts тшпыц horse tooth tsrədz тшрыдз to disappear (imp) tsteə тштщЫ to dip into something (imp) tsxiæ тшхьа forage	tşzı	тшжьы	horse meat
tspəts тшпыц horse tooth tsrədz тшрыдз to disappear (imp) tstsə тштщЫ to dip into something (imp) tsxjiæ тшхьа forage	tşpsaχ	тшпсАх	to change (imp)
tgrədz тшрыдз to disappear (imp) tşteə тштщЫ to dip into something (imp) tşxjæ тшхьа forage	tspcæ	тшпщА	to rest (imp)
tştcə тштщЫ to dip into something (imp) tşх ^j æ тшхьа forage	tṣpəts	тшпыц	horse tooth
tşҳ ^j æ тшхьа forage	tşrədz	тшрыдз	' - '
	tştcə	тштщЫ	to dip into something (imp)
tşə тшы horse	tşx ^j æ	тшхьа	forage
	tşə	тшы	horse

transarintian	orthography	translation
transcription	orthography	
tşət	тшыт	piece
tşəχ ^w χ	тшыхвх	to wound yourself (imp)
tşəχş	тшыхш	koumiss
tşəşş	тшышш	to make up yourself (imp)
tşəcχ	тшыщх	to kill yourself (imp)
tşəcc	тшЫщщ	to stroke yourself (imp)
t ^h əp ^h	тып	shelter of branches
thəχ	тых	shoo! (to a cat)
χ ^w ba	хвба	five
χ^{w} it	хвит	free
χzə	хзы	whey
χра	хпа	three
χεθ	хшы	milk
q ^{hw} da	хъвда	neck
q ^{hw} daş	хъвдаш	white neck (bird)
q ^{hw} dzə	хъвдзы	millet
q ^{hw} dzəts	хъвдзыц	grain
q ^h pşşa	хъпшша	get dry
q ^h t¢k ^w psa	хъчквпса	lace pillow cover
qhtcı	хъчы	pillow
q ^h əχ ^j	ХЪЫХЬ	headache
qhəş	хъыш	light
χә	ХЫ	bullet
χ ^j ap¢	хьапщ	gold
χ ^j zə	хьзы	name
χ ^j ta	хьта	frost
ts'ba	цІба	lack of something
ts'ĸa	цІгъа	cord
ts'da	цІда	cord
ts'χə	цІхы	night
ts'¢ı	цІщы	sole
tsa	ца	corn bin
tsba	цба	six
tscæ	цкьа	clean
tsχa	цха	honey
tcæc	чакь	doubt
tŝ ^w ʁ ^j ɪ	ЧВГЪЬЫ	bull
tŝ ^w jæ	чвгьа	evil
tŝ ^w cæ¢	чвкьащ	unfortunate
tçqa	чхъа	ear
te'ic	чыкь	shortish
tş'tbzə	шІтбжьы	call
ŝ ^w χə	ШВХЫ	carrot
ş?a	шъа	document
șta	шта	motherland
şşa	шша	fat
¢ta	щта	track
єχа	щха	bee
eqa	щхъа	pasture
ca	ща	blood
	· ·	I.

transcription	orthography	translation
ç?a	щъа	prop

Appendix 4: List of minimal pairs for the stress research

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