Proto-Berber Mid Vowel Harmony

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Abstract

The Berber nominal prefix allomorphs *a-/ta-* and *e-/te-* have been shown to be phonetically conditioned (Van Putten 2016). This paper will examine other cases of the Berber vowel *e* where it shows interchange with the vowel *a*, and will try to show that these alternations must also be seen as phonetically conditioned allophones of each other, through a process of what will be called Mid Vowel Harmony. The majority of attested cases of the vowel *e* in Berber can be understood as the result of this shift of **a* to *e*. Some cases of a reconstructible **e* remain, which cannot be explained as the result of Mid Vowel Harmony.

Keywords: Berber, Proto-Berber, Historical Linguistics, Vowel Harmony, Historical Phonology

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1. THE BERBER VOWEL *e* IN THE PREFIX

Different from most other Berber languages, Tuareg and Ghadames Berber have a phonemic contrast between *i* and *e*, and *u* and *o*. Unlike the mid vowel *o*, the vowel *e* is not easily explained as being of secondary origin in Tuareg and Ghadames.[2] This has led Prasse (1990) to propose that Proto-Berber had a fourth plain vowel **e* besides **a*, **i* and **u*. In Northern Berber varieties which only have the plain vowels *a*, *i* and *u*, **e* would have merged with **i* to *i*. However, we find several cases of a long vowel **e* which certainly has a secondary origin. This is especially clear in the case of the singular noun prefix *e-/te-* (*i-/ti-* in most dialects), which was already argued by Prasse (1974: 14-15) to be of a secondary origin. Prasse argues that the prefix *a-/ta-* shifts to *e-/te-* through dissimilation with **ă* or assimilation of **i* in the first stem syllable.

These initial findings by Prasse were based on Foucauld's transcriptions of Ahaggar Tuareg. Foucauld did not always distinguish the vowels *e* and *i*, as shown by Prasse (1990). In a reexamination of Prasse's rules in light of the new lexical material of the Tuareg dialects that has become available to us in recent years (e.g. Heath 2006 and Prasse et al. 2003), Van Putten (2016) has proposed that the prefix *e-/te-* is conditioned by the presence of *ă* and *e* and blocked by the presence of the vowels *i, u* and *a*. The distribution can be illustrated by the following examples taken from Mali Tuareg (Heath 2006):

> The first stem syllable contains *ă* followed by *e, ă* or no other vowel always have the prefix *e-/te-*:
> *e-dăber* 'pigeon', *e-ɣăšăr* 'valley', *e-ɣăyd* 'billy goat'.

> Stems that start with *Ce* always have the prefix *e-/te-*:
> *e-des* 'side', *e-heraɣ* 'fear', *e-šeyer* 'bustard', *e-welăn* 'summer', *e-dekəl* 'palm of the hand'

All other combinations of vowels keep the prefix *a-/ta-*, even if the stem starts with *Că*:

> *a-lămad* 'learning', *a-sălim* 'edge', *a-săɣon* 'rope'
> *a-sirəd* 'washing'; *a-dubən* 'marriage'; *ă-madəl* 'jaw, snout'; *a-nəhil* 'ostrich';
> *a-mɣar* 'old man';

1.1 An apparent exception: final *i* of glottal stop final derivations

While the presence of *a, i* and *u* generally block the shift of *a-/ta-* to *e-/te-*, there is one exception to this rule. Namely, certain instances of word-final *-i* do not seem to block this shift. This is unexpected, but a closer look at the cognates of such words in Zenaga, shows that these words always end with a stem-final glottal stop. Van Putten (2016: 24-27) tentatively suggested that these nouns should be derived from a word-final accented **ə́ʔ*. Some examples of this are:

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[2] See Prasse (1984), Kossmann (2001) and Van Putten (2015) for discussions on the origin of o in Ghadames Berber.

MA[3] *imətši* 'eater'; Tuareg H *e-măkši* 'id.', M *e-măkš* 'eater'; Zng. *əmətʸši* /əmətʸšəʔ/ 'id.'[4]

Tuareg H *e-măɣri*, M *emăɣărr* 'reader, student', Zng. *ämuʔri* /ăməʔrəʔ/ 'person who calls for prayer'

Tuareg H *e-mănyi*, M *e-măŋy* 'killer', Zng. *əmiʔni* /əməʔnəʔ/ 'id.'

2. ALTERNATION OF *e* AND *a* OUTSIDE OF THE PREFIX

The complementary distribution of the vowels *a* and *e* in the noun prefixes suggests that these prefixes were originally allophonic variants of each other. If this is the case, one would expect that in similar environments, we would find *a~e* alternation inside of the nominal stem as well. There are indeed various alternations between *e* in the singular and *a* in the plural in nominal stems.

2.1. Stem-internal sg. *e* and pl. *a*

We find several plural formations of nouns where the singular has an *e* while the plural has *a*.[5] These formations are found all over Berber, although they are particularly common in Tashelhiyt and Middle Atlas Berber, where one can find countless examples, usually with the plural suffix *-iwn*:

{2}[6]   Tashl. *i-fiɣr* pl. *i-faɣriwn, i-faɣrn* 'snake'; MA *i-fiɣr* pl. *i-faɣriwn*'
{4}   Tashl. *i-gidr* pl. *i-gadriwn, i-gadrn* 'eagle'; (MA *i-yyidr* pl. *i-yyadərn*)
{23}   Tashl. *i-ɣirdm* pl. *i-ɣardmiwn* 'scorpion'.

Alternation between *e* and *a* with the feminine plural suffix *-iwen* is attested for two nouns in Tuareg:

{7}   Tuareg M *te-nere* pl. *ti-nariwen* 'desert'
{8}   Tuareg M *te-fede* pl. *ti-fadiwen* 'having cuts on skin (due to carrying loads), verbal noun of *ăfadăɣ*'

Another, smaller group of nouns adds an **a* before the last stem consonant and the regular plural suffix **-ăn*. This formation is attested outside of Tashelhiyt and Middle Atlas Berber as well, especially for the word 'lamb':

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[3] A list of abbreviations and sources of Berber languages are given in the appendix at the end of this article.

[4] Zenaga loses the distinction between plain and short vowels, and almost completely loses the contrast between **i* and **u*. As a result /ə/ is the reflex of **ə, *i* and **e* and /a/ is the reflex of **ă* and **a*. The phonemic transcription used in this article follows Kossmann (2001: 94, endnote 2).

[5] Not all attested cases of this alternation are found in lexical items attested in languages that distinguish *e* and *i*. The prefix is *i-/ti-*, which can only come from *e-/te-*. As *e-/te-* is conditioned by a following **e*, it is reasonable to assume that the stem vowel was originally **e* and not **i*.

[6] Throughout this paper relevant forms for different etyma will be cited. These are usually preceded by {#}. The number in the brackets refers to the number in the etymological appendices at the end of this paper.

{3}   Tashl. *i-zimmr* pl. *i-zammarn* 'lamb'; MA *i-zimər* pl. *i-zamarn*;
      Kb. *i-zimər* pl. *i-zamarən*; Tuareg W ăžemăr pl. *i-žămarăn*;
      WY əžemăr pl. *i-žămarăn*; Zng. *iži?mär* pl. *əžä?märän*
{1}   Tashl. *i-dikl* pl. *i-dakaln* 'palm of hand'; MA *i-dišl* pl. *i-dašaln*
{5}   Tashl. *i-zikr* pl. *i-zakarn* 'rope'; MA *i-zikər* pl. *i-zakarn*; Zng. *iži?gär* pl. *əža?gärän*

Finally, a small group of nouns have *e~a* alternation in combination with the regular suffix *-ăn.* This formation seems to be unattested outside of Tashelhiyt and Middle Atlas Berber, and it is therefore difficult to determine whether the alternation in stems like these is old, or an innovation within these closely related varieties.

{4}   MA *iyyidr* pl. *iyyadərn* 'eagle'
{6}   Tashl. *imikr* 'thief' pl. *imakrn*; MA *imišr* pl. *imašrn*

2.2. Stem-initial sg. *e* pl. *a*

There are examples of *e~a* alternation for nouns that start with a stem-initial vowel.[7] Like the examples of stem-internal *e~a* alternation, many cases of *e~a* alternation are found in plurals with the suffix *-iwăn*. This formation is common in Tuareg but also attested elsewhere:

{12}   Tuareg N *t-eɣse* pl. *t-aɣsiwen* 'ewe' ; Zng. *təkših* pl. *tākšən*
{13}   Tuareg N *t-ekle* pl. *t-akliwen* 'going'
{20}   Tuareg NWMU *t-ele* pl. *t-aliwen* 'shadow'
{21}   Tuareg NWMU *t-eẓe* pl. *t-aẓiwe*n 'udder'
{14}   MA *ifr* pl. *afriwn* 'leaf, wing'; Kb. *ifərr* pl. *afriw-ən, i-fərrawən*; Zng. *äfrūn* 'wings' (no sg.)
{15}   MA *ilm* pl. *almiwn* 'tanned hide'; Zng. *iyəm* pl. *ällammūn, ällaṃṃūn*
{16}   Kb. *ixəf* pl. *axfiwən* 'head'; Zng. *i?f* pl. *ä?fūn, o?fūn* 'id.'
{17}   Fig. *ižž* pl. *ažžiwn* 'terebinth'; Izn. *ižž* pl. *ažžiwn* 'id.'

Another group of nouns with *e~a* alternation places *a* before the last stem consonant and suffixes *-ăn*. This formation is very common in Tuareg, and there are vestiges in most other dialects:

{9}   Tuareg N *eskăr* pl. *askarăn* 'nail'; Tashl. *iskr* pl. *askarn* MA *iššər* pl. *aššarn*;
       Kb. *iššər* pl. *aššarən*; Fig. *iššər* pl. *aššarn*.
{10}   Tuareg N *enhăr* pl. *anharăn* 'eyebrow'.
{11}   Tuareg N *emzăd, emẓăd* pl. *amzaḍăn, amẓadăn* 'hair (on head)'.
{12}   Fig. *ildəy* 'sling' pl. *aldayən*
{13}   Fig. *iɣməs* 'big tooth' pl. *aɣmasən*; Izn. *iɣməz* pl. *aɣmazən* 'id'

Finally, the same alternation is found in two nouns with a plural suffix *-an*:

{18}   Tashl. *iḍ* pl. *aḍan*; Kb. *iḍ* pl. *uḍan, aḍan*; Zng. *īḍ* pl. *āḍan*

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[7] I follow Penchoen's (1973: 19ff.) analysis that nouns with a stable initial vowel in the Etat Libre and Etat d'Annexion have a stem-initial vowel, and assume that the nouns have elided the original prefix vowel. Diachronically this can represented as follows: *a-anu* EA *wă-anu* > *anu* EA *wanu* 'well'.

{19}   Tuareg N *efăḍ* pl. *afăḍăn*; MU *efăḍ* pl. *afḍăn*; Tashl. *ifḍ* pl. *afḍan*; *əffaḍ* pl. *əffaḍan*, *avḏan*.

2.3. Cases of *e* that behaves like *a* in apophonic plurals

One of the classes of apophonic plurals in Berber is formed by replacing the last stem vowel by *a* and turning any preceding low vowels (*a, ă*) into high vowels (*u, ə*). Preceding high vowels remain unchanged (Prasse 1974: 52). Nouns that have a stem-internal *e* may also have apophonic plurals, and when they do, the *e* is treated as if it were *a*. That is, it is changed to *u* in the plural. Several of the cases of stem-internal *e* that were discussed before, namely: 'palm of the hand' and 'rope' take this apophonic plural in Kabyle and Tuareg; similarly the word for 'tooth' in Middle Atlas Berber:

{1}   Kb. *i-dikəl* pl. *i-dukal* 'palm of the hand'; Tuareg MB *e-dekəl* pl. *i-dukal* 'id.';
       W *ădekəl, ədekəl* pl. *i-dukal* 'id.'; Y *ədekăl* pl. *i-dukal* 'id.'
{5}   Tuareg M *e-šekər* pl. *i-šukar*; Kb. *i-zikər* pl. *i-zukar, i-zukʷar*.
{13}   MA *t-iɣməst* pl. *t-uɣmas*

A few other nouns that do not have obvious cognates in the rest of Berber follow this pattern as well, e.g.

       Kb. *i-šiqəṛ* pl. *i-šuqar* 'steep slope filled with brush'
       Tuareg M *te-šehənt* pl. *tišuhan* 'jujube tree'

3. REFORMULATING THE **a > e* RULE

The above examples show that it is not just the *a* of the prefix that has a allophonic relation to *e*. Stem-internal *e* also shows variation between *e~a* in the plural. The environment in which this takes place is generally before the plural formation **-iw-ăn* or **aC-ăn*. The presence of the vowel **i* or **a* block the shift of the prefix **a-/*ta-* to *e-/te-*. It seems likely that the same conditioning factors that cause the prefix *a~e* alternation are also the origin of the *a~e* alternation between the singular and plural stems of nouns.

The rules that were formulated for the prefix in Van Putten (2016) have to be altered somewhat to account for the stem-internal *a~e* alternation. The two rules that were formulated by Van Putten (2016:36) were as follows:

       Rule 1: **a-/ta- > *e-/te- / _Că* unless, later in the word there is an *a, i* or *u*
       Rule 2: **a-/ta- > *e-/te- / _Ce*

The original formulation of these rules assumed that only a single consonant can stand in between the *a* of the prefix and the following **ă* or **e*. This needs to be corrected slightly. For **ă*, there are no counterexamples, as no **|ccăc|* stems seem to exist in Proto-Berber. The rule for **e* was formulated to account for words such as {29} *a-ǧlem* 'prayer skin' which does not undergo

the **a > e* shift.

There are very few nouns with the stem shape |ccec|, and several of these have labialisation in Tashelhiyt, Middle Atlas Berber or Kabyle. Kossmann (1999: 42-59) argues that labialisation of velar and uvular consonants is caused by an old short vowel **ŭ* adjacent to such a consonant. It seems likely that such words originally had a stem shape *|cŭcec| instead. Note however that the labialisation is absent in *ta-gžiwt* 'young girl', where we might expect it.

{29}   M *a-ǧlem* 'prayer skin'; W *e-glem*, Y *a-glem* 'tanned skin'
        MA *a-gʷlim*, Tashl. *a-gʷlim*, Kb. *a-gʷlim* 'skin'
{30}   Ghd. *tažnént* 'wicker basket'; Nef. *ugnin* 'wicker basket'
        Tashl. *agʷnin* 'basket of alpha grass'
{31}   M *a-kẓew, a-kẓay* 'bastard'; H *akẓéou* /a-kẓew/ ?
        MA *ta-gžiwt* 'young girl'; Tashl. *a-gžaw* 'young man'

Moreover, if this rule applied to both a stem-internal **a* and the **a* of the prefix, the **a > e* shift clearly does not just affect **a* when *ă* or *e* are in the next syllable, but whenever **ă* or **e* occur later in the word, regardless of whether it is present in the next syllable.

With these changes, and applied to stem vowels rather than just the prefix vowels, we get the following general rules:

> Rule 1: **a > e* if *ă* follows*,* unless later in the word there is an *a, i* or *u*.
> Rule 2: **a > e* if *e* follows.

3.1. Application of the rules in *a*C-*ăn* and *-iw-ăn* plurals

An issue with the formulation of Rule 1 is that it would also apply to nouns with an infix *a* and plural suffix **-ăn* which is an environment where **a > e* should have taken place.

{3}   **a-zamăr*   > Rule 1 **a-zemăr*   > Rule 2 **e-zemăr*
       *i-zamar-ăn   > Rule 1 ***i-zamer-ăn*   > Rule 2 ***i-zemer-ăn*

The most obvious explanation would seem to be the presence of the **i* of the masculine plural prefix. If we accept this explanation, we would have to reformulate rule 1, as to account for the fact that high vowels block the **a > e* shift, regardless of what side of the vowel they are on.

The result of this formulation is that it is not necessarily the *a* and *i* in the **aC-ăn* and **-iw-ăn* plural that are blocking the **a > e* shift, but rather the plural prefix **i-*.

It does however require us to project back the **a > e* shift to a time before the prefix was lost before stem-initial nouns, as words like Tu. *eskăr* pl. *askarăn* could only be explained by assuming that the shift took place at a time that the words were still **a-askăr* pl. **i-askar-ăn*.

> Rule 1: **a > e* if *ă* follows and no other *a, i* or *u* is present in the word.

This would then allow us to explain examples like:

{2}   Tashl. *i-fiɣr* pl. *i-faɣriwn* 'snake'   < *a-faɣǎr* pl. *i-faɣǎr-iw-ǎn*
{9}   M *eskǎr* pl. *askarǎn* 'nail'   < *a-askǎr* pl. *i-askarǎn*

This formulation would also explain the variation that we find in Tashlhiyt and Tamazight for words that do not have these plural suffixes, although their limited distribution does not make it clear whether they are reconstructible for Proto-Berber:

{4}   MA *i-yyidr* pl. *i-yyadrn* 'eagle'   < *a-gadǎr*   pl. *i-gadǎr-ǎn*
{6}   Tashl. *i-mikr* pl. *i-makrn* 'thief'   < *a-makǎr*   pl. *i-makǎr-ǎn*

With the reformulated Rule 2, we can explain the *a~e* alternation that we find in feminine nouns that end in final *-e*,[8] which occasionally have a two consonant cluster between the suffix and the *a* vowel.

{7}   M *te-ner-e* pl. *ti-nar-iw-en*   < *ta-nar-e* pl. *ti-nar-iw-en*
{12}   M *t-eɣse* pl. *t-aɣsiw-en* 'sheep or goat'   < *ta-aɣs-e* pl. *ti-akl-iw-en*
{13}   M *t-ekle* pl. *t-akliwen* 'going'   < *ta-akl-e* pl. *ti-akl-iw-en*

3.2. Stems with *ʔ

Kossmann (2001) and Taine-Cheikh (2004) show that Zenaga Berber is the only variety that retains the Proto-Berber *ʔ. In all other languages, different combinations of vowel + *ʔ have yielded a variety of reflexes of vowels. Based on the known dynamic accent in the verb, Kossmann is able to formulate a number of general rules that accurately describe the reflexes of the verbs that contain a glottal stop in Proto-Berber. These rules can be summarized as follows:

Tuareg	**Zenatic (Figuig)**	**Ghadames & Nefusi**	**NW Berber (& Kabyle?)**
ắʔc > ac	*ắʔc > ac*	*ắʔc > oc*	*ắʔc > ac*
ắʔ# > a	*ắʔ# > o > u*	*ắʔ# > o*	*ắʔ# > a*
ă/ắʔă > o	*ă/ắʔă > ă*	*ă/ắʔă > ă*	*ă/ắʔă > a*
ăʔ > ă (> Ø/_#)	*ăʔ > ə > (> Ø/_#)*	*ăʔ > ă > (> Ø/_#)*	*ăʔ > ă > (> Ø/_#)*
əʔ > ə (> Ø/_#)	*əʔ > ə > (> Ø/_#)*	*əʔ > ə > (> Ø/_#)*	*əʔ > ə (> Ø/_#)*

To this we may add one more rule: *aʔc > ac* in all dialects except Ghadamsi and Nefusi where it becomes *oc*, with several specific other vocalic developments (Kossmann 2001: 82-85; Van Putten 2015), and *ə́ʔ > i* (Van Putten 2016: 26-27).

I have identified four nouns with which contain a reflex of *ăʔ* that displays *e~a* alternation. The relevant nouns are:

{3}   W *ăžemǎr* pl. *ižǎmarǎn*; WY *əžemǎr* pl. *ižǎmarǎn* 'id.'
       Tashl. *i-zimmr* pl. *i-zammarn* 'lamb'; MA *i-zimer* pl. *i-zamarn* 'id.';
       Kabyle *i-zimər* pl. *i-zamarən* 'id.'; Fig. *izmər* pl. *izmarən*

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[8] This *e* must be reconstructed for Proto-Berber and cannot be the result of the *a > e* shift (see section 5).

Zng. *iži?mär* pl. *əžä?märän*; Ghd. *aźómăr* pl. *źómarăn*; Nef. *zumə́r* pl. *izumárən, izumár*

{4}   M *e-ğădăr* pl. *i-ğədran, i-ğădărăn* Y *e-žădăr* W *e/a-žădăr*; WYM pl. *i-žădărăn*;
H *e-hădăr* pl. *i-hədran*
Tashl. *i-gidr* pl. *i-gadriwn*; MA *i-yyidr* pl. *i-yyadərn*; Kb. *i-gidər* pl. *i-gudar*
Chenoua *židər* pl. *židərən*
Zng. *ägo?d̲ər* pl. *əgo?d̲ərän*

{5}   M *e-šekər* pl. *i-šukar*
Mzab *iššər* pl. *iššarən*
Tashl. *i-zikr* pl. *i-zakarn*; MA *i-zikər* pl. *i-zakarn*
Zng. *iži?gär* pl. *əža?gärän* 'id.'; Nef. *zukə́r*

{6}   H *e-măkăr* pl. *i-măkărăn* 'thief' (Prasse 1974: 149);
Tashl. *i-mikr* pl. *i-makrn*; MA *i-mišər* pl. *i-mašərn*;
Zng. *amu?gär* pl. *umu?gurän*

The fact that the **a > e* shift has taken place even in nouns with a secondary vowel *a* that developed from **ă/a?* would seem to suggest that the **a > e* took place after dialectal differentiation had already developed. This is surprising for several reasons: 1. It takes place in all Berber languages, and therefore seems old. 2. It would place the collapse of the prefix-vowel with stem-initial prefixes to a post-Proto-Berber stage, for which there is absolutely no evidence. A solution to this paradox will be discussed in detail in section 4. For now it suffices to assume that the **a > e* developed at a Proto-Berber stage (or very close to it) and remained active (at least) until the point that the **?* was lost.

A reconstruction both with **ă?* or **a?* in the root seems formally possible, but |caccăc| nominal stems are rare, if not non-existent, while |căccăc| is quite common (Prasse 1974: 148), therefore the latter vocalism is to be prefered.

An outstanding issue concerning these nouns is the reflex of **ă?* that we find in Zenatic and Tuareg. In some nouns it is *ă* (= Zenatic Ø) while in others it is *e*. As **ă* is the reflex of unaccented **ă?*, one might be tempted to consider some kind of accentual alternation in the nominal stem. There is, however, little reason to expect such accentual alternation, and therefore this *ă~e* alternation in the stem is to be considered a currently unsolved problem.

As the reflexes of the glottal stop differ per group of languages, I will discuss these words and their reflexes separately in the four groups formulated in the table above, and finally also the reflexes in Zenaga.

3.2.1. The Tashelhiyt, Middle Atlas Berber and Kabyle data

The resulting *a* from **ă?* behaves like an etymological **a*, and shifts to *e*.

{3}	**a-ză?măr*	> **a-zamăr*	> **e-zemăr*	> *izim(m)r*
	*i-ză?mar-ăn	> **i-zamar-ăn*		> *izam(m)arn*
{4}	**a-ǵă?dăr*	> **a-ǵadăr*	> **e-ǵedăr*	> *igidr*
	*i-ǵă?dăr-iw-ăn	> **i-ǵadăr-iw-ăn*		> *igadriwn*
{5}	**a-ză?kăr*	> **a-zakăr*	> **e-zekăr*	> *izikr*

{6}   *a-mắʔkăr   > *a-makăr   > *e-mekăr   > imikr

3.2.2. The Ghadames and Nefusi data

The sequence *ắʔc yields Ghd. *o* and Nef. *u* (< *o).

{3}   *a-zắʔmăr   > *a-zomăr   > azómăr
{5}   *a-zắʔkăr   > *a-zokăr   > zukər

3.2.3. The Zenatic data

One noun has the regular reflex of an accented sequence *ắʔ in the Zenatic languages,[9] yielding *a*, and subsequently undergoing the *a > e shift. The other two nouns have a short vowel. The short vowel in place of the *e is attested in several other words in Zenatic as well, e.g. {22} Timimoun *timdi* 'termite', Mzab *iždi* 'sand' (cf. M *teǧeditt* 'dune') and Figuig *insi* 'hedgehog' (cf. Kb. *inisi*). See Kossmann (1999: 140, fn. 7) who identifies this syncope as a typical Zenatic innovation for (t)iCiCi nouns, but in light of these examples, it also seems to affect iCiCC nouns. The exact conditioning of this syncope is not well understood.

{4}   *a-ǵắʔdăr   > *a-ǵadăr   > *e-ǵedăr   > židər[10]
{3}   *a-zắʔmăr   > *a-zămăr   > *e-zămăr   > i-zmər
{5}   *a-zắʔkăr   > *a-zăkăr   > *e-zăkăr   > Mzab i-ššər (< *izšər)

3.2.4. The Tuareg data

In Tuareg, two nouns have the regular reflex of accented *ắʔ, yielding *a*, and subsequently undergoing the *a > e shift. The other two have a short vowel. Notice that the forms that have the full vowel, and the forms that have the short vowel are exactly mirrored compared to the Zenatic situation.

{3}   *a-zắʔmăr   > *a-zamăr   > *e-zemăr   > ăžemăr
        *i-zăʔmár-ăn > *i-zămar-ăn> *i-zămar-ăn> ižămarăn
{4}   *a-ǵắʔdăr   > *a-ǵădăr   > *e-ǵădăr   > eǧădăr
{5}   *a-zắʔkăr   > *a-zakăr   > *e-zekăr   > ăšekăr
{6}   *a-mắʔkăr   > *a-măkăr   > *e-măkăr   > emăkăr

The plural *ižămarăn* should probably be considered an example of unaccented *ăʔ yielding ă. If one assumes that Proto-Berber had default penultimate stress in the noun,[11] the plural suffix would be expected to cause a stress shift. It should be noted, however, that there is no evidence for such a stress pattern in Tuareg. The singular is expected to receive the penultimate, and the

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[9] Zenatic is a group of widespread Berber languages that share a set of morphological and lexical isoglosses with each other, see Kossmann (1999: 31f.). For a recent overview of shared features, see Souag's (2013: 25) description of "Northeastern Berber", which is equivalent to my definition of Zenatic, excluding Nefusi Berber, which seems to me a close relative of Ghadamsi with strong Zenatic influence.

[10] Zenatic languages irregularly lose (or more accurately shorten, and then lose) their prefix vowel before a CV sequence where V is a plain vowel *a, i* or *u* (Kossmann 1999: 31).

[11] Such a stress system is found in Zwara (Mitchell 2009: xi), and a similar system, where the weight of the final syllable plays a role is found in Awjili (Van Putten 2014: 43-46) and Nefusi (Beguinot 1942: 11).

plural the antepenultimate (see Prasse et al. 2003: XX-XXIII and Heath 2006: 81ff. for a description of the Tuareg accent).

3.2.5 The Zenaga data

Zenaga retains the glottal stop but nevertheless we find alternations that are very similar to those that we find in the other Berber languages in two of the four words under discussion, e.g.

{3}   *iži?mär* pl. *əžä?märän* 'lamb'
       /əžə?mar/ pl. /əža?maran/
{5}   *iži?gär* pl. *əža?gärän* 'rope'
       /əžə?gar/ pl. /əža?garan/

Besides these examples, there are examples that suggest that the **a > e* took place in nouns that do not contain a /?/, e.g.

{9}   **a-askăr*   > **eskăr*   > *əskär* /əskar/ 'nail'
{12}   **ta-aɣs-e*   > **t-eys-e*   > *təkših* /təkšə/ 'sheep'

In Zenaga, the glottal stop may only stand in post-vocalic position, and never in onset position. This can be analysed as *ʔ* essentially being a feature of the vowel and that we should perhaps analyse it as a glottalized vowel [vˀ] rather than a vowel-glottal stop sequence, as suggested by Kossmann (2001: 95 endnote 4). In this case, it is possible that the **a > e* affected Zenaga, at a period that **ăʔ* had shifted to [aˀ], from where it was treated as any other **a* for the shift.

{3}   **a-zăʔmăr*   > **azaˀmăr*   > **e-zeˀmăr*   > *iži?mär* /əžə?mar/
       *i-zăʔmar-ăn > **izaˀmarăn*   > *əžä?märän* /əža?maran/
{5}   **a-zăʔkăr*   > **azaˀkăr*   > **e-zeˀḱăr*   > *iži?gär* /əžə?gar/
       *i-zăʔkar-ăn > **izaˀkarăn*   > *əža?gärän* /əža?garan/

The word for 'thief' cannot be explained in this way. The sequence *uʔ* /əʔ/ cannot regularly come from **ăʔ*. It therefore appears to be a different formation with a high vowel **u* or **ə* before the **ʔ* in Zenaga.

{6}   **a-muʔkăr*   > **a-məʔkăr*   > *amuʔgär* /amə?gar/
       *i-muʔkăr-ăn > **i-məʔkărăn*   > *umuʔgurän* /əmə?gəran/[12]

The word for 'vulture' has an unexpected high vowel in the final syllable of the stem, and the **a > e* shift fails to apply in the prefix. Here too it seems likely that we are dealing with a different formation, e.g. **a-ǵaʔdər* 'vulture'.[13]

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[12] This *a > ə* shift in the final stem-syllable of the plural is part of a dissimilation rule in Zenaga *a...a > ə...a* whose conditioning is not yet fully understood. This rule is found to function most clearly in the verbal system but cf. *yugäm* /yəgam/ 'he drew water' pl. *uguṃän* /əgəman/ 'they drew water' (Cohen & Taine-Cheikh 2000: 271).

[13] Prasse (1974: 267) shows that the uncommon |cacəc| stem formation is used for three other birds (of prey): H *ăẓayĭ̆ğ* 'bustard' *ăẓayəğ* 'pied row'; NH *ăğayəs* 'bustard' (cf. also Zng. *ägäyš* pl. *əgäyššän* 'id.'); H *ăɣaləğ* 'crow', cf. N *täɣalğe* 'vulture sp.'

{4}   *a-ǵaʔdər > ägoʔḏər* /agaʔdər/[14]

4. UNDERSTANDING THE **a > e* RULES

So far we have looked at a variety of nouns which show *a~e* variation in Berber. Two rules have been formulated that apply to all Berber languages:

>   Rule 1: **a > e* if *ă* follows and no other *a, i* or *u* is present in the word.
>   Rule 2: **a > e* if *e* follows.

If we think of **ă* as a short equivalent of *a*, it is difficult to understand why a short **ă* would cause **a* to shift to *e*, while **a* would block it. It is also unclear why both the high vowels **i* and **u* would prevent the **a* from being raised, while **e* causes it. A solution to this unusual type of assimilation might be found in the vowel system of Tuareg.

In Tuareg, the vowel *ă* is not a low central vowel, but rather closer to a mid central vowel [ɜ~ɐ] (Louali 1992: 85). Its height therefore corresponds more or less to the mid front vowel *e* [ɪ~e], whereas *a* is a low front/central vowel [æ~a]. If we assume that in Proto-Berber a similar system existed, where **e* was pronounced closer to a mid vowel [e~ɛ], and the central vowels corresponded to a high central vowel **ə* [ɨ] and a mid central vowel **ă* [ə~ɜ],[15] then we can think of this **a > e* shift as mid-height harmony which harmonizes the height of **a* towards the **ă*, yielding *e*.

Thinking of the vowel system in this way, we can also understand why both high and low vowels would block such harmonization, as they are both on the cardinal sides of the high-low spectrum, while the sound law tries to harmonize the vowel as mid vowels.[16] I will call this system Mid Vowel Harmony (MVH) in the appendix and following sections.

	Front	Central	Back
High	**i* [i]	**ə* [ɨ]	**u* [u]
Mid	**e* [e~ɛ]	**ă* [ə~ɜ]	
Low		**a* [æ~a]	

Figure 1: The Proto- Berber vowel system

While the formulation of rule 2 is necessary to account for Tuareg forms like *e-heraɣ* 'fear', it seems that nouns with an |e...a/i/u| are not reconstructible for Proto-Berber.[17] We may therefore simplify the two rules of MVH to a single rule:

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[14] *o* is an allophone of *a* in front of *ʔ*, but its conditioning is not well understood, cf. *oʔgər* 'to steal', cf. Tashl. *akr* 'id.' but *äʔgäh* 'bucket', cf. Tashl. *aga* (Cohen & Taine-Cheikh 2000: 270).

[15] A close parallel for such a vowel system is found, for example in Amharic which has five plain vowels *a, i, u, e* and *o*, and two central vowels: *ə* [ɨ] and *ä* [ə] (Meyer & Ababa 2011: 1185).

[16] I thank Maarten Kossmann for suggesting this possible analysis.

[17] |e...i| and |e...u| are basically completely absent in Tuareg (Prasse 1974: 334f.). |e...a| does exist, but none of the words seem to be reconstructible for Proto-Berber (Prasse 1974: 323ff.).

MVH: Non-final **a* shifts to *e* if a mid vowel (**ă, *e*) follows unless there are any other plain non-mid vowels (**a, *i, *u*) in the word.

The formulation of **a > e* shift as a form of vowel harmony may allow for us to understand the paradox presented in section 3.2, where the **a > e* shift appears to apply to all Berber varieties after dialect differentiation of the **ʔ* reflexes had already taken place. Vowel harmony systems often stay stable within a language (family) for a long time, often even requiring to reconstruct such a system back to the Proto-Language (Hock 1991: 69). As MVH remains active, it would apply automatically to any new **a* that arises through the loss of **ʔ*.

5. PROTO-BERBER **e*?

While the MVH is able to explain many instances of *e* in Berber, not all instances of *e* can be the result of MVH. It cannot account for stems that have an **e* in their final syllable, e.g.

{27} **a-tăber* 'pigeon'
{28} **a-gŭlem* 'skin'
{29} **a-gŭnen* 'basket'
{30} **a-kəẓew* 'young person; bastard'

Several nouns have a stem |cec|, these are somewhat more common than the nouns with three consonants with **e* in the final syllable. This formation is the regular formation of verbal nouns of |cc| verbal stems in Tuareg (Sudlow 2011:134-5).

{24} **a-des* 'side'
{25} **a-sen* 'tooth'
{26} **a-les* 'fleece'

The feminine suffix *-e* must also simply be reconstructed as **-e*,[18] e.g.

{34} **ta-βădd-e* 'standing'
{13} **ta-akl-e* 'going'
{7} **ta-nar-e* 'desert'

There are a few nouns with the stem shape |ecəc|, whose shape clearly shows that the **e* must be primary, as MHV would not operate in such an environment.

{31} **eɣəd* 'ashes'
{32} **eḍəs* 'sleep'
{33} **t-esəm-t* 'salt'

The nouns **eɣəd* and **eḍəs* are verbal nouns derived from |c̄c| verbs: **ăqqəd* 'to burn' and

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[18] This ending has been connected with the Proto-Semitic feminine ending **-ay* (Prasse 1974: 44; Van Putten 2018), but cannot be reconstructed as **-ăy* for Proto-Berber.

ăṭṭəs 'to sleep'.[19]

The feminine plural suffix *-en* also has a vowel *e*.[20]

Finally, the negative perfective of simple verbal stems take an infixed *e* before the last stem consonant, e.g.[21]

'to slaughter'	Perf. 3sg.m.	Neg. Perf. 3sg.m.
Proto-Berber	*y-əɣrăs*	*y-əɣres*
Ghadames	i-ɣrăs	i-ɣres
Tuareg	i-ɣrăs	i-ɣres
Figuig	i-ɣrəs	i-ɣris

6. CONCLUSION AND REMAINING ISSUES

In this paper I have tried to show that a large amount of the cases of the vowel *e* found in Berber can be reconstructed as coming from original *a* or *ăʔ*. A process of Mid Vowel Harmony raises *a*, either primary or secondary (from *ăʔ*), to *e* in specific phonetic environments. This suggests that the specific conditions of Mid Vowel Harmony were a stable and productive vowel harmony system that stayed active as a phonetic rule for a prolonged period of time, already being present at a Proto-Berber stage, but still applying to cases of secondary *a* that arose from the collapse of *ăʔ* in a Post-Proto-Berber stage, when the different Berber varieties had already differentiated. Three problems remain open to further research, they will be discussed briefly in the following sections.

6.1. Agentive nouns of heavy verbs

MVH, as formulated, does not account for agentive nouns of heavy verbs stems in Tuareg (using the definition of heavy verb stems formulated by Heath (2005: 102)).

These verbs consistently have a pattern *e-|mă͞cecəc|*, *e-|mă͞ceci|*, *a-|mă͞cacuc|* or *a-|mă͞cacu|*. As soon as the plain vowel *u* appears, the *e* present in the stem becomes *a*, which suggests that this *e* is the result of MVH. Also the alternation between *e* and *u* in the apophonic plural points to this. Some examples are given below.

M *e-mă-hherəɣ* pl. *i-mə-hhurəɣ* 'someone who is afraid', from *hurəɣ* 'to be afraid'
M *e-mă-dderɣəl* pl. *i-mə-ddorɣal* 'a blind person', from *dărɣăl* 'to be blind'

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[19] These verbs have been hypothesized to have an initial *w* (Prasse 1973: 69-71). In this case the *e* might be the result of an interaction of the prefix, the semi-vowel and the first stem vowel (for a similar analysis see Prasse 1974: 124).

[20] Vycichl (1989: 5-8) suggests this is the result of a historically lost feminine suffix *-(ă)t* + plural suffix *-ăn*. This is an interesting idea, but has not been fully explained. There are clear instances of intervocalic *t*, and therefore, if Vycichl's suggestion is correct, it must be a Pre-Proto-Berber development.

[21] Brugnatelli (2002) suggests an umlaut scenario as the result of a post-verbal negator with a high vowel causing the *ă* of the negative perfective to shift to *e*. While this would explain the *e* in the negative perfective, it is not particularly convincing, see Kossmann (2015) for a discussion.

N *ă-mă-zzazuy* pl. *i-mə-zzuzay* 'healer', from *zuzəy* 'to heal'
M *e-mă-ssendəd, ă-mă-ssandud* pl. *i-mə-ssundad* 'a lazy person', from *sundəd* 'to be lazy'

N *e-mă-ǧǧeyh*[22] pl. *i-mə-ǧǧuyha, i-mă-ǧǧayh-an* 'witness', from *ǧăyh* 'to be a witness'
N *ă-mă-kkasu* pl. *i-mə-kkusa* 'heir', from *kusə-t* 'to inherit'

It is possible to formulate MVH in such a way to account for these nouns, so that the presence of mid vowels triggers the **a > e* shift, regardless of whether it follows or precedes the **a* on either side:

MVH: Non-final **a* shifts to *e* if a mid vowel (**ă, *e*) is present unless there are any other plain non-mid vowels (**a, *i, *u*).

While this formation is productive in Tuareg, it is not clear whether this formation can be reconstructed for Proto-Berber although similar formations are attested in Tashelhiyt and Middle Atlas Berber, e.g.

Tashl./MA *i-nigi* pl. Tashl. *i-nagan*, MA pl. *i-nigan* 'witness' (metathesized form of *emăǧǧeyhi*?)
MA *a-məkkasu* 'heir', from *kkas* 'to inherit'
MA *i-nifif* 'sieve', from *afuf* 'to be sieved'
MA *i-məssiggi* 'visitor', from *ssigg* 'to visit'
MA *i-mširi* 'person who holds a possession for a determined time, from *šru* 'to borrow'

An apparent exception is: MA *a-məddak*ʷ*l* 'friend', from *ddukəl* 'to accompany' (< **a-măddakəl*?)

Further research into the reconstruction of Proto-Berber heavy verbs and its related nominal derivations will allow us to better understand these formations. Such an examination is outside the scope of this paper.

6.2. Absence of MVH in the verb

MVH appears to be absent in the the verbal system. The |vcc| verbs and |ʔcc| verbs have the environment where we expect the shift to take place in the imperfective:

	'to draw water (impf. 3sg.m.)'	'to steal (impf. 3sg.m.)'
Proto-Berber	**y-ətt-ágăm*	**ətt-ắʔkăr*
Zenaga	*yəttäggäm*	*yəttaʔgär*
Ghadames	*ittáǧăm*	*ittókăr*
Figuig	*ittayəm*	*ittašər*

It is possible that the **ə* in the initial syllable blocks MVH, which would also explain why

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[22] < *emăǧǧeyhi*, Mali Tuareg loses word-final *i*.

MVH is blocked, for example, in the Etat d'Annexion of plurals like **yə-răgaz-ăn* 'men', but this extra condition is somewhat *ad hoc*.

MVH: Non-final **a* shifts to *e* if a mid vowel (**ă, *e*) is present unless there are any other plain non-mid vowels (**a, *i, *u*) or a **ə* is in the initial syllable.

6.3. Three nouns with *a* for *e* in Niger Tuareg

Three nouns show alternation between *a* and *e* within Tuareg, where the Mali Tuareg dialect and Tamaghit of Burkina Faso have *e*, whereas the Niger Tuareg dialects and the Tudalt dialect of Burkina Faso have *a*. Ahaggar seems to cluster with N, M in one instance and with Y, W, and U in another. These words are:

{8}   NM *te-fede* pl. *ti-fadiwen* 'chaff wound'
        WYU *t-ăfade* pl. *ti-fadiwen* 'id.'

{22}   NM *te-medhe, tă-madhe* 'termites'
        WYU *tămade* H *tămâdé*

{23}   N *te-ẓerdəmt, tăẓerdəmt* pl. *ti-ẓurdam* 'scorpion'; M *te-ẓerdəmt* pl. *te-ẓordam*;
        W *tăẓarḍəmt* pl. *ši-ẓərḍam*; Y *təẓarḍəmt* pl. *ti-ẓərḍam*; U *tăẓardəmt* pl. *ti-ẓərḍam*

{23}   N *e-ɣerdəm* pl. *i-ɣurdam, i-ɣərdam* 'large scorpion sp., [perhaps includes wind scorpions]'; M *e-ɣerdəm* pl. *i-ɣerdəmăn* 'id.'; H *ĕɣîrdəm* pl. *iɣôrdâm* 'id.'
        W *ăɣardəm* pl. *i-ɣərdam* 'wind scorpion'; Y *əɣardəm* pl. *i-ɣərdam* 'id.'; U *əɣardəm*
        pl. *i-ɣərdam* 'id.'

There is no obvious reason for this distribution. {8} has no cognates in other Berber languages, but words of similar shape do not have this distribution, cf.:

{7}   N *te-nere* pl. *ti-nariwen* 'desert expanse'; W *teṇere* pl. *šiṇariwen* 'id.';
        Y *teṇere* pl. *tiṇarawen* 'id.'
        MNUWY *temeḍe* pl. *timaḍ* 'hundred'

For {23} the alternation seems to be present outside of Tuareg as well. Tashelhiyt, Middle Atlas Berber and Kabyle all have reflexes with *e*, while most (but not all) Zenatic languages seem to have reflexes with *a*:

{23}   Tashl. *i-ɣirdəm* pl. *i-ɣardmiwn*; MA *i-ɣirḍəm* pl. *iɣirḍam*; Kb. *i-ɣirdəm* pl. *iɣurdam*
        Fig. *tɣardəmt* pl. *ti-ɣardmiwin, ti-ɣurdam*; Ouargla/Mzab *tɣardəmt* pl. *ti-ɣurdam*
        But: Snous *tɣirḍəmt* pl. *ti-ɣərḍmawin, ti-ɣərḍmin*

There are no examples of other nouns of this shape, making it difficult to say anything about its reflexes. {22} always only has reflexes of *e* as far as can be deduced from the cognates in other dialects.

ETYMOLOGICAL APPENDICES

These appendices contain a list of nouns of different types relevant to the discussion in this article. Appendix A consists of examples of nouns with *e~a* variation which are the result of MVH. Appendix B consists of nouns with an original **e*.

The appendices refer to a large number of Berber varieties. The varieties under discussion and the abbreviations used for them as well as the sources used for these languages are given in the list below.

Awj.	Awjila	Van Putten (2014)
Chenoua	Chenoua	Laoust (1912)
Fig.	Figuig	Benamara (2013)
Foq.	El-Foqaha	Paradisi (1963)
Ghd.	Ghadames	Lanfry (1973)
Ghomara	Ghomara	Mourigh (2016)
Izn.	Beni Iznasen	Kossmann (unpublished)
Kb.	Kabyle	Dallet (1982)
MA	Tamazight	Taifi (1991), Oussikoum (2013)
Mzab	Mzab	Delheure (1984)
Nef.	Nefusa	Beguinot (1940); Provasi (1973)
Ouargla	Ouargla	Delheure (1987)
Rif.	Tarifiyt	Serhoual (2002)
Senh.	Senhadja de Sraïr	Ibañez (1959)
Siwa	Siwa	Naumann (unpublished)
Snous	Beni Snous	Destaing (2007 [1914])
Sok.	Sokna	Sarnelli (1924)
Tashl.	Tashlhiyt	Sabir (2010); Stroomer (forthc.)
Zng.	Zenaga	Taine-Cheikh (2008)

Tuareg dialects

H	Ahaggar	Ritter (2009)
N	Mali Tuareg	Heath (2006)
M	Tamaghit	Sudlow (2009)
U	Tudalt	Sudlow (2009)
W	Iwellemmeden	Prasse et al. (2003)
Y	Ayer	Prasse et al. (2003)

The number of a certain word discussed in Kossmann (1999) is given in the entry as [K number of entry].

The cognates of each entry are presented in blocks of languages roughly following the classification as presented by Kossmann (forthcoming). This is, first and foremost, to organize the data and to make it easier to talk about some of the specific developments as these blocks often share specific developments. Any form of classification of the Berber languages in terms of a

linguistic tree is very difficult, and it should not be thought of as such. These blocks should rather be thought of as linguistic areas.

Each item is given a number in curly braces {...}. Throughout the paper, whenever a specific word is discussed this number is provided so it can be referenced in this appendix.

APPENDIX A: Nouns with sg. *e* pl. *a* variation.

{1} **a-dakăl* pl. **i-dakal-ăn, *i-dukal* 'palm of the hand'
Tuareg: NMH *e-dekəl* pl. *i-dukal* W *ădekəl,ədekə*l pl. *i-dukal,* Y *ədekăl* pl. *i-dukal*
(N)WM/Kb: Tashl. *ti-diklt*; MA *i-dišəl* pl. *i-dašaln*; Kb. *i-dikəl* pl. *i-dukal*;
                Senh. *tidikelt ufus* pl. *tidikal*
Zenatic: Rif. (Aït Ammart) *dikəřt ufus* (Renisio 1932: 309)
Zenaga: * əḏīgiy* pl. *əḏīgiyän*

Zenaga has a long vowel ī both in the singular and plural. This is an unexpected reflex. Long vowels in Zenaga may be the reflex of **əβ, *iβ,* (or **eβ*?) or of **əɣ, *iɣ,* (or **eɣ*?) (Kossmann 2001b). The other Berber dialects show no sign of the presence of **β* or **ɣ*, making the Zenaga reflex irregular.

Several Zenatic languages have a different word for 'palm of the hand' which seems related to this root, but with a different formation **ta-mădkălt*, for a discussion, see Basset (1937). Ghd. *aḏănšal* pl. *ḏănšalăn, ḏanšalíwăn* is presumably related to this but would have (1) irregular metathesis (2) irregular *d > ḏ* (3) irregular *k > š*.

{2} **a-fa/ăʔɣăr* pl. **i-fa/ăʔɣăr-iw-ăn / (i-fə́ʔɣr-an / i-fə́ʔɣar)* 'serpent'
(N)WM/Kb: Tashl. *i-fiɣr* pl. *i-faɣrn*; MA *i-fiɣr* pl. *i-faɣriwn*; Senh. *i-fiɣar* pl. *i-fiɣriwin*
Zenatic: Fig. *fiɣər* pl. *i-fiɣar*; Rif. *fiɣar* pl. *i-fiɣɣran*; Mzab *fiɣr* pl. *i-fiɣran*;
                Ouargla *fiɣr* pl. *i-fiɣran*; Chenoua *fiɣər* pl. *Ifiɣran*

This noun has a fairly limited distribution, but shows the *i~a* alternation in Tashlhiyt and Middle Atlas Berber. Combining this with the *i*-prefix, this seems to point to an *a~e* alternation in the stem.

As this word lacks Zenaga and Ghadamsi cognates, we cannot confirm whether the word had an internal glottal stop or not.

{3} **a-zăʔmăr* pl. **i-zăʔmar-ăn* 'lamb'
Tuareg: Y *əžemər* pl. *i-žămarăn*, W *ă-žemăr*, *ə-žemăr* pl. *i-žămarăn*
(N)WM/Kb: Tashl. *i-zimmr, i-zimr* pl. *i-zammarn, i-zamarn* MA *i-zimr, i-zimmər*
                pl. *i-zammarn*; Kb. *i-zimər* pl. *i-zamarən*; Senh. *i-zimar* pl. *i-zimmarən*
Zenatic: Figuig *i-zmər* pl. *i-zmarən*; Chenoua *i-zmər* pl. *izmarən*; Snous *i-zmər*
                pl. *i-zmarən*; Siwa *tizmərt* pl. *tizəmrən* 'ewe'.
Libyan: Ghd. *aẓómăr* pl. *ẓómarăn*; Nef. *zumə́r* pl. *izumárən*[23]
Zenaga: *iẓiʔmär* pl. *əžäʔmärän*

This word shows alternation between *e* and *ă* as its reflex for **ăʔ*. This is discussed in more detail in section 3.2.

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[23] Adam Benkato (p.c.) recorded this from an informant originally from Jadu. Beguinot has *zūmə̂r* pl. *izūmâr*.

Both Tashelhiyt and Middle Atlas Berber have variants with unexplained gemination of *m*.

{4} *a-ǵăʔdăr* pl. *i-ǵăʔdăr-iw-ăn, *i-ǵăʔdăr-ăn* 'eagle, vulture' [K 309]
Tuareg: NMU *e-ǧădăr, e-gădăr* pl. *i-ǧədran, i-gədran, i-ǧădărăn* Y *e-žădăr*
                 pl. *i-žădărăn*, W *e-žădăr, a-žădăr* pl. *i-žădărăn*, H *e-hădăr* pl. *i-hədran*.[24]
(N)WM/Kb: Tashl. *i-gidr* pl. *i-gadriwn*; MA *i-yyidr* pl. *i-yyadərn*; Kb. *i-gidər* pl. *i-gudar*.
Zenatic: Rif. *židar* pl. *i-židān*; Chenoua *židər* pl. *i-židrən*
Zenaga: *ägoʔḏər* pl. *əgoʔḏərän*.

This word shows alternation between *e* and *ă* as its reflex for *ăʔ*. This is discussed in more detail in section 3.2.

Zenaga has an unusual ə instead of *a* before the last stem consonant and no high vowel in the prefix. In Section 3.2.5 it is suggested that Zenaga reflects a different formation *a-ǵaʔdər*.

{5} *a-zăʔkăr* pl. *i-zăʔkar-ăn* 'rope'
Tuareg: N *e-šekər* pl. *i-šukar*; M *e-šewăr* pl. *i-šiwar*.
(N)WM/Kb: Tashl. *i-zikr* pl. *i-zakarn*; MA *i-zišər* pl. *i-zašarn*; Kb. *i-zikər*
                 pl. *i-zukar, i-zukʷar*; Senh. *i-zikər* pl. *i-zakarən*
Zenatic: Mzab *išəššər*, *iššər* pl. *iššarən, iššəššarən*.
Libyan: Nef. *zukə́r*.
Zenaga: *ižiʔgär* pl. *əžaʔgärän*
Awjila: *ažíkər*

This word shows alternation between *e* and *ă* as its reflex for *ăʔ*. This is discussed in more detail in section 3.2.

The Mzab cognate points to *ăʔ*: *a-zăʔkăr > a-zăkăr > e-zăkăr > e-skăr > i-ššər*.[25] I assume that the forms *išəššer* pl. *iššəššarən* are secondary, although they are not well-understood.

Burkina Faso Tuareg dialect Tamaghit (M) has a noun *ešewăr* 'rope (for tying back legs of a cow when milking)', this appears to be a cognate to the other words in this group, but this would point to an irregular correspondence *k~w*, which is occasionally attested in Berber (see Kossmann 1999: 209ff.).

{6} *a-măʔkăr* pl. *i-măʔkăr-ăn* 'thief'
Tuareg: H *e-măkăr* pl. *i-măkărăn*
(N)WM/Kb: Tashl. *i-mikr* pl. *i-makrn*; MA *i-mišər* pl. *i-mašərn*
Zenatic: Fig. *i-mušər* pl. *i-mušar*
Zenaga: *amuʔgär* pl. *umuʔgurän*

This word shows alternation between *e* and *ă* as its reflex for *ăʔ*. This is discussed in more detail in section 3.2. The Zenaga initial high stem vowel is unexpected, and closely matched the Figuig formation, whose *i-* prefix is not easily explained, this form is discussed in section 3.2.5.

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[24] Ahaggar and Iwellemeden and Ayer point to *g > ž*. This is an irregular development (Kossmann 1999: 140).
[25] The development *sk* and *sḱ > šš* is regular in Zenatic (Kossmann 1999: 183). In other Branches of Berber *sk* and *sḱ* may have different reflexes (Kossmann 1999: 185).

{7} **ta-nar-e* **pl.** *ti-nar-iw-en* **'desert'**

Tuareg:	HN *te-nere* pl. *ti-nariwen* 'desert expanse'; W *teṇere* pl. *šiṇariwen*; Y *teṇere* pl. *tiṇarawen*.
Zenaga:	*tnäyriʰ*

This noun is well-attested in Tuareg but is mostly absent elsewhere. Zenaga has an unexpected reflex for **a*, perhaps rather pointing to a reconstruction **ta-năy-re*.

{8} **ta-fad-e* **pl.** **ti-fad-iw-en* **'chaff wound (on animal's back)'**

Tuareg:	NM *te-fede* pl. *ti-fadiwen*; WYU *t-ăfade* pl. *ti-fadiwen*

This is the only other noun in Tuareg that has *a~e* alternation in a stem-internal long vowel before the plural suffix *-iw-en*. It is a derivation of the verb of *fadăy* 'to be chaffed'. The final diphthong *-ăy* appears to have been reanalysed as the feminine ending *-e*, lending some credibility to Prasse's interpretation that the feminine suffix *-e* originally came from **-ăy* (Prasse 1974: 44).

Notice that several of the Tuareg dialects have *a* in the stem. This is currently unexplained, see section 6.3 for a discussion.

{9} **a-askăr* **pl.** **i-askar-ăn* **'nail' [K 515]**

Tuareg:	MNHU, *eskăr* pl. *askarăn*; W *eškăr, e-škăr* pl. *aškarăn, i-škarăn*; *aškar* pl. *aškarăn* 'claw'; Y *eškăr, e-škăr* pl. *aškarăn, eškărăn*
(N)WM/Kb:	Tashl. *iskr* pl. *askarn* MA *iššər* pl. *aššarn*; Kb. *iššər* pl. *aššarən*;
Zenatic:	Fig. *iššər* pl. *aššarn*; Rif. *iššar* pl. *aššān*; Mzab *aššar* pl. *aššarən*; Ouargla *aššar (a-)* pl. *aššarən (a-)* 'claw'; Chenoua *iššər* pl. *aššarən*; Snous *iššər* pl. *aššarn*; Siwa *aččer* pl. *ččerən*; Sok. *iššə́r* pl. *iššárən*
Zenaga:	*əskär* pl. *əskärän*
Libyan:	Ghd. *aškar* pl. *aškarăn*; Nef. *aššár* pl. *aššárən*
Awjila:	*íškər* pl. *škírən*

Several languages have generalized the plural stem to the singular (e.g. the Libyan group, Mzab and Ouargla).

The *e* in the Siwi stem is secondarily from **ă* next to a post-alveolar obstruent, cf. Souag & Van Putten (2016). The vowel *i* in Awjila can be the result of the local *a > i* shift (Van Putten 2014).

{10} **a-anβăr* **pl.** **i-anβar-ăn* **'eyebrow' [K 29]**

Tuareg:	NMH *enhăr* pl. *anharăn*; U *anar* pl. *anarăn*; WY *aṇar* pl. *aṇarăn*
Libyan:	Ghd. *anβăr* pl. *anβarăn*

Ghadames and several Tuareg dialects have generalized the plural stem to the singular.

{11} **a-amẓăd* pl. **i-amẓad-ăn* 'hair'

Tuareg:	NH *emẓăd* pl. *amẓaḍăn, amẓadăn*; W *anẓad, a-nẓad, ənẓad* pl. *anẓadăn, i-nẓadăn*; *ənẓadăn*; Y *ənẓad* pl. *ənẓadăn*
(N)WM/Kb:	MA *i-nəẓḍ* pl. *i-nẓaḍn*; Tashl. *inẓḍ* pl. *anẓaḍn, inẓaḍn*; Kb. *anẓad, inẓəd* pl. *anẓadən*; Senh. *i-nzəḍ* pl. *i-nẓədawən*
Zenatic:	Rif. *a-nzəḍ* pl. *i-nəẓḍawən, i-nəẓḍan*

Middle Atlas Berber does not have the *e~a* variation, and has a prefix *i-*. It seems that the forms with variation as found in Tuareg, Tashlhiyt and Kabyle are original, and that Middle Atlas Berber has regularized the form.

{12} **a-aldăy* pl. **i-alday-ăn* 'sling'

(N)WM/Kb:	MA *a-ldi(y)* pl. *i-ldyan/a-ldiyn*; *illəy* pl. *illəyn, ildyan*; Tashl *ildi*; Kb. *ildi* pl. *ildan, ildiyən*
Zenatic:	Fig. *ildəy* pl. *aldayən*; Ouargla *ildi* pl. *ildawən*

This word seems to be confined to the Northern Berber. Only Figuig has the alternation, sg. *i* pl. *a* alternation. Considering the rarity of such formations, makes it likely that the Figuig form is old, and the other dialects have innovated.

{13} **t-aɣmăz-t* pl. *t-uɣmaz* 'tooth'; **a-aɣmăz* pl. **aɣmaz-ăn* 'big tooth'

(N)WM/Kb:	MA *t-uɣməst/t-iɣməst* pl. *t-uɣmas* 'tooth'; Kb. *t-uɣməst* pl. *t-uɣmas*; Senh. *t-iɣməst* pl. *t-iɣmas*; *iɣməz* pl. *aɣmazən* 'big tooth'
Zenatic:	Fig. *iɣməs* pl. *aɣmasən*; Rif. *ti-ɣməst* pl. *ti-ɣmas*; Izn. *ti-ɣməst* pl. *ti-ɣmas*; *iɣməz* pl. *aɣmazən* 'big tooth'; Ouargla/Mzab *ti-ɣməst* pl. *ti-ɣmas*; Snous *ti-ɣməst* pl. *ti-ɣmas*; Chenoua *hiɣməst* pl. *hiɣmas*

Only the augmentative masculine formation appears to have *i~a* alternation. The Zenatic feminine form points to a form without a stem-initial vowel: **ta-ɣmăz-t* pl. **ti-ɣmaz*. The Middle Atlas Berber form retains the stem-initial vowel, presumably from **t-aɣmăz-t* pl. **t-uɣmaz* with the regular apophonic plural pattern.

{12} **ta-aɣs-e* pl. **ti-aɣs-iw-en* 'ewe (sheep or goat)'

Tuareg:	NW *t-eɣse* pl. *t-aɣsiwen*; Y *t-eɣse* pl. *t-aɣsawen*; H *tiɣse* (Prasse 1974: 345).
(N)WM/Kb:	MA *t-ixsi* (no pl.); Tashl *t-ixsi* (no pl.); Kb. *t-ixsi* pl. *ulli*
Zenatic:	Fig. *t-ixsi* pl. *t-ixsiwin*; Rif. *t-ixsi* pl. *ti-xəswin*; Mzab *tixsi* pl. *tixsiwin*; Ouargla *ti-xsi* pl. *ti-xsiwin* 'goat'; Chenoua *hixsi* pl. *hixsiwin*; Snous *ti-xsi* pl. *ti-xswin*; Sokna *tíxsi* pl. *tixsíwin* 'goat'; Foq. *tíxsi, téxsi* pl. *təxsíwən* 'goat'.
Zenaga:	*təkših* pl. *tākšən*
Awjila:	*tíxsi* pl. *tixsiwín* 'flock, cattle'

Zenaga has an unexpected lengthened vowel *ā* which is usually the reflex of **ă/aβ* (Kossmann 2001b). There is no evidence for this in the other Berber languages. A similar problem is found with {1} **a-dakăl* 'hand palm'.

{13} **ta-akl-e* pl. **ti-akl-iw-en* 'going'
Tuareg: NHW *t-ekle* pl. *t-akliwen*; Y *t-ekle* pl. *t-eklawen*;
(N)WM/Kb: MA *tikli* pl. *tikliwin* (Izd.); Kb. *t-ikli* pl. *t-ikliwin*
Zenatic: Fig. *ti-šli* pl. *ti-šliwin*; Ouargla *ti-kli*; Snous *ti-šli*; Chenoua *hik̲li;* Siwa *tikli*
Libyan: Ghd. *tekle* 'caravan'

Only Tuareg gives evidence for the **e~a* variation in this verbal noun derived from the verb **akəl* 'to walk, to go'.

{14} **a-afăr* pl. **i-afăr-iw-ăn* 'wing, leaf'
Tuareg: N *a-fərr* pl. *i-fraw-ăn*; W *a-fṛut* pl. *i-fṛutăn*; Y *afṛut* pl. *əfrutăn*; *a-fṛaw*
pl. *əfrawăn*; M *a-frew* pl. *a-frewăn*; U *a-frut* pl. *i-frutăn;* H *a-fraw* pl.
i-frawăn
(N)WM/Kb: MA *ifr* pl. *afriwn*; Tashl. *ifr* pl. *ifrawn*; Kb. *ifərr* pl. *afriw-ən, i-fərrawən*;
Senh. *afar* pl. *afriwən*
Zenatic: Fig. *afriw* pl. *afriwən*; Rif. *afar* pl. *afriwən*; Mzab *a-fər, a-friw* pl. *a-friwən*;
Ouargla *a-friw* pl. *a(-)friwən*; Snous *afər* pl. *i-friwən, i-frawən*; Chenoua *afər*
pl. *ifrawən*; Chaouia *afr* pl. *afriwn*; Siwa *afīr* pl. *ifran*
Libyan: Ghd. *təfra* pl. *təfrawén* 'leaf'; Nef. *afríw* pl. *ifríwən*
Zenaga: *äfrūn* 'wings' (no sg.).

Figuig and Ouargla have generalized the plural stem to the singular. The Mzab form *a-fər* has an unexpected prefix *a-*. The Tuareg forms are derived from a stem with an extra **-əw* or **-ut* added to the stem.

{15} **a-alăm* pl. **i-alăm-a/iw-an* 'skin'
Tuareg: NWYMU *e-lăm* pl. *i-lămawăn*; H *e-läm* pl. *i-lämawän* (Prasse 1974: 144).
(N)WM/Kb: Tashl. *ilm* pl. *ilmawn*; MA *ilm* pl. *almiwn*.
Zenatic: Fig. *iləm* pl. *i-lmawən*; Rif. *iřəm* pl. *iřmawən*; Snous *iləm* pl. *ilmawən*; Siwa
iləm pl. *ilman?*; Foq. *ilə́m*.
Libyan: Ghd. *élăm* pl. *elămáwăn*.
Zenaga: *iyəm* pl. *ällammūn, ällaṃṃūn*

Tuareg has reanalysed the stem-initial *e* as a prefix *e-* (this is true for nearly all **aCăC* nouns in Tuareg, cf. {16, 18} but {19}). Middle Atlas Berber and Zenaga seem to retain the original plural, although the Zenaga gemination of the first stem consonant of the plural has no obvious explanation.

{16} **a-aɣăf* pl. **i-aɣăf-a/iw-ăn*; **a-ɣăf* pl. **i-ɣăf-iw-ăn* 'head' [K 719]
Tuareg: N *e-ɣăf(f)* pl. *i-ɣăfawăn*; WYMUH *e-ɣăf* pl. *i-ɣăfawăn*
(N)WM/Kb: Tashl. *i-xəf* pl. *ixfawən*; MA *i-xf, ixf* pl. *i-xfawn*; Kb. *ixəf* pl. *axfiwən,
i-xfiwən*
Zenatic: Rif. *ixf* pl. *ixfawən*; Mzab *ixf, iɣəf* pl. *ixfawən*; Ouargla *ixf, iɣəf* pl. *ixfawən*;
Snous *ixf* pl. *ixfawən*; Siwi *axfi* pl. *xfawən*; Sok. *iɣə́f* pl. *yəɣfáwən*; Foq. *iɣə́f*
pl. *iɣəfáwən*
Libyan: Nef. *iɣə́f* pl. *iɣfáwən*.
Zenaga: *iʔf* pl. *äʔfūn, oʔfūn*

Zenaga and Kabyle point to a reconstruction with a stem-initial *a*. All other dialects simply point to a regular prefix *e-* < **a-*. The Zenaga and Kabyle situation may be original as the shift to *a-CăC* nouns for this type is common (cf. {15, 18}).

{17} **a-aǵăǵ* pl. *i-aǵăǵ-iw-ăn* 'terebinth' [K329]
(N)WM/Kb: MA *ižž* pl. *ažžiwn*; Tashl. *igg*; Kb. *iggi* 'cork oak' ?
Zenatic: Fig. *ižž* pl. *ažžiwən*; Rif. *ižž* pl. *ažžawən*; Izn. *ižž* pl. *ažžiwən*
Libyan: Nef. *tižəyt*
Zenaga: *iʔgəgi* '*combretum aculeatum*' ?

Middle Atlas Berber has a Zenatic reflex of **ǵ* rather than the regular expected *g*. Nefusi has an irregular reflex *y*, alternation between **ǵ and *y* occurs occasionally but is irregular (Kossmann 1999:212ff.).

The Kabyle and Zenaga are certainly cognates of each-other, but it is not completely clear whether they are cognate to the other languages, as semantically they are quite removed, and they rather point to a reconstruction **a-ʔǵăǵəʔ* or something similar.

{18} **a-aβăḍ* pl. **i-aβăḍ-an, *i-uβḍ-an*; **a-βăḍ* pl. **i-βə/ăḍ-an* 'night' [K 189]
Tuareg: NMH *e-hăḍ* pl. *i-hăḍ-an*; W *ehăḍ* pl. *i-hăḍawăn, ăḍan*; Y *ehăḍ* pl. *ihăḍawăn, yăḍan*; U *e-hăḍ* pl. *ăḍan*
(N)WM/Kb: Tashl. *iḍ* pl. *aḍan*; MA *iḍ* pl. *iḍan*; Kb. *iḍ* pl. *uḍan, aḍan*
Libyan: Ghd. *éβăḍ* pl. *éβăḍawăn*; Nef. *iṭ* pl. *iṭáwən*
Zenatic: Fig. *iḍ* pl. *iḍan*; Rif. *iḍa* 'currently'; Mzab *iḍ* pl. *iyḍan*; Ouargla *iḍ* pl. *iyḍan*; Foq. *ayyəḍ*
Zenaga: *īḍ* pl. *āḍan*
Awjila: *ávəṭ* pl. *vəṭáwən*

This noun has many different reflexes in the Berber languages due to the presence of the consonant **β*, which is lost in most Berber languages, but with differing reflexes, for an overview see Kossmann (1999: 108f. and pg. 61ff.) for a full discussion.

The Tuareg and Zenatic blocks can probably all be understood as coming from **a-βăḍ* pl. *i-βăḍ-an*. The combination with the plural suffix **-an*, however, is surprising. Normally nouns with this pattern have a high vowel **ə* in the stem, e.g. Tuareg *ekăbăr* 'hut' pl. *ikəbran* (Plural type 3, Prasse 1974: 55). We would therefore expect **a-βăḍ* pl. **i-βəḍ-an*. This reconstruction would yield the reflexes found in Zenatic and N, M and H Tuareg. But Tuareg W *ăḍan* and Y *yăḍan* U *ăḍan* can only be understood as coming from **i-βăḍ-an*, as the high vowel quality **ə* would be retained in front of emphatic in these dialects.

The Kabyle form may be understood as a formation with a stem-initial vowel **(a-)aβăḍ* pl. **(i-)uβḍ-an*. The plural *aḍan* found in Tashelhiyt and Kabyle and Zenaga once again point to an unexpected low vowel in front of the plural suffix **-an*: **(i-)aβḍ-an*.

Prasse suggests that the plural formation is rather his Plural Type 4 (Prasse 1974: 57), with a final laryngeal **h* being lost to account for the unexpected low vowels before the suffix **-an*: **e-hăḍăh* > **e-hăḍ* pl. **i-hăḍah-ăn* > **i-hăḍ-an*. There is however no comparative evidence

that this noun ever had a final consonant **h*, and therefore this solution is not very attractive. Instead, we might consider that *(*i*-)*aCC-an* is an ancient plural formation for nouns of this type (cf. also {19} below).

{19} **a-afăḍ* pl. **i-afăḍ-an* ~ **i-afăḍ-ăn*; **efəḍ* pl. **efədan* 'thousand'
Tuareg: N *efăḍ* pl. *afăḍăn, efḍan*; W *efəḍ* pl. *efəḍan* 'million'; MU *efăḍ* pl. *afḍăn, afḍan*
(N)WM/Kb: Tashl. *ifḍ* pl. *afḍan* 'id.'
Zenaga: *əffaḍ* pl *əffaḍan, avḍan*.

Notice that the formation found in Tashlhiyt and Zenaga and the variation found in Mali Tuareg and Burkina Faso Tuareg is the same *(*i*-)*aCC-an* plural formation as discussed in {18} above.

{20} **ta-al-e* pl. **ta-al-iw-en* / **t-illa* 'shadow'
Tuareg: NWMU *t-ele* pl. *t-aliwen*; Y *t-ele, t-ile* pl. *t-yəlla*; H *têle* pl. *tâliwîn* (Prasse 1974: 346).
(N)WM/Kb: MA *t-ili*; Kb. *t-ili*; Senh. *t-ili*
Zenatic: Rif. *t-iřa*; Mzab *t-ili*; Ouargla *t-ili*; Snous *t-ili*; Chenoua *hili*; Chaoia *tili*; Siwi *tla*
Libyan: Ghd. *téle*.
Zenaga: *tiyih* pl. *tiyäyn*

The plural formation *tyəlla* in Ayer Tuareg (Y) is the result of a shift **ti > tyə* in closed syllables (Kossmann 2009: 36, *čə* in his transcription.) and thus points to a formation **t-illa*, a form that is difficult to reconcile with the reconstruction **ta-al-e*. Compare also following {21}.

Only Tuareg shows evidence for a plural formation with stem-initial *a*. It is possible that formation is secondary, as this noun understandably lacks a plural in most dialects due to its hard to pluralize semantics. If the plural is indeed secondary, the singular could be reconstructed as either **t-ale* or **t-ele*.

The two nouns with the shape *teCe* both surface as *tCa* in Siwi (see Souag & Van Putten forthcoming for a discussion), see also {21}.

{21} **ta-aẓ-e* pl. **ta-aẓ-iw-en* 'udder'
Tuareg: N *t-eẓe* pl. *t-aẓiwe*n; WMU *t-eẓe* pl. *t-aẓiwen*; Y *t-eẓe* pl. *t-yəẓẓa*; H *têẓe* pl. *tâẓiwîn* (Prasse 1974: 346)
(N)WM/Kb: MA *t-iẓi* 'pubic hair'; Tashl. *t-iẓi* pl. *t-iẓẓa*
Zenatic: Siwi *tẓa* pl. *tẓawen* ~ *tiẓəẓẓa*

The plural formation *tyəẓẓa* in Ayer Tuareg matches exactly the plural of the other *teCe* noun, {20} **t(a)-al-e*. This formation looks similar to the one found in Tashlhiyt.

{22} ? **ta-ʔmă/adβ-e* 'termite' [K 131]
Tuareg: N *te-medhe, tă-madhe* (pl. *ti-medhewăn* [sic!]); M *te-medhe* (pl. *ti-medhiwen*); WYUH *tămade* pl. *ti-madiwen*;

(N)WM/Kb:	Tashl. *ti-midi*;
Zenatic:	Timimoun *timdi*; Siwa *tamdi* 'ant'
Zenaga:	*taʔmäḏ* 'termites'
Awjila:	*təmidi*

The reconstruction of this noun is uncertain. Zenatic has lost the medial vowel similar to nouns with a sequence *ăʔ* (see section 3.2.3). It is not clear if this vowel shortening is directly related to the presence of *ʔ*. *ta-ǵă/arəs-t* 'winter', cp. Fig. *t-ažrəst*; Foq. *ǧaríšt*; Zng. *tgärS* suggests that this phenomenon is unrelated to the presence of a glottal stop. An in-depth study of this alternation is outside the scope of this paper.

The Zenaga formation is unusual. Zenaga points to an stem-initial *ʔ* and lacks the regular feminine suffix *-t* or the feminine suffix *-e*.

Notice that several of the Tuareg dialects have *a* in the stem. This is currently unexplained, see section 6.3 for a discussion.

{23} ? *a-ɣă/ardăm pl. *i-ɣə/urdam 'scorpion' [K 633]

Tuareg:	N *te-ẓerdəmt, tăẓerdəmt* pl. *ti-ẓurdam, ti-ẓərdam* (Heath 2005: 210); W *tăẓarḍəmt* pl. *ši-ẓərḍam*; Y *təẓərḍemt* pl. *ti-ẓərḍam*; MH *te-ẓerdəmt* pl. *te-ẓordam*; U *tăẓardəmt* pl. *ti-ẓərdam*
	N *e-ɣerdəm* pl. *i-ɣurdam, i-ɣərdam* 'large scorpion sp., [perhaps includes wind scorpions]'; W *ăɣardəm* pl. *i-ɣərdam* 'wind scorpion'; Y *əɣardəm* pl. *i-ɣərdam* 'id.'; M *e-ɣerdəm* pl. *i-ɣerdəmăn* 'id.'; U *əɣardəm* pl. *i-ɣərdam* 'id.'; H *eɣerdəm* pl. *iɣordam* 'id.'
(N)WM/Kb:	Tashl. *i-ɣirdəm* pl. *i-ɣardmiwn*; MA *i-ɣirḍəm* pl. *iɣirḍam* (Oussikoum); *ti-ɣərdəmt, ti-ɣərḍəmt* pl. *ti-ɣərdam* (Taïfi); Kb. *i-ɣirdəm* pl. *i-ɣurdam*; Senh. *tiɣirdənt* pl. *tiɣirdəniwin*
Zenatic:	Fig. *tɣardəmt* pl. *ti-ɣardmiwin, ti-ɣurdam*; Ouargla *tɣardəmt* pl. *ti-ɣurdam*; Mzab *tɣardəmt* pl. *ti-ɣurdam*; Snous *tɣirḍəmt* pl. *ti-ɣərḍmawin, ti-ɣərḍmin*; Siwa *taqərḍumt* pl. *tiqərḍumen*; Foq. *tayurdə́mt* pl. *tyurdámin*; Sok. *tqardə́mt* pl. *tqurdám*
Libyan:	Ghd. *tašarḍămt* pl. *tšərḍám*; Nef. *tɣardə́mt* pl. *tɣurdám*
Awjila:	*tɣardímt* pl. *tɣardimín*[26]

Notice that several of the Tuareg dialects have *a* in the stem. This is currently unexplained, see section 6.3 for a discussion.

Unexpectedly, the plural formation in some of the dialects of Tuareg have a short vowel *ə* rather than the expected (and also attested) *u*. Ghadamsi also has an unexplained *ə* in the plural.

The Western Moroccan/Kabyle block always has *i*. The Zenatic block mostly points to *a*, but there are some varieties with *i*.

For the development *ɣ* > Tuareg *ẓ*, Ghadamsi *š* see Kossmann (1999: 216ff.) and Vycichl (1990).

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[26] The final *i* in Awjili is secondary, see Van Putten (2013) for an in-depth discussion.

APPENDIX B: Common nouns with *e

{24} *a-des pl. *i-des-ăn, *i-dus-an 'side'
Tuareg: N *e-des* 'besides'; MUWY *e-des* pl. *i-desăn*.
(N)WM/Kb: MA *i-dis* pl. *i-disn* (Taïfi), *i-dusan* (Oussikoum); Tashl. *i-dis* pl. *i-disn*;
Kb. *idis* pl. *i-disan*
Zenatic: Mzab *i-dis* pl. *i-disan*; Ouargla *i-dis* pl. *i-disan*; Fig. *idis* pl. *i-disan*
Libyan: Ghd. *adés*

Presumably related to {39} *ta-dis-t* 'belly', but with a different stem vowel.

{25} *a-sen pl. *i-sen-ăn 'tooth'
Tuareg: N *e-sen, e-săyn* pl. *i-senăn, i-săynăn*; MH *e-sen* pl. *i-senăn*; WYU *e-šen*
pl. *i-šenăn*
(N)WM/Kb: Ghomara *a-san* pl. *i-sanən*
Zenatic: Siwi *asen* pl. *isenén*
Libyan: Ghd. *asén* pl. *sénăn*
Awjila: *asín* pl. *sínən*

Ghomara regularly has a reflex *a* for *e*, cf. also the feminine plural suffix *-an* < *-en* (Mourigh 2016: 70).

{26} *a-les pl. *i-les-ăn 'fleece'
Tuareg: N *e-les* 'cotton, 'shearing'; MU *e-les* 'id.; fleece'.
(N)WM/Kb: MA *ilis* pl. *ilisn* (Taïfi); *ilis* pl. *ilasiwn*; Kb. *ilis* pl. *Ilisən*; Senh. *tilist* pl. *tilisin*
Zenatic: Fig. *ilis* pl. *ilisən*; Mzab *i-lis* pl. *i-lisan* Ouargla *i-lis* pl. *i-lisən*; Snous *ilis*
pl. *ilisan*; Chenoua *ilis* pl. *ilisən*
Libyan: Ghd. *alés* pl. *lesăn*

This is a verbal noun derived from the verb *ăləs* 'to shear'. In Tuareg the pattern |e-CeC| is regular for verbs of this type (Prasse's conj. IA5). In other Berber languages this formation is not as productive.

MA and Kb. have an unexpected voyelle constante, perhaps because the verb has become re-analysed as a conj. IA3 verb *lləs*.

{27} *a-tăber pl. *i-tăber-ăn 'pigeon' [K 293]
Tuareg: N *e-dăber* pl. *i-dəbran*; WY e-*dăber* pl. *i-dəbran*; W *a-dăber*; MUH *te-dăbert*
pl. *ti-dəbren*
(N)WM/Kb: MA *a-tbir* pl. *i-tbirn*; Tashl. *a-tbir* pl. *i-tbirn*; Kb. *i-tbir* pl. *i-tbirən*
Zenatic: Fig. *a-tbir* pl. *i-tbirən*; Rif. *a-dbir* pl. *i-dbirn*; Mzab *a-tbir* pl. *i-tbirən*;
Chenoua *adbir* pl. *idbirən*;Timimoun *itbi* pl. *itban*
(Boudot-Lamotte 1964: 514)
Libyan: Ghd. *adaber* pl. *dabérăn*; Nef. *adbír, dbir* pl. *idbírən*
Awjila: *adbír* pl. *dbírən*

There are only a few dialects that have an *e-/i-* prefix for this noun, but dialects that have it cut

across several dialect boundaries. For this reason it seems reasonable to consider those original. Where the *a-* prefix was innovated, mostly, in dialects where the *e/i* contrast was no longer visible.

{28} **a-gŭlem* pl. **i-gŭlem-ăn* 'skin' [K 364]
Tuareg: N *a-ǧlem* 'prayer skin'; W *e-glem*, Y *a-glem* 'tanned skin'
(N)WM/Kb: MA *a-gʷlim*, Tashl. *a-gʷlim*, Kb. *a-gʷlim* 'skin'
Zenatic: Chenoua *aglim* pl. *iglimən*
Libyan: Nef. *uglim* 'skin'
Awjila: *glim* 'skin'

The *u* in Nefusi is not well-understood, nor is the missing prefix in Awjili.

{29} **a-gŭnen* 'nest, basket' [K 415]
(N)WM/Kb: Tashl. *agʷnin* 'basket of alpha grass'
Zenatic: Mzab *agnin* 'a large wicker basket'; Ouargla *agnin* 'nid'; Siwa *agnen* 'basket sp.' (Lameen Souag, p.c.)
Libyan: Ghd. *tažnént* 'wicker basket'; Nef. *ugnin* 'wicker basket'

The *u* vowel in Nefusi is not well-understood, cf. {29} above.

The Ghadamsi reflex of **g* as *ž* is irregular.

{30} **a-kəẓew* 'young man' [K 580]
Tuareg: N *a-kẓew, a-kẓay* 'bastard'; H *a-kẓew* pl. *i-kẓewăn* 'bastard'
(N)WM/Kb: MA *ta-gẓiwt* 'young girl'
Zenatic: Mzab/Ouargla *a-yẓiw* 'boy'

As there is no sign of labialization, it seems that there was no stem-internal **ŭ*.

{31} **a-eɣəd* 'ashes' [K 634]
Tuareg: N *eẓ(ẓ)əd* pl. *eẓ(ẓ)əd-ăn*; WY *eẓəd* pl. *eẓəd-ăn*
(N)WM/Kb: Tashl. *iyd*; MA *iɣəd*; Kb. *iɣəd*; Senh *iɣəd*
Zenatic: Fig. *iɣəd*; Rif. *iɣɣəd*; Mzab *iɣəd*; Ouargla *iɣəd*; Snous *iɣəḏ*; Chenoua *iɣəd*; Siwa *iɣəd*
Libyan: Ghd. *éšəd*; *iɣəd*

Tuareg and Ghadames have a **ẓ/š* reflex of the **ɣ*. This palatalisation is discussed by Vycichl (1990). It is unclear what exactly triggers this palatalisation (see Kossmann 1999: 218 for a discussion). See also {23}. This noun is related to the verb **ăqqəd* 'to burn'.

{32} **a-eḍəs* 'sleep'
Tuareg   NYH *eḍəs*; W *eṭəs*;
(N)WM/Kb: MA *iḍəs*; Kb. *iḍəs*
Zenatic: Rif. *iḍəs*; Snous *iḍəs*

This is a derivation from the verb **ăṭṭəs* 'to sleep'.

{33} **ta-esəm-t* **'salt'**
Tuareg: NHWY *t-esəmt* pl. *t-esmen*
(N)WM/Kb: Tashl. *t-isənt*; MA *t-isənt*; Senh. *tisənt*
Libyan: Ghd. *tesənt*

{34} **ta-βădd-e* **'standing; height' [K190; 272]**
Tuareg: N *te-hădde* MU *te-bădde* WY *t-edde*
(N)WM/Kb: MA *t-iddi*; Tashl. *t-iddi*; Kb. *t-iddi* 'part of a weave that is not yet rolled up'
Zenatic: Fig. *t-iddi*; Ouargla *t-iddi*; Izn *t-iddi*
Zenaga: *tīddih, täwddäh*

This is the verbal noun of the verb **ăβdəd* 'to stand'. In some of the Tuareg dialects the *b* of the verbal form, MU *əbdəd*, has been restored.

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