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Berber Phonology

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23.1. Berber languages

The Berber languages, spoken in North Africa by some 15 to 20 million people, are a branch of the Afro-Asiatic phylum.

The largest population of Berberophones can be found in Morocco. Approximately 45% of the total Moroccan population (26 million) speaks a Berber language as a mother tongue. People of the High Atlas and the Anti-Atlas mountains and the Sous valley speak Tashelhit (*tašlhiyt*), also called Sous Berber (*tasusit*). This language is spoken by some 7 million. It is, together with Kabyle in Algeria, the most important Berber language in terms of number of speakers. Tashelhit Berber has some dialect variation, but not so strong as the Berber language spoken in the Middle Atlas mountains. This language, often called Tamazight (*tamazɣt*), is spoken by some 3 million people in various dialects. Strong dialect variation can also be found in the Moroccan Rif mountains. The Riffian language (*ⵜⴰⵔⵉⴼⴰⵏⵜ*) has some 2 million speakers.

In Algeria, 25% of the total population (about 26 million) speaks a Berber language. In a densely populated area in the north of Algeria, Kabyle Berber (*ⵜⴰⵎⴰⵛⴰⵢⵏⵜ*) is spoken by approximately 7 million. In Algeria, Berber is also spoken in the Aurès mountains, the Mزاب region, the Ouargla oasis, and by the sedentary population of the Sud Oranais area. Touareg, a Berber language spoken by a million, is found not only in the Algerian Sahara but also in neighboring areas of the Sahel republics of Mali and Niger. The Tamahaq (*tamaahaq*) dialect is spoken in the Ahaggar region in southern Algeria. The Tamajaq (*tamaažaq*) dialect is spoken in the Awi region of Niger. The Tamashek dialect (*tamašəq*) is spoken in the Adrar des Ifoghas region in Mali. The Tawlemmet dialect (*tawləmmət*) is spoken by the Iwlemmeden Touaregs of the Mali–Niger borderland.

In Tunisia, Berber is spoken by the population of fewer than six villages on the Tunisian mainland. On the island of Djerba one finds some five

Berberophone villages. All together, Berber represents only 1% of the total population.

In Libya, some 25% of the total population of 4 million is Berberophone. In this country Berber is spoken in Zouara on the western Libyan coast, in the western Djebel Nefousa region, and in a number of oases.

As far east as Egypt we find a very small community of Berberophone people in the famous oasis of Siwa. In Mauritania a small group (say, around 3,000) of Zenaga Berber speakers still exists south of the capital Nouakchott.

Berbers emigrated from their North African homelands in all directions. One finds a considerable number of speakers not only in the big cities of Morocco and Algeria but also in several European countries.

23.2. Writing

The oldest epigraphic records that perhaps represent a form of Berber are the so-called Libyco-Berber inscriptions. They stem from the pre-Islamic period and are found mainly in Tunisia and Algeria, but also in Morocco. These inscriptions are undated and difficult to interpret. The script in which they were written resembles the so-called Tifinagh script, still in use among the Touaregs. There is some regional variety in the shape of the characters. The Arabic script is also used for writing Berber. There is a longstanding tradition of writing Tashelhit in Arabic characters. The Roman script is used for scientific and practical purposes.

23.3. Classification of Berber languages

Berber languages may be tentatively classified according to morphological criteria as follows:

- Group 1. Tashelhit and Middle Atlas Berber (with exception of the Beni Ouarayn Berber and Ayt Seghrouchen of the Eastern Middle Atlas)
- Group 2. Zenati languages: Beni Ouarayn, Ayt Seghrouchen, Rif, Chawia, the dialects of the Sud-Oranais (including Figuig), Mzab, Ouargh
- Group 3. Kabyle
- Group 4. Touareg, Ghadamsi
- Group 5. Zenaga of Mauritania

23.4. Phonology

Most grammars and textbooks pay but little attention to phonology. However, during the last two decades under the influence of modern trends in theoretical phonology, scholarly interest in the phonology of Berber languages has increased.

The variation in Berber phonological systems is large. Therefore, it is not possible to give an overview of Berber phonology without referring to particular languages (see §§ 23.6–8).

23.4.1. Vowels

Most Berber languages have *a*, *i*, and *u*. According to the context, the phonetic realizations of these three vowels may be quite different, *a* ranging from [a] to [æ], *i* from [e] to [i], *u* from [o] to [u]. There are no diphthongs or vowel clusters. In some languages (Touareg, Ghadamsi, Zenaga), the vowel system is more complicated. The Touareg system is given in § 23.8.

23.4.2. The shwa

A problem in Berber phonology is the status of shwa or ə. Most Berber words contain ə or one or more syllabic consonants.

For some dialects, the leading principle for the placement of ə is the structure of the word. The principle of ə-placement is simple: If there is a cluster of two consonants, ə is placed between them, unless this would lead to ə in an open syllable (i.e., it would be followed by a single consonant followed by ə or a plain vowel). The rule operates from right to left. E.g.:

ilm → *iləm* 'skin' (Figuig)

ɪʃɪɹ → *ɪʃəɹ* 'he cultivated' (Figuig)

In *ɪʃɪɹ*, the cluster *ʃɪ* cannot be broken by ə, as this would lead to ə in an open syllable. *ˌɪʃəɹ* is an impossible string.

For other dialects, the leading principle for the placement of ə is the intrinsic sonority of the consonant. Consonants are ranked on a sonority scale, in which some consonants are more apt to be preceded by ə than others. The placement of ə in a string of consonants follows this scale. First, ə is placed before the consonants which are highest on the sonority scale, then before the second highest consonants, etc. Again, ə in an open syllable is impossible. For instance, in Tashelhit, *ɪ* ranks higher on the sonority scale than *k*, *s*, or *ɹ*:

ɪkɪɹ → *ɪkəɪɹ* 'he plowed'

ɪskɪɹ → *ɪskəɪ* 'he did'

The prohibition of ə in an open syllable renders *ɪkəɾəʔ* or **ɪsəkəɾ* impossible.

These two principles account for the majority of cases where ə is found. However, almost all Berber languages have words or morphological contexts where the rules are violated. This fact has led to positing two types of ə: one inserted by phonetic rule, the other as a part of the underlying structure. This underlying ə is phonemic. It remains to be seen which of the Berber languages require an underlying ə. Its existence is certain in some of them, for instance in Figuig Berber.

23.4.3. Consonants

Almost every Berber language has bilabial, dental, palatal, velar, uvular, pharyngeal, and laryngeal consonants, and many have interdentals as well. A large number of consonants have been borrowed from Arabic or European languages, e.g., *s*, *t*, *q*, *h*, and *ʃ* from Arabic and *p* from Spanish or French. Due to the massive influx of foreign vocabulary in some Berber languages, these borrowed consonants can be frequent.

Berber consonant systems can be described by a number of correlations. The Berber languages have voiced and voiceless consonants and fricatives, plosives, and approximants. Two correlations will be treated here: the contrast between pharyngealized and non-pharyngealized consonants, and that between lax and tense ones.

23.4.3.1. Pharyngealization

Berber languages contrast non-pharyngealized and pharyngealized consonants. They may be voiced or voiceless (e.g. *d* and *t*) and fricative or plosive (e.g., *ɖ* and *ʒ*). With the exception of some dialectal phonemes of marginal functionality, all pharyngealized phonemes are dental or interdental. Parallel to the situation in many Arabic dialects, pharyngealization is a spreading feature. Under the influence of a pharyngealized phoneme, other sounds may become pharyngealized. This process is automatic, and the pharyngealization of the other sounds is not phonemic. The domain of spreading is not the same in all varieties of Berber. Some languages seem to have the syllable or the word as a domain, while others have more complicated rules.

Proto-Berber had only two pharyngealized phonemes, *ɖ* and *ʒ*. The other pharyngealized phonemes were borrowed from Arabic. Assimilations may sometimes lead to new pharyngealized phonemes. For example, in Figuig Berber the cluster *ld* becomes the tense pharyngealized consonant *ll*, **tayəldimt* gives *tayəllimt* 'little ball of couscous'.

23 4.3.2. *The opposition lax versus tense*

In Berber morphology, consonants can alternate from lax to tense or vice versa. This is the case, e.g., in the verbal system, when we compare aorist forms with intensive aorist forms, or, in stative verb paradigms, the aorist forms with preterite forms. In the nominal system lax versus tense alternation can be found when one compares singular nouns with their plurals. The phonetic realization of the opposition lax versus tense varies from dialect to dialect and from consonant to consonant. Lax consonants are always realized shorter than their tense counterparts.

For some consonants the opposition is expressed in a difference in length, for example:

ɪləm 'skin' (Figuig)

illəm 'he has spun'

In other cases, the difference in length is supplemented by other phonetic features. Voiced lax consonants may have voiceless tense counterparts, e.g.:

mədl-əɣ 'I buried' (Figuig)

məttl-əɣ 'I always bury'

ʕəbr-əɣ 'I measured' (Figuig)

ʕəppr-əɣ 'I always measure'

Fricative lax consonants may have affricate tense counterparts, e.g.:

həsb-əɣ 'I counted' (Figuig)

həttʃb-əɣ 'I always count'

Lax approximants may have tense plosive counterparts:

rəwl-əɣ 'I flee' (Figuig)

rəgg l-əɣ 'I always flee'

A spirantized lax consonant may have a plosive tense counterpart, e.g.:

βəɖɪ-ɣ 'I began' (Riffian)

βəddɪ-ɣ 'I always begin'

A lax voiced dorso-velar fricative may have a tense voiceless uvular counterpart:

ad ɪ-nəɣ 'he will kill' (Figuig)

ad ɪ-nəqq 'he will continuously kill'

Some languages use the length opposition almost exclusively. For example, Tashelhit has only three cases where the length opposition is supplemented by some other change, viz., *d* : *tt*, *ɣ* : *qq*, and *u* : *gg*. On the other hand, in some Berber languages only *n*, *m*, *l*, *ɾ*, *h*, and *ʃ* express the lax : tense opposition exclusively by length.

There has been considerable discussion about the status of tense consonants. Generative linguists consider them to be geminates, i.e., clusters of

two identical consonants. Most French scholars consider them to be monophonemic consonants. This problem is related to the insertion of ə. On the one hand, it is rare for a tense consonant to become divided into two parts by ə insertion. On the other hand, tense consonants behave differently from lax ones concerning open syllables. While ə insertion is impossible before a lax consonant followed by ə or a plain vowel, there is no impediment when a tense consonant is followed by ə or a plain vowel, e.g., Figuig Berber:

iʃiz → *iʃɛz* 'he cultivated' (**iʃəɛz* is impossible)

iʃɪz → *iʃəɪɛz* 'he always cultivates'

The issue is further complicated by the existence of a small number of words where two identical consonants may be separated by ə, e.g., Figuig Berber *imləl* 'it is white' (as opposed to *iməll* 'he became bored with'). This form suggests an opposition between a sequence of two identical consonants and a monophonemic tense consonant. Another possibility, however, would be to analyse ə in *imləl* as a structural, i.e. underlying, ə.

23.5. Some dialectal developments

Two developments have affected the phonological systems of many Berber languages. The first of these developments is spirantization, the development of lax stops into fricatives. The second is the gradual confusion of *w* and *j* with *u* and *i*.

23.5.1. Spirantization

Spirantization is a common feature in the northern part of the Berberophone territory. It reaches its culminating points in Rifian and Kabyle. Spirantization implies the development of lax stops into fricatives, e.g., *b* becoming *β*. In some cases spirantization is accompanied by a change of place of articulation. Spirantized *d*, for example, is *ð*.

Spirantization never affects tense consonants. Moreover, it may be prevented in certain contexts. There is, for example, no dialect in which *t* in the cluster *nt* can be spirantized. Spirantized and unspirantized lax stops are in complementary distribution. In many cases subsequent laxification of some tense stops or borrowing has blurred this situation. This leads to a system with spirantized lax consonants, non-spirantized lax ones, and non-spirantized tense stops, each with phonemic status.

23.5.2. The development of *w* and *y*

An important phonological development is the confusion of *w* and *y* with *u* and *i* respectively. In some Berber languages, *w* and *y* can be opposed to *u* and *i* in any position, e.g., in Figuig Berber. In most languages, however, there is a neutralization of this opposition in certain environments. This tendency towards neutralization may lead to a situation in which *w* and *u* and *y* and *i* are virtually allophones of each other, as for example in Tashelhit.

23.6. Tashelhit

The consonants of Tashelhit are given in Table 23-1.

Table 23-1. Tashelhit Consonant Inventory

	lab	dent	dent phar	pal	vel	vel lab	uvu	uvu lab	phar	glot
stops		t	t		k	k	q	q		
	b	d	d		g	g				
fricatives	f	s	s	ʃ	x	x			h	
		z	z	ʒ	ɣ	ɣ			ʕ	
nasals	m	n								
trill		r	r							
lateral		l	l							
approximant				y		w				h

23.6.1. Lax versus tense

As stated in § 23.4, the intensification of a consonant coincides in many cases with length. In Tashelhit, this is valid for all consonants, except *w*, *d*, and *y*, where the process of intensification leads to a phonetically unexpected result:

- (1) lax *w* corresponding to tense *gg*:
aorist: *izwɪj*, preterite: *zgg aɟ* 'to be red' (a stative verb)
singular: *adgg al*, plural: *ɪdulan* 'in-law'
- (2) lax *d* corresponding to tense *tt*:
aorist: *tdɹ*, intensive aorist: *tttr* 'to have breakfast'

(3) lax $\mathfrak{y}$ corresponding to tense *qq*.aorist: $\mathfrak{y}rs$, intensive aorist: *qqr $\mathfrak{s}$* 'to slaughter'aorist: $\mathfrak{y}r$, intensive aorist: *aqqr $\mathfrak{a}$* 'to read'aorist: *im $\mathfrak{y}ur$* , preterite: *mqqur* 'to be great' (a stative verb)

Lax-tense differences can play a role in Tashelhit dialectology. One dialect may have a lax variant of a lexical item, where another dialect has a tense variant, e.g., 'flour' is *agg m* in the Aštukn dialect corresponding to *awwm* in Igdmwn.

23.6.2. *Labialized consonants*

Besides the phonemes $\mathfrak{k}$, g , $\mathfrak{x}$, γ , and q one finds the labialized forms $\mathfrak{k}$, g , $\mathfrak{x}$, $\mathfrak{y}$, and q . There are no minimal pairs of labialized versus unlabialized phonemes. In general we observe that some forms are more frequent than others. One finds more frequently: *ak r* 'to steal', but the unlabialized variant exists also. On the other hand, we would never find *imik r* 'thief' or *arg az* 'man', but only *imikr* and *argaz*.

23.6.3. *Vowels, syllabification, shwa-insertion*

The vowels are $\mathfrak{i}$, $\mathfrak{a}$, and u . One finds $[\mathfrak{ə}]$ on the phonetic level; it is, however, not a phoneme. The main preoccupation of recent phonological studies is the search for syllable build-up. None of the existing proposals is fully convincing. When one starts to apply proposed syllable structures to actually existing words, one sees that they do not give the expected surface result. An interesting analysis of Tashelhit syllabification and $\mathfrak{ə}$ -insertion was presented by Dell and Elmedlaoui (1988) for the Imdlawn dialect, in which a simple system for syllabification is attached to a sonority scale for the units that form the nucleus of the syllable

23.7. *Riffian*23.7.1. *Spirantization*

Riffian includes many spirantized consonants. In most Riffian dialects all lax stops except q have become fricatives, e.g., in the dialect of the Beni Said tribe:

 $b \rightarrow \beta$ $d \rightarrow \delta$ $t \rightarrow \theta$ $t \rightarrow \theta$

$g \rightarrow j$ or j

$k \rightarrow \zeta$ or ς

In other dialects, g has become ζ , while in some western variants g and k are stops. Moreover, in a number of dialects b has remained a stop.

Spirantization occurs everywhere, except when the consonant is preceded by a homorganic nasal:

$\theta\beta amb\partial s\theta$ 'darkness'

$\theta anda$ 'pool'

ndu 'jump!'

$antun$ 'yeast'

In these four examples, spirantization does not occur in the clusters mb , nd , nd , and nt .

There are some cases of lax stops outside this environment. They are either recent loans (e.g., *dijaʒ* 'loosen' from French *dégager* with d instead of ∂) or the result of a change of tense consonants to lax consonants. The precise conditions under which some tense stops have become lax stops are not clear.

The introduction of phonemic non-spirantized stops has lead to a tripartite system. First, we find a series of spirantized consonants. Second, we find the marginal series of non-spirantized stops. Third, we find the series of tense stops (which are never spirantized). On morphological grounds, it can be shown that the spirantized consonants are the lax counterparts of the tense stops, e.g.:

$ddaa$ 'live!'

$\theta u\partial aa\theta$ 'life'

Here, dd in the verbal form corresponds to ∂ in the noun.

23.7.2. *Shwa insertion*

The insertion of ∂ is conditioned by the structure of the word, according to the rules given in § 23.4. Some words do not follow the rules, and should be analyzed as containing phonemic ∂ , e.g., $\zeta\zeta\partial h\partial$ 'strength' instead of the expected $\zeta\zeta h\partial$. Only in the case of r does sonority seem to play a role in the rules for ∂ -insertion. The development of r is complicated; it will be treated below.

23.7.3. *Particular developments*

Some phonemes have undergone developments which are typical for Rif Berber. Most important are the developments of l , ll , r and rr .

Except for some variants on the periphery of the Riffian territory, *l* has developed into an *r*-like sound, which is transcribed here as *ř*. Its phonetic realization varies from region to region. One may hear tap-like sounds, but also sounds similar to Czech *ř*. In most dialects *ř* is different from *r*, e.g.

θisiřa 'sandals' (← *θisila*)

θisira 'mills' (← *θisira*)

However, in some variants these two words are pronounced identically.

The tense counterpart of *l* has developed into the affricate *ddž*:

addži 'brains' (← *allī*)

ddžirəθ 'night' (← *lliləθ*, a loan from Moroccan Arabic *l-lila*).

In a number of loans *l* and *ll* occur:

lišanəs 'petrol' (← French *l'essence*)

βəlləʕ 'close!' (← Eastern Moroccan Arabic *bəlləʕ*)

However, in many loanwords *l* and *ll* have become *ř* and *ddž*.

The development of *r* and *rr* is more complicated. In Riffian, *r* is the only consonant which forces *ə* to be inserted before it. In most Riffian dialects, *r* and *rr* have had particular developments that can be summarized in stages as follows (we use V for *a*, *i*, or *u* and C for a consonant or a morpheme boundary):

stage 1:

<i>ər</i> → <i>ar</i>	<i>içərz</i> → <i>içarz</i> 'he plowed'
<i>ərr</i> → <i>arr</i>	<i>içərrəz</i> → <i>içarrəz</i> 'he plows'

stage 2:

<i>arC</i> → <i>aaC</i>	<i>içarz</i> → <i>içaaz</i> 'he plowed'
<i>arr</i> → <i>aař</i>	<i>içarrez</i> → <i>içaarəz</i> 'he plows'
<i>urC</i> → <i>oaC</i>	<i>θamurθ</i> → <i>θamoaθ</i> 'land'
<i>urr</i> → <i>oař</i>	<i>aħurri</i> → <i>aħoaři</i> 'free man'
<i>irC</i> → <i>eaC</i>	<i>aðβir</i> → <i>aðβea</i> 'pigeon'
<i>rV</i> → <i>rV</i>	<i>ari</i> → <i>ari</i> 'write!'

stage 3:

<i>aa</i> → <i>a</i>	<i>içaaz</i> → <i>içaz</i> 'he plowed'
<i>ř</i> → <i>r</i>	<i>içaarəz</i> → <i>içarəz</i> 'he plows'
	<i>aři</i> (← <i>ali</i>) → <i>ari</i> 'go up!'

In the first stage of the development, the opposition between *ə* and *a* is neutralized before *r*. In the second stage, *r* becomes a (rather short) *a*-like sound if not followed by a vowel. When preceded by *a*, this sound merges into a long vowel; when preceded by *u* or *i*, the diphthongs *oa* and *ea* emerge.

These two diphthongs may eventually develop into *wa* and *ya*. In the third stage of the development, the long *a* is shortened and at the same time *ĩ* (as found in the reflexes of *ir* and of *l*) merges with *i*. The importance of the mergers in the last stage may be exemplified by the word *na* 'play'. From the form in the third stage of the development it is not possible to predict whether the original form was *irai*, *naĩ*, *na*, *ilai*, *ilǽ* or *ila*. If we look at the form of the word in the second stage, *naa*, only *nar* and *irǽ* are possibilities. From evidence of dialects where *r* has not undergone any change, we know that the proto-form was *nar*.

The three stages described above are not only historical stages, but are actually represented in the different dialects. The original situation can be found in Beni Iznassen (East), the first stage in Gueznaia (South), the second stage in Ait Said (Center), and the third stage in Ait Sidhai (North).

The question is whether *r* remains as an underlying phoneme in the three stages mentioned above or not. The answer is largely a theoretical choice. It should be noted, however, that these developments have not affected the morphology of the dialects. There has not been any analogical restructuring as a result of the phonetic developments.

23.7.4. Assimilations

The most important assimilations are

A voiced non-liquid consonant becomes voiceless when immediately followed by *θ*

aiɾaβ 'Arab man'

θaiɾaɪθ 'Arab woman'

The consonant cluster *ĩ + θ* becomes *tʃ*

ɔwǽʃ 'return'

θamǽɔwǽtʃ 'return (noun)'

The consonant cluster *mθ* becomes *nd*

θandint 'town' (← Arabic *mdina*)

Two identical lax consonants merge into their tense counterpart when in immediate contact

nɔ̃ θθ → *nɔ̃ tɪt* 'kill (pl.) him'

The consonants *ɔ* or *d* followed by *θ* or *t* result in *tt*

ɔ θandint → *ttandint* 'it's a town'

Similarly *ɔ* or *d* followed by *θ* or *t* result in *tt*

θaɔ̃ ruθθ → *θaɔ̃ rutt* 'shoulder'

23.7.5. *w* and *y*

w and *y* are opposed to *u* and *i* in all environments except at the end of a word. Here *w* becomes *u* and *y* becomes *i*:

nəðwəɟ 'I jumped' (stem: *nəðw*)

yəndu 'he jumped'

ulyəɟ 'I went up'

yuli 'he went up'

23.8. Touareg

The phonological system of Touareg is quite different from that of the other Berber languages. It should be noted that especially in the field of the Touareg vowel system there is great uncertainty about the status of the different elements. This uncertainty is partly caused by internal complications of the system, partly by the variation across the different dialects and, last but not least, partly by the fact that much of the discussion is based on data collected at the beginning of this century.

23.8.1. *Vowels*

There are at least six vowels: *i*, *e*, *ə*, *a*, *o*, *u*. The vowel *ə* occurs in open syllables and is phonemic. There has been considerable discussion about the existence of a second short central vowel, transcribed here as *a*, in opposition to *ə*. Recently, the existence of this phoneme has been shown with the help of phonetic instruments in Abalagh Touareg (Niger) by Naima Louali, featuring the following minimal pairs (1990: 138):

agru 'understand!'

əgru 'find!'

alu 'weep!'

alu 'be like!'

This distinction is, however, not common to all dialects.

23.8.2. *Vowel quantity*

Most scholars distinguish long and short vowels. All vowels except *ə* and *a* have a long variant. Length is said to play a role especially in the verbal system, where a number of tenses are distinguished by length. The study by Louali of the Abalagh Touareg system does not find any difference between short and long vowels. According to her, the tense differences which are said to be expressed by vowel length are expressed in reality by qualitative dis-

tinctions. Whether this situation pertains only to Abalagh or also for other dialects remains to be studied.

23.8.3. Consonants

In general, the Touareg consonant system is less rich than the systems of the northern dialects, due to the fact that Arabic has had less impact on Touareg and that most Arabic loans have been phonetically integrated into the Touareg system. Therefore, consonants like *h*, *ʕ*, and *ʁ* and their tense counterparts are absent. For the same reason, simple *q* and *t* are rare, though *t* may be the result of assimilation of *d* to a following voiceless consonant. Cf. *Ayr* *edəs* 'sleep' corresponds to *Iwlemmeden* *etəs* 'sleep'. Resulting from the influence of Songhay and Hausa, some southern Touareg dialects feature *ŋ* as a borrowed phoneme. Special mention is warranted for two consonants: *z* and *h*. In Touareg, simple *ˤz* has undergone various developments. In the north (Ahaggar), it has become *h*. In Mali one finds *ʃ* and in Niger *ʒ*. This can be illustrated by the name of the language in the different dialects. In Algeria Touareg is called *tamaahaq*, in Mali *tamaʒəq*, in Niger *tamaaʒaq*. These terms correspond to *tamaɣɣt* in other Berber languages. The tense *zz* is always retained. By analogical formation, simple *z* has been reintroduced in a number of lexical items.

The consonant *h* is frequent in Touareg. In the Algerian variants it may be the correspondent of *ˤz*, but it also occurs in words without *ˤz*. This second *h*, which is also found in the other dialects, corresponds generally with *zero* in the Berber languages of the north and *β* in Ghadamsi:

ar 'lion' (Ouargla, Zenatic)

aħar 'lion' (Ayr)

aβor 'lion' (Ghadamsi)

There are a number of instances of palatalization. The consonants *g* and *k* become palatalized *g'* and *k'* and eventually develop into *ǰ* and *č*. These may become *ʒ* and *ʃ*. Before *i*, *t* may become *ʃ* in dialects of Niger.

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There are some good bibliographies concerning Berber linguistics. For the period until 1954 one can use the bibliography contained in Basset 1969. For the period 1954–1977, see Galand 1979. For the period after 1977, see Chaker 1991. The most readily available bibliography for American readers is Applegate 1970. Other titles given in the bibliography below all explicitly concern phonological subjects.

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