Macrothink Institute™
International Journal of Linguistics
ISSN 1948-5425
2012, Vol. 4, No. 2

An Optimality Theoretic Analysis of Broken Plurals in Muscat Arabic

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Received: March 22, 2012 Accepted: April 16, 2012 Published: June 1, 2012
doi:10.5296/ijl.v4i2.1769 URL: http://dx.doi.org/10.5296/ijl.v4i2.1769

Abstract

Muscat Arabic exhibits unique prosodic tendencies in the formation of broken plurals which, as a result of their uniqueness, have not received adequate theoretical exploration in the literature of broken plural formation. Building on McCarthy's pre-Optimality Theoretic claims on broken plurals in Classical Arabic, I argue that an 'affixed mora [μ]' attached at a certain locus in the broken plurals enforces two expansions of the iambic foot to be realized in two distinct shapes of broken plurals in Muscat Arabic. I further show that the affixed [μ] associates in a position that does not disrupt the prosodic and syllabic canons of the language as a whole. This is manifested in a ranked set of constraints couched in a unified Optimality Theoretic analysis which reflects the grammar of Muscat Arabic.

Keywords: Muscat Arabic, Broken plurals, Prosodic morphology, Affixed [μ], Optimality Theory

International Journal of Linguistics
ISSN 1948-5425
2012, Vol. 4, No. 2

1. Introduction

Like other dialects of Arabic, Muscat Arabic (henceforth, MA) expresses ‘plural’ meaning more often by imposing an internal change on the singular form rather than attaching a fixed plural affix. This phenomenon is known as the broken ‘internal’ plural. It can be seen in the data below, which represent broken plurals[1] in MA. The stem of the singular forms, particularly the C_1VC_2 shape[2] at the left edge (underlined below), is altered into a different shape C_1VC_2V: in the broken plurals.

(1) MA broken plurals

Sing.	*Pl.*	*Gloss*
a. daftar	dafa:tar	‘notebooks’
b. kursi	kara:si	‘chairs’
c. tannu:r-ah	tana:ni:r	‘skirts’
d. malʕaq- ah	mala:ʕaq	‘spoons’

Broken plurals in (1) resemble in their prosody the broken plurals of Classical Arabic (CA) explored in depth in the literature of broken plural formation (Ratcliffe 1988; McCarthy and Prince 1990a; Abd-Rabbo 1990; Abu-Mansour 1995; McCarthy 2000; Kihm 2006 and the literature reviewed therein). These plurals form a typical iamb[3] at their left edge (e.g. [**(da.fa:)**.tar] and [**(ka.ra:)**.si]).

(2) CA broken plurals (McCarthy and Prince 1990:217)

Sing.	*Pl.*	*Gloss*
a. ʒun.dub	**(ʒa.na)**.dib	‘locusts’
b. sul.ta:n	**(sa.la:)**.ti:n	‘Sultan’

[1] Broken plurals are phonemically transcribed, following previous scholarship on this phenomenon and Arabic in general (McCarthy and Prince 1990a and McCarthy 2000).

[2] C and V stand for Consonants and Vowels respectively. [:] indicates vowel length.

[3] An iamb is a type of foot which is right-headed. It can either be disyllabic (L**L** and L**H**) or monosyllabic (**H**). Much cross-linguistic research into stress systems show that the best shape of disyllabic iambs is (L**H**), known as ‘uneven or typical’. According to Hayes (1995:82), a typical iamb obeys the Iambic/ Trochaic Law which stipulates that “elements contrasting in duration naturally form groupings with final prominence”. Thus, a foot with two long syllables and final prominence violates this law as it has even duration. Hayes (1995) argues that languages with iambic feet (such as Hixkaryana) resolve to lengthening in order to produce the optimal/ canonical shape L**H**. Evidence also comes from the fact that listeners often hear and parse a combination of open-closed syllables as L**H** rhythms. In Optimality Theory, the typical iamb is more common cross-linguistically and is encoded in the constraint UNEVEN-IAMB which posits that (L**H**) is a ‘better iamb’ than (L**L**) or (**H**) (Kager 1999).

It is important to note that in MA nouns can either be masculine or feminine. Gender is indicated by either (1) the inherent gender of the noun or (2) the suffix *–ah* which marks the feminine gender. This suffix is not considered to be part of the consonantal root morpheme which indicates the meaning of the whole word in Arabic (McCarthy and Prince 1990a; Abd-Rabbo 1990, among many traditional Arab grammarians), and is not mapped onto the plural template. MA, like other dialects of Arabic and Semitic, is non-concatenative. The stem has three non-isolable constituents: the consonantal root defined as "the fundamental lexical unit" (McCarthy and Prince 1990b:2), the templatic shape onto which the root consonants are mapped and finally the vowels which indicate voice and aspect. The fundamental notion is that morphemes are not represented linearly as a "sequence of phonemic segments separated by a morpheme boundary" (Ratcliffe 1992:32), except for the suffix indicating the feminine gender and the sound plural suffixes *a:t* and *u:n*.

Semantically, CA broken plurals fall into two major types: plurals of paucity (denote the numbers from 3 to 10) and plurals of multitude (indicate more than 10). Attia (2005) also states that Classical Arabic broken plurals take on a specific templatic shape based on "whether the noun describes a profession or an attribute, and whether the attribute is static or transient." (p.8). However, such distinction in meaning is missing from MA broken plurals.

In addition to the broken plurals with a typical iamb, MA has a wide range of unique broken plurals whose prosodic shapes are vastly different from those of the typical broken plural. For example, plurals derived from singulars with a single heavy syllable and a consonant cluster at their left edge (e.g. [nʕa:l] 'shoe, *sing*.') contain two heavy syllables adjacent to one another [**(nuʕ).(la:)**.n] 'shoes, *pl*.'.

The vowels contained in MA broken plurals fall into two distinct types of fixed vocalism: morphological and phonological. The first type is manifested by the invariant vowel [a] which occupies all the vowel slots of the first foot (CV.CV:) or (CCV:) at the left edge of MA broken plurals. The phonological fixed vocalism relates to the variable vowels in the final short syllable whose vocalic quality is highly dependent on the place features of the consonant that follows it. Al Aghbari (in press) assumes that the fixed vowel [a] results from a competition between an alignment constraint which aligns [a] to the right edge of every syllable in the broken plurals and the constraint AGREE-VC# (Place) which monitors identity in place feature between the vowel and consonant word-finally. The current paper only concerns analyzing the prosody of MA broken plurals. I refer interested readers to (Al Aghbari in press) for a complete Optimality Theory (OT) analysis of the vocalism of MA broken plurals.

This paper has a two-fold goal. It documents two distinct shapes of broken plurals in MA derived from diverse shapes of singular forms, and offers a formal analysis of these shapes using the framework of Optimality Theory (Prince and Smolensky 1993/2004; McCarthy and Prince 1993a&b). It theoretically advances McCarthy's (2000) pre-Optimality Theoretic claims that the distinction between singulars and broken plurals lies in an affixed [μ] attached at a particular locus in the singular forms. It specifically argues that the 'affixed [μ]' proposal accounts for diverse shapes of broken plurals in MA. The 'affixed [μ]' enforces two expansions of the iambic foot to be realized in two distinct shapes of broken plurals in MA.

This paper is organized as follows. § 2 discusses some phonemic and prosodic facts of MA, an underrepresented dialect of Arabic that has never received serious study in the literature to date. I choose to highlight only particular facts of MA that will be central to the discussion of broken plural formation. I then describe the diverse shapes of broken plurals in § 3. I introduce the basic theoretical assumptions and technical details of McCarthy's pre-OT analysis of the broken plurals in CA in § 4.1. In § 4.2, I present the theoretical assumptions on which the current Optimality Theoretic analysis hinges. I analyze the process of broken plural formation in § 5. I analyze the most common shapes of MA broken plural in § 5.1 and argue against an alternative analysis (RealizeMorpheme) in § 5.2. I demonstrate how my analysis of MA broken plurals can be extended to successfully capture the shapes with epenthetic glides, with medial geminates and even iambs in § 5.3, § 5.4 and § 5.5 respectively. In § 6, I conclude my discussion of MA broken plurals and preset the theoretical implications of my analysis.

2. Muscat Arabic Segmental and Supra-segmental Facts

MA is a dialect of Arabic spoken by Omanis who are native to Muscat, the capital of the Sultanate of Oman. The formation of broken plurals in MA reveals an inextricable intertwining of word formation and prosody. Therefore, presentation of some segmental and supra-segmental facts of MA is indispensable to the discussion of broken plurals. § 2.1 discusses MA peculiarities at the segmental level while § 2.2 exposes the syllabic facts and stress patterns in MA.

2.1 Segments

Glottal stop /ʔ/ is realized in MA as vocalic length (e.g. [raas][4] 'head' and [jaakil] 'he eats' for [raʔs] and [jaʔkul] in CA. Initial /ʔ/ is relatively uncommon. In certain forms, /h/ or /w/ is preferred where other dialects of Arabic have initial /ʔ/, e.g. [hen]/ [wen] 'where' for [ʔajn] in CA and other dialects of Arabic (Clover 1988: 40). Where CA inserts /ʔ/ in certain broken plurals to conform to the mapped shape, MA inserts /j/ (e.g. [saħa:ʔib][5] 'clouds' in CA is [saħa:**j**ub] in MA). The emphatic /ð̣/ corresponds to the emphatic phonemes /ẓ/ and /ḍ/ in CA (e.g. [ð̣ju:f] 'guests' for [ḍuju:f] in CA). MA has five long vowels /a:/, /i:/, /o:/, /u:/ and /e:/ and three short ones /a/, /i/ and /u/ which contrast in length with three of the long vowels (Clover 1988:55)[6].

2.2 Syllables and Stress

Syllables in MA begin with a consonant or consonant cluster followed by either a short or long vowel. MA exhibits a wide range of syllable structures like CV, CVC, CV:, CCV:, CV:C,

[4] Throughout this paper, I use a dot **.** for syllable boundaries, [ ] for prosodic words and ( ) for feet.

[5] The singular form in Modern Standard Arabic (MSA) is [saħa:b-at] and in MA is [saħa:b-ah].

[6] The quality of vowels in MA is phonologically conditioned by the surrounding consonants. For example, short vowels adjacent to pharyngeal consonants in open or closed syllables are lowered to [a] (e.g. [ʕ**a**nub] 'grapes' in MA for /ʕ**i**nab/ in MSA).

CCV, CCV:C and CVCC (e.g. [ʕa.zam] 'he invited', [ma.ra:.si:m] 'royal decrees', [mo:x.r-ah] 'nose', [txi:ṭ) 'she sews', [so:q] 'suq', [ɡanb] 'side', [nʕa:l] 'shoe, sing.' and [mdar.s-ah] 'school'). Word-initial syllables may begin with a cluster of two consonants due to the deletion of a following short vowel in an open syllable. Clover maintains that "the syllable boundary in a medial cluster of two consonants falls between them, in a medial cluster of three consonants between the second and third consonants, e.g. [xab.bar] 'he told' and [xubz.ha] 'her bread'. Finally, MA bans onsetless syllables.

Like other dialects of Arabic, MA has a single main stress per word. Clover (1988) argues that stress in MA is "never farther from the end of the word than the antepenultimate syllable and because of syncope[7] most commonly falls on one of the last two syllables." (1988: 69). She presents the following facts about stress assignment in MA:

1. starting from the end of a word, stress falls on the last syllable if it is super-heavy (e.g. [taʕ.bá:n] 'tired'; otherwise,
2. it falls on the next (rightmost) syllable if heavy (e.g. [tit.qáj.ja.ð̣] 'she spends the summer'. If neither is heavy,
3. it falls on the light syllable at the left edge of the word (e.g. [ṭá.ṭi] 'she gave'.

The above stress assignment rules reveal that MA has a quantitative stress system which forms moraic trochees from right to left with final consonant extrametricality[8], similar to Iraqi Arabic (Tucker to appear) and Palestinian Arabic (Rosenthall and van der Hulst 1999)[9].

3. The Broken Plural Pattern

In MA, there is immense diversity in the shapes which result from mapping singulars onto broken plurals. The diversity in the broken plural shapes often stems from the distinct shape of the singular forms from which these plurals are derived. However, a large number of broken plurals do not relate to their singular shapes. My discussion of the broken plural shapes outlines the most common patterns of broken plurals in MA.

The generalization that governs the formation of the broken plural is that the left foot $C_1V_1C_2$ of the singular forms ([daf] as in form (4a.) below) or CV: ([ʃa:] as in form (4f.) below) or C_1VC_2V ([maki] as in form (4d.) below) is extracted and mapped onto a typical iamb C_1VC_2V: ([dafa:], [ʃawa:] and [maka:]) respectively[10]. The iamb constructed involves a

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[7] Clover (1988) argues that MA involves much syncope whereby short vowels in open syllables often get deleted.

[8] Extrametricality as a notion of the metrical theory was first put forth by Liberman and Prince (1977). It "designates a particular prosodic constituent such as a Foot or syllable as invisible for the purpose of rule application" (Hayes 1995: 57).

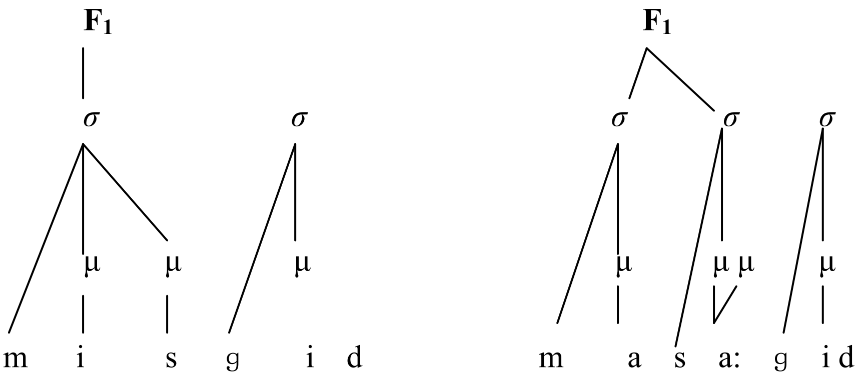
[9] Please refer to (Rosenthall and van der Hulst 1999) for the Optimality Theory metrical constraints operative in trochaic systems and the ranking these language systems take for stress assignment.

[10] The shapes CVC, CVV and CVCV can be 'iambs' or 'trochees' in foot theory. A trochee is a left-headed foot which has either two light syllables with the stress falling on the left syllable (**LL**) or a single heavy syllable (**H**). A trochee also can be bimoraic (CVC) with two morae (mora is a unit of weight). The most typical shape of a trochee is **LL** based on extensive cross-linguitic research into stress systems. Languages with trochees (such as English and Fijian) shorten a long vowel where the resultant light syllable is footed with a following light

sequence of two syllables; heavy H preceded by a light syllable L and resides at the left edge of the broken plural. This iamb is, then, concatenated to the rest of the singular form, maintaining the weight of the final syllable (Glover 1988: 159; McCarthy and Prince 1990a and Benmamoun 1999). McCarthy and Prince (1990a) conclude that, as a basic requirement for the formation of broken plural in CA, a typical iamb **L H** has to be realized in the broken plural shapes. I provide the following prosodic representation to illustrate the mapping of singulars onto broken plurals. This representation shows that the first *trochaic* foot [mis] of the singular from [misɡid][11]'mosque' is expanded into an *iamb* [ma.sa:] in the broken plural.

(3) Prosodic representation of misɡid → masa:ɡid 'mosques'

Sing. *Pl.*



(mis). ɡi.d **(ma.sa:).**ɡi.d

The broken plurals listed below resemble in their formation the 'canonical/ typical' broken plurals in CA. Following McCarthy and Prince (1991) and McCarthy (2000), I continue to dub these broken plurals as 'typical or canonical' since the mechanism applied to forming them follows straightforwardly from the general rule assumed to form the broken plurals in CA. They frequently map their first foot onto a typical iamb (L**H**) (e.g. **[(ʃub).**ba:k]→ [(ʃ**a.ba:).**bi:k] 'windows'. Quite a large number of diverse singular forms which range in their shapes from tri-consonantal to quadri-consonantal are observed to pluralize by this mechanism. Moreover, nonce and borrowed words in MA take this shape in their plural formation (e.g. [**(sak).**ʃan] → [**(sa.ka:).**ʃin] 'sections'. There are many details to be explored in full account regarding the extra morphology[12] taking place in some forms in addition to the general mechanism applied to form the broken plurals.

(4) The typical shapes of broken plurals in MA

a. daftar dafa:tar 'notebooks'

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syllable in an even trochee (**L**L) (Kager 1999).

[11] In MA, /ɡ/ is realized as a voiced velar stop. This is attributed to the speech of an old tribe of Arab called 'Azed of Yemen' which settled in Oman a hundred years ago, and to which most Omanis belong (Shaaban 1977). It also "appears to carry more local prestige (Clover 1988:53).

[12] The extra morphology involves the distinct vocalic melodies in the broken plural which differs greatly from that contained in the singular form. I present an OT account of the vocalism of MA broken plurals in Al Aghbari (in press).

b. maqlam-ah	maqa:lum	'pens' cases'
c. qandi:l	qana:di:l	'torches'
d. maksi	maka:si	'dresses'
e. maki:n-ah	maka:jin	'machines'
f. ʃa:ðar	ʃawa:ðar	'bed blankets'
g. sakki:n	saka:ki:n	'knives'
h. kurfaj-ah	kara:fi	'beds'
i. maqʂaf	mqa: ʂuf	'small vendors'

Despite the fact that the singular forms bear various prosodic shapes, the mechanism forming the broken plurals in MA is the same. The first foot of the singulars C_1VC_2 (e.g. form 4a.) (daf)tar is changed into (dafa:)tar to indicate plurality. The length of the final syllable of both the singulars and plurals is preserved. This is manifested in forms (4c.) and (4g.) where the length of the final syllable in the singular forms is transferred to the broken plurals without shortening. The quality of the long vowel of the final syllable in the broken plural is consistently /i:/.

The singular forms (4d.) and (4f.) contain only three consonants coming from the base singulars whose shapes are **C**V**C**.**C**V (4.d), **C**V**C**V:**C**-ah (4.e) and **C**V:**C**V**C** (4.f). Again, the shape of the first foot (C_1VC_2) of (4.d) is expanded into a different shape (C_1VC_2V:); (mak) becomes (maka:). The first foot of the broken plural in (4f.) expands by inserting a default glide to conform to the mapped shape. (ʃa:)ðar contains only one consonant and a long vowel in the first foot and requires another consonant for shaping the foot into (C_1VC_2V:); (ʃawa:)ðar results. The singular form (4e.) has a long high vowel in its second syllable [Ci:] (e.g. [ma**ki:**n-ah]). After mapping C_1VC_2V [maki] of the singular form onto C_1VC_2V: [maka:], the residue of the singular [in] requires a glide to form the onset of the third syllable in the broken plural [maka:jin]. The final syllable CV in the broken plurals corresponds to the final syllable in the singular form where both the length and quality of vowel is kept unaltered[13]. Kihm (2006) argues that the formation of broken plurals with extra glides "is reducible to one process: root internal site activation with glide insertion as a phonological effect." (pp.72). The internal site activation where a glide gets inserted corresponds to the long vowel in the singular form, and it happens to avoid onsetless syllables (phonological effect).

The singular form (4g.) has a medial geminate [sa**kk**i:n] with the first half of the geminates closing the first foot of the singular and the second half filling the onset position of the second syllable. The geminates being adjacent to each other in the singular is separated by the vowel /a:/, and splits into two feet in the broken plurals [$(saka:)_1(ki:)_2n$]. The length of the final syllable of the singular forms is maintained in these plurals. McCarthy (2000: 178) notes

[13] [(ma.ki:).n] is blocked from surfacing as a broken plural for this singular form to avoid homophony since [(ma.ki:).n] is an adjective meaning 'strong, stable, firm'. It is also one of the attributes of Allāh 'the God of Muslims'.

that the original geminates in the singulars become 'long-distance'[14] in the broken plurals. Each half of the geminate belongs to a different foot.

The singular form (4h.) has four consonants in its underlying form (excluding the consonant of the feminine suffix *-ah*) but maps onto a broken plural shape with only three consonants. The final consonant in the singular form is consistently the glide /j/ preceded by an open syllable with a short vowel [a] or [i]. The trochaic foot (kur) expands into (kara:) in the broken plural. The length of the final syllable is the same in both the singular and plural forms. The deleted consonant is constantly the final consonant /j/ in the singular forms.

In MA, some singular forms like (4i.) whose shape is exactly similar to those discussed above map onto a different shape of broken plurals (CCV:).CV(V).C[15]. These plurals differ from the canonical broken plurals (CV.CVV.).(CV(V)).C in that they collapse the first two syllables of the first foot at the left-edge into one heavy foot by deleting the first vowel. MA tolerates consonant clusters word-initially. This happens as a result of syncope which deletes the short vowel between C_1 and C_2. Shaaban (1977) formalizes the following rule to capture the deletion of the vowel between C_1C_2 in the broken plurals in MA.

(5) $V_1 \rightarrow Ø$ / $C_1V_1.C_2VV$ resulting in a cluster and heavy syllable CCVV[16].

The first foot of the singular in (4i.) [maq] maps onto [mqa:] and not the usual expected pattern [maqa:]. The final syllable in these forms maintains its length when the mapping onto the broken plural takes place. Although broken plurals, which pattern like this, all begin with a sonorant /m/, this observation is later refuted by broken plurals clustering various types of consonants at their left edge (e.g. [**xm**u:r] 'wines', [**ql**u:b] 'hearts', [**ʃr**u:ṭ] 'conditions', [**ṭb**u:l] 'drums' and [**ṭj**u:r] 'birds'.

MA is also characterized by a wide range of broken plurals with highly different shapes from those described above. They are derived from singulars with a long vowel in the only syllable they have, and have fewer consonants than those in the typical broken plurals.

(6) Other shapes of broken plurals in MA

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[14] The identical segments belong to two distinct feet in the broken plurals. They are not adjacent to one another, and are broken up by a vowel in the broken plural form. That is why they are long distance.

[15] This should not be interpreted as "one singular may have different plurals" although it has been claimed in (Ojeda 1992) that forms in Modern Standard Arabic (MSA) do have one to many singular > plural mappings. For example, the singular form in MSA (e.g. [be:ð̣ -at] 'egg' can have two plurals: [be: ð̣] 'collective plural' and [be:ð̣ -aat] 'sound plural'. Also, a singular form in MSA may have a sound and broken plural at the same time (e.g. [ʃagr-at] 'tree' → [ʃgr-aat] and [ʔʃgaar]. (pp.317)). Ojeda also mentions that when a sound plural alternates with a broken plural, speakers of Cairene Arabic gives the sound plural a semantics of "paucal". However, singulars in MA can either have a sound or broken plural. MA does not make this fine distinction between singular, singulative, dual, collective, plurals of multiplicity/ multitude and plurals of paucity. Moreover, MA no longer marks dual.

[16] This rule does not apply in all contexts in MA broken plurals.

a. nʕa:l	nuʕla:n	'sandals'
b. gda:r	gidra:n	'walls'
c. ko:b	kiba:n	'cups'
d. na:r	nira:n	'fires'

The singular forms (6a.) and (6b.) have only one heavy syllable and three consonants. They are shaped into C.CVV.C. When these singulars are pluralized, the consonant clusters CC word-initially are broken up by an epenthetic vowel[17]. Because the broken plural shape requires four consonants to fill the target broken plural shape CVC.CVV.C, a morphemic /n/ fills the final consonant position[18].

The singular forms (6c.) and (6d.) only have two consonants and a long vowel between them, shaping into CVV.C. When these shapes form broken plurals, they map onto the shape CV.CV:.n. The first vowel position is filled by a fixed vowel /i/ while the long vowel is realized as /a:/. The final C position is again filled by a morphemic /n/.

The broken plurals in (6) are peculiar to MA; there are no similar shapes attested in the literature of broken plurals in CA or any dialects of Arabic. To illustrate, [ko:b] 'cup' is pluralized as [ʔakwa:b] in CA, [kuba:j-a:t] in Egyptian Arabic and never *kiba:n as in MA.

What is inconsistent with these broken plurals is that they do not follow the general mechanism applied to form broken plurals of CA. They more specifically pose a challenge to the assumption made by McCarthy and Prince (1990a) that a C_1VC_2 or C_1VC_2V or C_1VV of the singulars is mapped onto C_1VC_2VV (a typical iamb) since these forms map C_1C_2 VV and CVV plus an extrametrical consonant onto $C_1VC_2.C_3VV$.n (two even **H** iambs) and Ci.CVV.n, whereby a morphemic /n/ serves as the final consonant in these shapes. The overall final plural shapes have iambic foot which means there is often that tendency to form iambs in the

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[17] Oddly enough, the context of the inserted vowel is exactly the same as the deleted one. This indeed seems like a serious issue for phonological theories which take parallelism to be paramount (as opposed to serial or derivational approaches).

[18] /n/ cannot be epenthetic since it is a fairly marked consonant. Besides, there are three pieces of evidence that show that this /n/ is morphemic. First, Clover (1988) states that in MA there is an insertion of the morpheme -in which precedes pronominal clitics attached to participles, e.g. [ka:tb-in-ha] 'he has written it'. Secondly, the morphemic /n/ can also be understood as a remnant from 'dual' in the Classical Arabic's dual marker [u:n, genitive] or [a:n, accusative] (Andrew Rippin, personal communication; Jayakar, 1889: 659). Examples of dual in Arabic include [ṭa:ʔirat-a:n] 'planes, dual', [qalam-a:n] 'pens, dual' and [kub-a:n] 'cups, dual'. Thirdly, Shaaban (1977) considers this /n/ as a remnant of nunation from Classical Arabic. Nunation is the morphological marker of indefiniteness- accomplished by adding /n/ following the last vowel (Guda 1988: 186). The fact that /n/ is morphemic and not epenthetic entails that it is present in the underlying singular from which the broken plural is derived.

broken plural shape.

A wide range of broken plurals exhibits patterns that are notoriously inconsistent with the canonical broken plurals. The following singulars map their CCVC (-ah) or CVC.C (-ah) onto CCVV.C with a consonant cluster word-initially and a long vowel in the only syllable of these broken plurals.

(7) Exceptional plural shapes in MA

a. mlaf	mla:f	‘folders /binders’
b. mxam- ah	mxa:m	‘brooms’
c. mʃuṭ	mʃu: ṭ	‘combs’
d.baħθ	bħu:θ	‘research papers’
e. nuqṭ -ah	nqu: ṭ	‘dots’
f. ṣaħan	ṣħu:n	‘plates’
g. ṭabal	ṭbu:l	‘drums’
h. ɡabal	ɡba:l	‘mountains’

The singular forms (7a.) to (7c.) have consonant clusters word-initially and (7d.) and (7f.) have the clusters word-finally. They map onto the same target shape CCV:C when forming broken plurals. While forms (7a.), (7b.) and (7c.) maintain the clusters and lengthen the vowel following them, the rest of the forms delete or metathesize the vowels in between C_1C_2 and shape into one heavy syllable. The singular forms (7f.) to (7h.) whose shape is CVCVC also map onto CCVV.C. The vowel contained in the only heavy syllable of the broken plurals varies between /a:/ and /u:/. The vocalic quality is *ad hoc* and cannot be determined from the surrounding consonants. Both (7a.) and (7b.) have a labial /m/ and /f/ following the long vowel but each gets different vocalic qualities. Other examples of this type include [ṣba:ʕ] ‘fingers’, [mṣa:r] ‘turbans’, [mṣa:l] ‘sieves’, [qfu:l] ‘locks’, and [mka:b].

McCarthy and Prince (1990a) propose that broken plurals in CA surface with a typical iamb. This follows from the principle of ‘Template Satisfaction Condition’ which requires that forms satisfy the minimal requirement of the target shape. The MA broken plurals are peculiar in two ways. They may surface with any expansion of iambs (with L**H** or **H)** to meet the ‘Template Satisfaction Condition’.

4. Theoretical Background

4.1McCarthy's Technical Details

This paper builds on proposals made in McCarthy (2000) who shows how a range of Prosodic Circumscription[19] analyses can be recast into non-derivational OT by retaining the

[19] Prosodic Circumscription extracts the trochaic foot from the singular forms and maps it onto an iamb. It retains the weight of the final syllable of the singular which is then concatenated to the rest of the constructed iamb.

prosodic structure of output forms. This section briefly reviews the basic assumptions made by McCarthy (2000) with respect to broken plural formation in CA, and technical details of his analysis are addressed in the actual analysis in a subsequent section.

Although McCarthy (2000) is only pre-OT proposals about broken plural formation and does not include a ranking for his claims, his assumptions based on the moraic faithfulness constraints can address successfully two prevalent shapes of MA broken plurals which surface with any expansion of the iambic foot: typical or even. From the outset, McCarthy (2000) identifies the major prosodic facts characterizing the broken plural formation in CA such as preservation of the weight of the final syllable, the insertion sites of the extra consonants in broken plurals and the tendency to preserve consonantal spreading in geminates.

He argues that high-ranking prosodic faithfulness constraints like "do not delete a mora in the output plural (MAX$_{OO}$-μ)" and "do not insert a mora in the output plural (DEP$_{OO}$-μ)" can obtain preservation of the weight of the final syllable in broken plurals (McCarthy 2000: 174). Moreover, he uses constraints that capture the conservation of consonantal positions in the mapping of the singulars and broken plurals. These constraints ensure that the order of the consonants contained in the singular is not disturbed when they map onto broken plurals.

In his conclusion, McCarthy suggests the possibility of using positional faithfulness constraints to obtain the identity or faithfulness effects of certain privileged positions like 'stem-final' syllables (see McCarthy 2000: 180). However, he does not formalize any positional faithfulness constraints in his paper nor does he provide tableaux to capture the ranking of the constraints he proposes.

The analysis of MA canonical shapes of broken plurals makes crucial advancements to McCarthy's prosodic facts on broken plural formation. It builds on the assumption that the difference between singulars and broken plurals lies in an extra mora 'affixed + μ' attached at a definite position in the singular forms to yield the final shapes of broken plurals. It develops McCarthy's 'affixed mora' proposal into a complete OT analysis, and reveals that the locus of the affixed mora must not disrupt the syllabic well-formedness in MA. The following section outlines the basic theoretical tools the analysis of MA broken plurals adopts.

4.2 Theoretical Assumptions

In addition to McCarthy's technical details outlined above, this paper hinges on a number of theoretical assumptions that govern its overall arguments and develop the final analysis. This section presents the major theoretical assumptions made to analyze the prosody of the canonical broken plurals in MA.

The foremost theory it adopts is the Optimality Theory framework (OT), a constraint-based approach (Prince and Smolensky 1993/2004; McCarthy and Prince 1993a&b) in which linguistic forms are evaluated by constraints and the optimal form (the one which does best on the highest-ranked constraints) is the output. In OT, there are two basic sets of competing constraints: Markedness and Faithfulness constraints. Markedness constraints evaluate marked structures in the outputs while faithfulness constraints monitor identity in correspondent forms. They basically militate against change.

To account for the MA broken plurals, I use Output-Output Correspondence (Benua 1997). Below, I address how Output-Output Correspondence relates to the analysis of MA broken plurals.

4.2.1 Output Output Correspondence (Benua 1997)

Benua (1997) extends the correspondence relations from Input-Output and Base-Reduplicant (McCarthy and Prince 1995) to correspondence between independent surface forms. According to Benua, the identity of words in a paradigm is captured by constraints regulating output-output relations. These constraints interact directly with markedness constraints.

There are at least three compelling arguments that suggest that output broken plurals in MA are derived from their output singular forms and not from the consonantal root[20]. The first argument relates to the preservation of marked structures in the derivation from singulars to broken plurals. For example, there is total identity of weight in the final syllables of both the singulars and their broken plurals. Moreover, both the singular forms and broken plurals share the same consonants with exactly the same segment order (refer to (8) below). The last argument relates to the iambic foot constructed at the left edge of the broken plurals which reflects aspects of the foot at the left edge of the singular forms. Benmamoun (1999) argues that nouns and verbs in CA are derived from the imperfective and not from their consonantal root. His evidence comes from the fact that marked structures such as vocalic melodies and gemination are retained from the imperfective. He further argues that the singular forms serve as the underlying form to plurals in Arabic. Some properties of the singular forms survive in the plurals. Furthermore, the long vowel in the final syllable of the singular form is carried over to the final syllable of the plural form.

McCarthy and Prince (1990a) note some problems of the dependency on the consonantal root as the input for broken plural formation in CA. They illustrate that the "iambic plural systematically reflects aspects of the singular that the consonantal root does not determine." Ussishkin (1999) offers cogent arguments for output-output correspondence when analyzing denominal verbs[21] in Hebrew. His arguments rely on some empirical observations such as the fact that the vowel and second consonant of the output nouns relate directly to their denominal verbs. Moreover, consonant clusters in these nouns are also preserved in their denominal verbs. These crucial observations lead Ussishkin to adopt an output-output correspondence relation between denominal verbs and their output nouns.

I provide the following representation to show that the weight of the final syllable of the broken plural is only derivable from the output singular (not from the input consonantal root). Compare the final syllable of the input root which has only one mora as opposed to the final

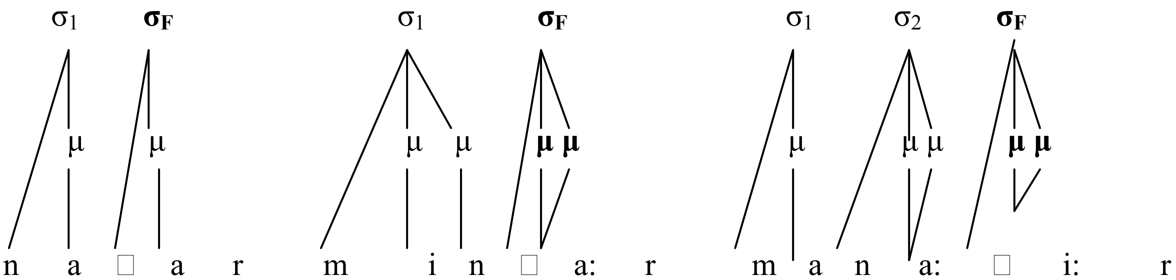
[20] For an alternative approach, see Tucker (To appear) who argues that the verbal paradigm in Iraqi Arabic can be derived from an input consisting of /root/ + a. Using the framework of Root and Prosody, he claims that the input to verbs in Iraqi Arabic consists of a consonantal root and a vowel affix. He further argues that templates result from satisfaction of high-ranking prosodic Markedness constraints.

[21] Denominal verbs are verbs derived from nouns.

syllables of both the singular and broken plural which contains two morae each. This identity lends support to the fact that the input root cannot derive MA broken plurals.

(8) Output-Output relation between the input consonantal root[22], singular and broken plural

Input stem [naʃ**ar**] ‘sow’ *Sing.* [minʃ**a:**r] *Pl.* [mana:ʃ**i:**r]



5. Analysis of Broken Plurals

5.1 Typical (Canonical) Broken Plurals

Three general observations obtained by examining the shapes of broken plurals in (4) are made below:

1. The first foot at the left-edge of the singular forms which has the shapes C_1VC_2 or C_1VC_2V or C_1VV is mapped onto a typical iamb [C_1VC_2V:]. The iamb constructed as a result of mapping from singulars onto broken plurals expands the original foot. It contains a light syllable L followed by a heavy one H.

2. The final syllable of the broken plurals is not affected by the mapping of the first foot of the singulars onto an expanded foot. Thus, the weight (McCarthy 2000) or length (McCarthy and Prince 1990a, Benmamoun 1999) of the singular and broken plural is identical.

3. The position of the epenthetic glide in the broken plurals is determined by the position of the long vowel in the singular forms. For example, the first syllable (ʃa:) is long and contains just one consonant. The broken plurals epenthesize a glide /w/ to fill in the second consonant position pertaining to the second syllable of the first foot to the left-edge in the shape C_1VC_2V: (ʃawa:). However, if the second syllable of the

[22] Following Arab grammarians, I assume that the perfective form of a verb is the root. However, Benmamoun (1999: 191-2) has a different stand on this issue. He argues that the imperfective form (and not the consonantal root) serves as the input to word formation processes in Modern Standard Arabic (MSA). His evidence comes from the fact that the vocalic melodies contained in the locatives and nominals suggest that they are derived from the imperfective (e.g. muʕ**allim** ‘teacher’ → juʕ**allim** ‘he teaches, imperfective’). Moreover, the imperative also looks closely to the imperfective (e.g. ta**drus** → ʔu**drus** ‘study’). In light of these facts along with the wider distribution the imperfective enjoys (the imperfective occurs in the context of matrix present tense sentences, sentences with modal particles and circumstantial adjuncts, for example), Benmamoun (1999) concludes that word formation in Arabic is word-based rather than root-based. The imperfective does not carry either tense or aspect and is simply inflected for agreement.

singular forms is long (e.g. [ma**ki:**n-ah], the broken plurals epenthesize /j/ to fill the onset of the third syllable in the broken plurals CV.CVV. jV.C. [maka:**j**in] results.

The pre-OT claims about the broken plurals in CA made in McCarthy (2000) state that the distinction between the singular and plural forms lies in an 'affixed μ' added to a certain locus in the plural forms (McCarthy 2000: 186). In OT, this is translated into the constraint banning insertion, defined as follows:

(13) DEP$_{OO}$ (μ) For every μ in output$_2$, there is a correspondent μ in output$_1$.

I further assume that the singular output comes with an affixed mora that must be parsed or realized in the output broken plural. The constraint that militates against the deletion of the affixed mora in the output plural is MAX (μ), defined as follows:

(14) MAX$_{OO}$ (μ) For every μ in output$_1$, there is a correspondent μ in output$_2$.

In tableau [1] below, candidate (a) parses the affixed mora in the output plural form; it surfaces with one extra mora than the output singular. The 'affixed mora/+**μ$_{PL}$**' in the underlying output singular needs to be parsed in the output broken plural. On the other hand, candidate (b) surfaces with exactly the same number of morae as those contained in the output singular form, violating the highly ranked constraint MAX$_{OO}$ (μ). Candidate (c), on the other hand, parses two morae in both the first foot and final syllable and impinges one more violation to DEP$_{OO}$ (μ) than the actual output does. This reveals that MAX$_{OO}$ (μ) » DEP$_{OO}$ (μ).

Tableau [1]

O:[(mul).ħaq]+**μPL** 'appendix'	MAX$_{OO}$ (μ)	DEP$_{OO}$ (μ)
☞ a.(ma.la:).ħa.q		*
b.(mal).ħa.q[23]	*!	
c. (ma.la:).ħa:.q		**!

The inclusion of MAX$_{OO}$ (μ) is crucial because not only does it ensure the realization of the affixed mora that comes attached to the singular form, it also bans deletion of morae from the final syllable of broken plurals which are derived from singulars with a final long syllable. Candidates that parse the affixed mora in their first foot but lose a mora in their last syllable are ruled out by MAX$_{OO}$ (μ). I assume that this constraint is gradient and is violated in three contexts:

1. The broken plural does not parse the affixed [μ] attached to the output singular forms and surfaces with exactly the same number of morae as those included in the singular form (e.g. [(bar).(qu:).ʕ] + μ → *[(bar).(qu:).ʕ] and [(mul).ħa.q] → *[(mal).ħa.q])

2. The broken plural has fewer μ than its singular form. This happens when the broken plural

[23] More potential candidates will be considered in the subsequent discussion of the analysis.

International Journal of Linguistics
ISSN 1948-5425
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lose a mora from its final long syllable and does not parse the affixed mora (e.g. [(bar).(qu:).ʕ] + μ → *[(bar).(qi).ʕ]).

3. The broken plural parses the mora in the first foot but loses a mora from its final syllable. It surfaces with exactly the same number of morae as those included in the singular form (e.g. [(bar).(qu:).ʕ] + μ → *[(ba.ra:).(qi).ʕ]).

To see how DEP$_{OO}$ (μ) and MAX$_{OO}$ (μ) interact, observe the following representations which show the number of morae in the output singular [mul.ħaq]:

(15)

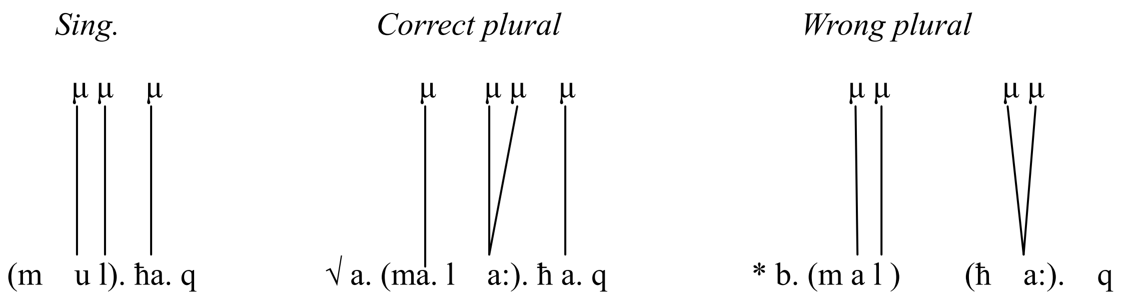

Tableau [2]

O:[(bar).(qu:).ʕ]+**μ**$_{PL}$ ‘veil’	MAX$_{OO}$ (μ)	DEP$_{OO}$ (μ)
☞ a. (ba.ra:).(qi:).ʕ		*
b. (ba.ra:). (qiii).ʕ		**!
c. (ba.ra:).(qi).ʕ	*!	
d. (bar).(qu:).ʕ	*!	
e. (bar).(qi).ʕ	*!	

In tableau [2], the broken plural is derived from a singular with a final long syllable. This length is carried over to the final syllable of the broken plural. The affixed mora must be attached to the first syllable of the broken plurals. Therefore, candidate (a) which maintains length of the final syllable and affixes a mora to the first foot is winning. Candidate (b) goes to the extreme by affixing two morae (one to its first foot and another to the final long syllable). It incurs one more violation to DEP$_{OO}$ (μ) than the winning candidate. Thus, it is out. Candidates (c), (d) and (e) illustrate different scenarios where MAX$_{OO}$ (μ) is violated. Candidate (c) shortens the last syllable but adds one mora to its first foot. Both the singular and plural have four morae each. Thus, it incurs one violation to MAX$_{OO}$ (μ). Candidate (d) does not parse the affixed mora but maintains the length of its final syllable. This entails exact number of morae in both the singular and broken plural and a violation of MAX$_{OO}$ (μ). Candidate (e) fails to attach the extra mora to the output plural form. It also deletes a mora from its last syllable. Thus, it surfaces with fewer morae than those contained in its singular output.

Thus far, I have confirmed that MAX$_{OO}$ (μ) » DEP$_{OO}$ (μ) derives the optimal broken plurals of

MA. However, a crucial observation about the actual surface shape of broken plurals is in order here. The affixed mora makes an iamb (L**H**). For example, *[(ma:.la).ħa.q] cannot be a broken plural in MA although its first foot inserts a mora but the parsed mora is not realized in the second syllable of the first foot. Moreover, *[mal.ħa:.q] 'appendix' derived from [mul.ħaq] is ruled out despite the fact that it has one more mora than its output singular. That is because the extra mora need be attached to the first foot to make an iamb, and the final syllable of the broken plural need have the same length as its output singular form. It violates UNEVEN-IAMB (L**H** is better than L**L**, H) which stipulates that the constructed foot in the broken plural must be a typical iamb and is violated when the 'affixed mora' produces feet other than iamb.

(16) UNEVEN-IAMB L**H** is better than L**L**, H (Kager 1999:151)

This constraint has been used to account for metrical structure and stress assignment in many languages. For example, in disyllabic words of two open syllables in Hixkaryana, there is a preference to lengthen the initial syllable and leave the final syllable unfooted over forming a canonical iamb. This tendency can be translated into two competing metrical constraints: NONFINALITY (No foot is final in a prosodic word) and UNEVEN-IAMB (L**H** is better than L**L**, H).

Constraint (16) is templatic; it requires a specific foot structure (namely an iamb) to be realized in the output broken plural. It would be more desirable to assume that templatic effects such as CV-shapes and type of foot structure are derived from interactions of other constraints in the Universal Grammar, as stipulated by Generalized Template Theory (GTT) (McCarthy and Prince 1994a). However, (16) is necessary in the derivation of MA broken plurals since it rules out potential feet like (CV:.CV) and (CV.CV) which may emerge as a result of affixing a mora to (CVC). The iambic foot is not derivable from the interactions of constraints proposed so far. Despite the nicety of GTT, its wide applicability in Semitic remains to be uncertain and debatable by the MA broken plural formation. Observe the following ranking:

Tableau [3]

O:[(mul).ħaq] + $\mathbf{\mu}_{PL}$ 'appendix'	MAX$_{OO}$(μ)	UNEVEN-IAMB	DEP$_{OO}$(μ)
☞ a. (ma.la:).ħa.q			*
b. (mul.).ħa.q	*!		
c. (mul).(ħa:).q		*!	*
d. (ma.la:).ħa:.q			**!
O:[(bar).(qu:).ʕ]+$\mathbf{\mu}_{PL}$ 'veil'	MAX$_{OO}$ (μ)	UNEVEN-IAMB	DEP$_{OO}$ (μ)
☞ a. (ba.ra:).(qi:).ʕ			*
b. (ba.ra:).(qi).ʕ	*!		
c. (bar).(qu:).ʕ	*!	*	
d. (bar).(qi).ʕ	*!	*	
e. (ba.ra:).(qiii).ʕ			**!

The ranking above holds true for broken plurals derived from singulars with either a short or a long final syllable. The optimal output (a) in tableau [3] restricts the inclusion of an extra mora to the first foot and forbids disruption of weight/ length in the final syllable. No insertion or deletion of a mora from the final syllable is permitted at all. This is due to the ranking UNEVEN-IAMB » DEP_{OO} (μ) which stipulates that adding a mora can only affect the initial foot and not any other position in the broken plural in order to make an iamb. Similarly, MAX_{OO} (μ) ensures the sub-optimality of broken plurals which expand their first feet by affixing a mora but losing another mora from their final syllables.

5.2 RealizeMorpheme: An Alternative Analysis?

Another alternative analysis for the formation of broken plurals entails substituting MAX_{OO} (μ) which ensures parsing the plural mora into the plural form with RealizeMorpheme (RM) which requires morphemes (the affixed mora in our case) in the input to be realized in the output. RealizeMorpheme may be used to analyze the broken plural formation in MA but it has many problems. I will discuss two reasons why RM may work and then argue against it.

First, the parsing of a mora in the broken plural forces a change in the singular-plural mappings which make the broken plural obey RealizeMorpheme. Secondly, Kurisu (2001) stipulates that the ranking RM » Faith addresses morpho-phonological cases where no stem modification occurs but a morpheme is parasitic on a stem segment. He states that “this strategy is in a sense more harmonic than any forms which undergo some phonological reshaping of the stem because no phonological faithfulness violation is incurred” (pp.50). Broken plural formation in MA is expressed through expansion of the first foot (minimal stem change) but faithfulness to the consonants, consonants’ order and final syllable length is clearly observed. The plural marker (affixed mora) is parasitic on the stem singular form and parsed at a locus that incurs less costly violation. Thus, RM can work perfectly well here.

However, I argue that RealizeMorpheme is fine if I only assume that MAX_{OO} (μ) does nothing but rules out the exceptionally faithful candidate which does not parse the affixed mora. I illustrated above that MAX_{OO} (μ) is crucial and is violated in three contexts which RM, due to its abstractness, may not be able to clearly identify. The more relevant contexts here are the output plural which surfaces with fewer morae than the output singular form and those which have exactly the same number of morae as those in their output singulars. This may happen as a consequence of shortening the final syllable of broken plurals derived from singulars with final long syllables. These plurals do, in fact, parse the affixed mora and expand their initial foot. However, they still violate MAX_{OO} (μ). The fact that the plurals which shorten the final syllable obey RealizeMorpheme since they are distinct from their output singulars weakens the potentiality of this constraint. We will need to resolve to redundant and abundant constraints to rule out distinctly shaped plurals. MAX_{OO} (μ), on the other hand, succinctly captures the formation of broken plural without recourse to access constraints which may complicate the ranking rather than offer straightforward answers to the broken plural formation questions. It also competes successfully with the constraint militating against parsing the affixal mora in the last syllable of plural form. Moreover, RealizeMorpheme has a number of conceptual problems. For instance, Kurisu assumes that the change imposed in the output form results from morphology. This entails that morphemes may produce marked structures which cannot be extended to/ supported by the phonology of the language as a whole. Consider, for example, the formation of deverbal[24] nouns in Icelandic which produce more marked structures that violate *Complex-Coda which is completely obeyed elsewhere in the language (Kurisu 2001). However, broken plural formation takes into account the syllabic and prosodic well-formedness of the phonology of the language as will be shown shortly. This is mostly manifested by the behavior of the exceptional broken plurals whose formation reflects conformity with the language as a whole. Finally, RealizeMorpheme is abstract and is satisfied by any sort of change in the output form. Therefore, I take caution and refrain from endorsing it in the analysis of MA broken plurals. A broken plural that realizes the mora and does any other radical and costly change that never actually happens in MA (e.g. truncation of a whole syllable or losing a consonant from the singular base) will satisfy RealizeMorpheme blindly. To sum up, RealizeMorpheme is so powerful that it admits any change to happen in the output form, and is not desirable in the analysis of MA broken plurals.

I further observe that DEP_{OO} (μ) admits potentially different shapes of feet to emerge. Observe these kinds of feet resulting from the violation of DEP_{OO} (μ):

(17) C_1VC_2 +μ

C_1VC_2	***+μ***	*resultant feet*
a. *C_1V **+μ** C_2		(C_1VVC_2)
b. * **+μ** C_1VC_2		($VC_1.VC_2$)
c. √ C_1VC_2**+μ**		($C_1V.C_2$ VV)
d. *C_1V**+μ** C_2		($C_1VV.C_2$ V)
e. *C_1VC_2 **+μ**		(C_1VC_2V)

Syllabic well-formedness constraints govern the locus of the affixed mora. These constraints regulate the permissible syllable shapes and prosodic structures in MA. They serve as a filter excluding potential broken plurals. To illustrate, the foot (17.a) produces a trimoraic structure (three morae in a syllable), a highly marked structure cross-linguistically. The foot structure (17.b) fatally violates the requirement for having an onset; every syllable starts with a consonant in MA. The foot structures (17.d and e) are ruled out by (16) above.

(18) ONSET Every syllable has an onset (McCarthy and Prince 1993a).

Syllables such as .V. and .VC. violate (18) since they do not have a C at their left edge.

(19) *μμμ]σ Syllables do not have three morae. (McCarthy and Prince 1990a&b)

A non-final syllable like CV:C violates (19) since it has three morae. The following tableau illustrates the interaction between syllabic well- formedness constraints and the constraints responsible for plural formation in MA.

[24] Verbs derived from nouns.

Tableau [4]

O:[(mul).ħa.q]+μ_{PL}‘appendix’	MAX$_{OO}$(μ)	ONSET	*μμμ]σ	UNEVEN-IAMB	DEP$_{OO}$ (μ)
☞ a. (ma.la:).ħa.q					*
b. (mal).(ħa:).q				*!	*
c. (ma:.la).ħa.q				*!	*
d. (ma.la).ħa.q	*!			*	
e. (ma:l).ħa.q			*!		*
f. (mul).ħa.q	*!				
g. (am.ul).ħa.q		**!		*	**

This tableau illustrates that the locus of the added mora is not random, and is governed by the prosodic and syllabic well-formedness requirements in the language. The prosodic well-formedness constraints along with the general mechanisms of forming the broken plurals (these are basically three mechanisms: ‘preserve the weight of the final syllable’, ‘parse an affixed mora’ and ‘form an iamb’) produce the correct output. The affixed mora settles in a position that suits the structure of the language as the whole. Candidate (e) has a trimoraic syllable and candidate (g) has two onsetless syllables, violating high-ranking well-formedness constraints. Candidates (b), (d) and (f) fail to realize a mora in their first feet. Thus, they are doomed. Candidate (c) does not form an iamb and it is out too. Candidate (a), on the other hand, obeys all the high-ranking well-formedness constraints and violates the low ranked constraint DEP$_{OO}$ (μ). It is selected as the winning candidate.

This tableau concludes the discussion of the typical broken plurals in MA. MAX$_{OO}$ (μ), UNEVEN-IAMB and well-formedness constraints produce the final prosodic shape of MA broken plurals.

The current analysis remains challenged by the broken plurals derived from singulars with a feminine suffix *–ah*. To illustrate, the singular form [mal.ʕa.q-ah] ‘spoon’ has underlyingly four morae. When it is mapped onto the broken plural, it also surfaces with four morae [ma.la:.ʕa.q], undermining the ‘affixed mora’ proposal. The plural of this form still expands its first foot and maps it onto a typical iamb; however, the total number of morae it has is not affected by this mapping. However, if I adopt Ratcliffe’s (1988) analysis and delete the suffix before mapping *[mal.ʕa.q] onto [ma.la:.ʕa.q], the affixed mora proposal will successfully address these plurals. By resolving to new approaches to exceptionality in Optimality Theory, I assume that *–ah* is invisible to the singular-plural mapping due to Stem≡PrWd[25] (Kurisu 2001:246). According to Kurisu, double marked morphology like German plurals which have both a suffix plural marker and stem change can be accounted for if we assume that the suffix is invisible as a plural marker. This entails that a stem + the plural suffix alone violates

[25] Kurisu (2001:206) states “this constraint is formally understood as constraint conjunction of Anchor-L (stem, PrWd), Anchor-R (stem, PrWd) and contiguity stem”.

RealizeMorpheme which needs to be ranked below Stem≡PrWd to ensure double realization of plurality in German. In the case of broken plural formation, Stem≡PrWd has to be ranked higher than $Max_{OO}(\mu)$ so that the deletion of the suffix *–ah* is invisible to Max_{OO} (μ) and thus does not incur a violation to it.

5.3 Shapes with Default Glides

In MA, there is a group of broken plurals which exhibits an additional consonant. Specifically, an extra glide {w} or {j} is inserted in the surface forms of these broken plurals. This glide does not exist in the singulars from which these broken plurals are derived. Observe the following patterns of broken plurals with the extra glide inserted:

(20) Broken plurals with default glides

a. maki:n- ah	maka:jin	'machines'
b. ħadi:q- ah	ħada:jaq	'parks'
c. ʃa:ðar	ʃawa:ðar	'bed blankets'
d. ʃa:raʕ	ʃawa:raʕ	'roads'

The singular forms in (20) have three consonants (excluding the consonant in the feminine suffix *–ah*). The broken plurals need to map onto a prosodic shape with four consonantal slots. Therefore, they expand by inserting a default glide. For example, the singulars (a) and (b) have a long high vowel in their second syllable [Ci:]. After mapping C_1VC_2V [maki] onto C_1VC_2VV [maka:], the residue of the singular form [in] requires a glide to form the onset of the third syllable in the broken plural [maka:**j**in]. The insertion of /j/ is peculiar to the broken plurals in MA. In CA, a glottal stop /ʔ/ / is inserted to form the onset to the third syllable of the broken plurals (McCarthy and Prince 1990a and McCarthy 2000) (e.g. [maka:ʔin]). In the singular forms (c) and (d), the first foot of the singular form [(ʃa:).ða.r] contains only one consonant and a long vowel [ʃa:], and requires another consonant to shape into the foot (C_1VC_2VV); [ʃawa:].ðar results.

McCarthy (2000) makes a fourth crucial observation with respect to the mapping of the consonantal segments from the singular onto the broken plural shapes. He attributes the complex relation between the long vowels in the singulars and epenthetic glide in the broken plurals to a conservation of consonantal positions in the singular → plural mappings. He accounts for this relation by proposing the following undominated associational faithfulness constraints. I define them as follow:

(21) NO-SPREAD$_{OO}$ (μ, SEG) segment to μ linkage is preserved in the singular-plural mapping.

(22) NO-DELINK$_{OO}$ (μ, SEG) segment to μ linkage is not delinked in the singular-plural mapping.

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ISSN 1948-5425
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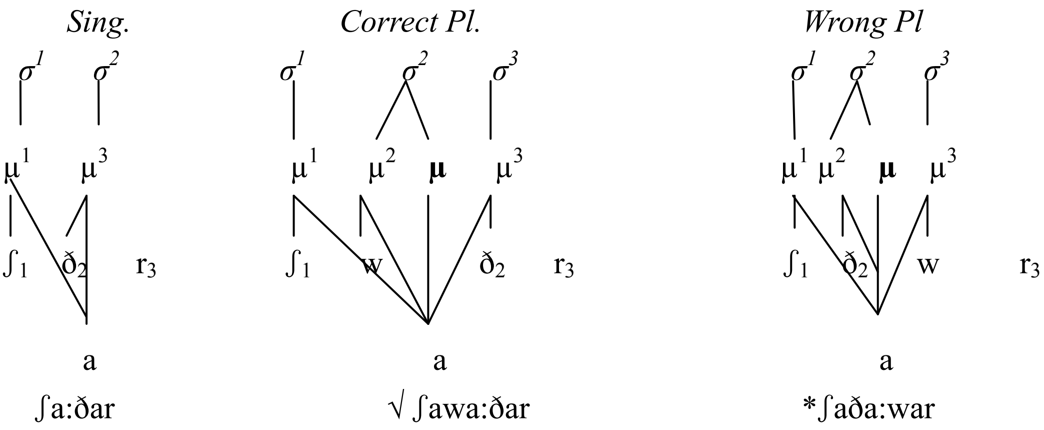
The effect of these constraints is felt in representation (23)[26]. These constraints ensure that if, for example, the third segment of the singular is associated with the μ^2, then it also should be associated with the same μ^2 in the broken plural.

(23) Correspondence Relations in ʃa:ðar ⟶ ʃawa: ðar, *ʃaðа:war



In these representations, onsets [ʃ, w, ð] are associated with μ (standing for a morpheme), forming together with the following vowels a CV sequence. Final consonant [r] is extrametrical and does not participate in the prosody of the words in Arabic[27]. In the representations, it is not linked to μ. The extra μ (bold-faced in the representations of the broken plurals above) is affixed to the first syllable of the singular [ʃμμ]. When the affixed μ attaches to σ^1, it forms a syllable with three morae, a highly complex structure cross-linguistically. To resolve this problem, a glide /w/ gets inserted after the μ^1, making a second syllable. Both σ^1 and σ^2 form an iamb. The third broken plural form (incorrect) has μ^3 linked to w instead of $ð_2$ (mismatching the association lines in the singular forms). The superscripts as well as subscripts help keep track of this correspondence relation. Both NO-SPREAD$_{OO}$ (μ, SEG) and NO-DELINK$_{OO}$ (μ, SEG) are undominated, and govern the preservation of the association lines. It is important to note that the ranking established for the typical MA broken plurals holds true for these forms.

Tableau [5]

O:[(ʃa:).ða.r]+ μ_{PL}‘blanket’	MAX$_{OO}$(μ)	NO-DELINK$_{OO}$(μ,SEG)	DEP$_{OO}$ (μ)
☞ a. (ʃa.wa:).ða.r			*
b. (ʃa.ða:).wa.r		*!	*
c. (ʃa).(ða:).r	*!		
d. (ʃa:).ða.r	*!		

/ð/ which is linked to the final syllable in the singular form is associated with the second

[26] The consonants and vowels (melodic elements) associate with the CV tier in accordance with the Universal Association Convention of phonology which stipulates that melodic elements associate with the skeletal tier one to one, left to right. These tiers represent the notion ‘morpheme’ notated as μ which is “a set of feature matrices dominated by a single node” (McCarthy 1981: 384). So, μ does not correspond to mora in this representation.

[27] The consonant in the coda position of the singular and plural forms is not moraic for metrical reasons and for the fact that assigning it a mora will result in a superheavy syllable when the syllable already has a long vowel.

syllable in the broken plural in candidate (b). This incurs a fatal violation of NO-DELINK$_{OO}$ (μ, SEG). Therefore, this candidate is out (refer to the representation (23) above). The winning candidate (a) maintains the association lines observed in the singular form. Both candidates (c) and (d) violate MAX$_{OO}$ (μ). There are doomed too.

In Semitic, the first stem consonants cannot be identical. Therefore, [ʃaʃa:ðar] is ruled out. To address the fact that initial consonants are never doubled in Semitic in general and in Modern Hebrew denominal verbs in particular, Ussishkin (1999) proposes a type of Anchoring constraint (STRONG ANCHOR-L), which disallows doubling of a consonant at the left edge.

An important detail remains; an epenthetic glide is inserted to fill the empty onset position. The requirement for having an onset is more important than the constraint against inserting an extra consonant in MA and in CA too (McCarthy 2000).

(24) DEP$_{OO}$-GLIDE[28] Every glide in output$_2$ has a correspondent in output$_1$

This constraint is a faithfulness constraint which ensures that glides in the output broken plural have correspondents in the output singular forms. It is violated when the output broken plural surfaces with an extra glide.

Tableau [6]

O: [(ʃa:).ða.r] + μ$_{PL}$ ‘blanket’	ONSET	DEP$_{OO}$-GLIDE
☞ a. (ʃa.wa:).ða.r		*
b. (ʃa.a:).ða.r	*!	

The second syllable in candidate (b) has no onset. It fatally violates ONSET[29] while candidate (a) wins because all its syllables have onsets. It inserts a glide at the expense of violating the low-ranked constraint DEP$_{OO}$-GLIDE.

When the second syllable of the singular forms has the vowel /i:/, broken plurals insert the glide /j/ to fill in the onset position of the third syllable of the broken plurals as exemplified below[30].

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[28] This constraint is highly specific and may make the reader assume that every other segment type has an associated constraint and that the grammar of MA includes such constraints at undominated position. However, the constraint is meant to be highly specific and is always dominated in MA. The language tends to insert only default glides {w} and {j} and not other consonants in a variety of morpho-phonological contexts such as broken plurals, shallow verbs and participles. Therefore, the grammar of MA, for economic reasons too, does not have such constraints for each and every segment of the language as it does not need such stipulation.

[29] Onset is highly ranked in the formation of broken plurals in Muscat Arabic.

[30] It is important to note that the inserted ‘onset’ segments share the same place of articulation with the following vowels. For example, {w} is inserted to fill in the onset position of the second syllable of the broken plural when the singular form has long [a:]. Both have [+ back] in common. The inserted [j] corresponds to the [i:] in the singular and both share [+coronal].

The shape C_1VC_2V [maki] is mapped onto $C_1V.C_2V$: [ma.ka:]. The residue of the singular form [in] requires an epenthetic consonant to fill the onset position of the third syllable in the broken plural. However, not any onset is legitimate in this position. There is a restriction on inserting an onset consonant which has the same place features as the vowel contained in the residue [in].

(25) Representation of the place features

[i, j]

[cor] [+ high] (Lombardi 1996; Alderete et al. 1999; Ussishkin 1999)

This representation shows that both /i/ and /j/ share the same place features; both are coronal and high. This tendency is translated in OT by the constraint IDENT-COR or IDENT-HIGH (Ussishkin 1999) which requires coronal/ high segments in the singular form to have coronal/ high correspondents in the output plurals. This constraint outranks *PL/COR which assesses a violation for any segment with [+ coronal] in the output broken plural.

The following tableau shows the ranking of the constraints that compete to produce the broken plurals with default glides.

Tableau [7]

O: [ma.ki:$_9$.n-ah] +μ_{PL} 'map'	MAX$_{OO}$ (μ)	UNEVEN IAMB	IDENT - COR	ONSET	DEP$_{OO}$-Glide	*PL/COR
☞ a. (ma.ka:).j$_9$i.n					*	***
b. (ma.ka:).w$_5$i.n			*!		*	**
c. (ma.ka:).i$_9$.n				*!		**
d. (ma:.ki).n	*!	*				**

Candidate (b) inserts a glide /w/ to fill in the onset position of the residue of the singular form. Thus, it violates IDENT-COR since the place feature of the glide /w/ is labial/ round and not coronal/ high. Candidate (c) has the residue without an onset. It exhibits a violation of 'have onsets'. Candidate (d) violates UNEVEN IAMB. It is out too. The optimal output is structurally well -formed as it obeys all the high ranking constraints at the expense of violating the low ranked *Pl/Cor and DEPOO-Glide.

The epenthesis of glides stems from the need to have onsets. However, the inserted glides should not disturb the existing associational relations in singular → plural mappings because of the high-ranking constraints NO-SPREAD$_{OO}$ (μ, SEG) and NO-DELINK$_{OO}$ (μ, SEG).

5.4 Shapes with Medial Geminates

In MA, singulars with medial geminates preserve their geminates when they map onto broken plurals. However, certain syllabification restrictions pertaining to gemination come into play to govern the acceptable final shape of broken plurals.

26. Broken plurals with gemination

a. sakki:n saka:ki:n 'knives'

b. θalla:ɡ-ah θala:li:g 'refrigerators'

Singular forms in (26) have a medial geminate [sa**kk**i:n] with the first half of the geminate belonging to the first foot of the singular and the second half filling the onset position of the second syllable. The geminate being adjacent to each other in the singular form are separated with a long vowel /a:/ in the broken plural form ([sa.ka:)$_1$.(ki:)$_2$.n]) as a result of the expansion of the left foot C_1VC_2 of the singulars onto a different shape C_1VC_2VV; maintaining the length of the final syllable in the singular forms.

Plurals with a geminate are yet another proof for the success of the affixed mora proposal. When the affixed mora is added to the first foot of the singular forms with geminate, several potential output shapes might surface. However, again, syllabic well-formedness constraints ensure the locus of the affixed mora.

The following tableau illustrates the ranking constraints to produce the optimal broken plural with geminate.

Tableau [8]

O:[(duk).(ka:).n]+μ_{PL} 'shop'	MAX$_{OO}$ (μ)	ONSET	*μμμ]σ	DEP$_{OO}$ (μ)
☞ a.(da.ka:).(ki:).n				*
b. (da:k).ki:.n			*!	*
c. (da:).kki:.n	*!			
d. (da.ka:).ki.n	*!			
e.(da.ka).a.(ki:).n		*		*
f. (duk).(ka:).n	*!			

Candidate (b) has a trimoraic syllable, violating the constraint against trimoraicity. Therefore, it is out. Candidates (c) and (d) have exactly the same number of morae as those contained in the singular forms. They violate MAX$_{OO}$ (μ), a highly ranked constraint in the formation of MA broken plural. Candidate (e) fails to insert a mora in its first foot and has an onsetless syllable. Candidate (f) also fails to parse the affixed mora and violates MAX$_{OO}$ (μ). Thus, it is also doomed. However, the optimal output obeys all the high-ranking well-formedness constraints and incurs a violation to DEP$_{OO}$ (μ) by adding an extra mora to first foot of the broken plural.

5.5 Plurals with even (H) iambs

One of the evident peculiarities of MA broken plurals is that it allows the formation of broken plurals with either expansion of iambs. They can either realize a typical iamb **L H** or the even

International Journal of Linguistics
ISSN 1948-5425
2012, Vol. 4, No. 2

one **H**.

The mapping of the trochaic foot from the singular to the even iamb in the broken plurals is motivated by the unusual shapes of the singular. When the singular undergoes the 'affixed + **μ'** formalism, they are forced to be shaped in a way that conforms to the prosodic and syllabic canons of the language. Therefore, the mechanism applied to form these broken plurals is exactly similar to the proposal adopted to account for the typical broken plurals. The general shape of the singular form as well as the prosodic well-formedness constraints of the language as a whole govern the locus of the 'affixed + **μ**'.[31]

27. Broken plurals with even iambs

a. nʕa:l	nuʕla:n	'sandals'
b. tra:b	tubrba:n	'sands'
c. gda:r	gidra:n	'walls'

The singular forms (27) have a consonant cluster at their left edge followed by a long vowel. The broken plurals end in a consonant that the singulars do not have in their surface forms. Since /n/ is morphemic, it should be present in the underlying singular output.

When a mora is affixed to the first foot of the singular form, the resultant shape of the broken plural has to satisfy all the prosody canons of the language in order to be admitted as an actual surface form. The locus of the affixed mora is highly determined by the prosody of the language. The only difference between this distinct shape from the canonical broken plurals is that it does not make a typical (**L H**) iamb. Rather, the first foot is **H H** (two even iambs).

The following illustrates potential positions of the extra mora in the plural forms:

(28)

a. nʕa:ln +**μ**	*nʕa:l.na	*μμμ]σ
b. nʕa: +**μ**ln	*nʕa:.al.n	ONSET
c. +**μ** nʕa:ln	*an.ʕa:l.n	ONSET and*μμμ]σ
d. n +**2μ** ʕa:ln	√ nuʕ.la:.n	
e. n +**3μ** ʕa:ln	*(na.ʕa:).(la:).n	Access moras
f. n +**2μ** ʕa:ln	*(na.ʕa).(la:).n	UNEVEN IAMB

Each of the wrong candidates above violates high-ranking prosodic constraints which the language ensures not to violate when affixing a mora. Candidate (a) violates *μμμ]σ. Candidates (b) and (c) have onsetless syllables. Although candidate (e) obeys the syllabic well-formedness constraints similar to the optimal form, it adds more morae than the optimal output does. Candidate (f) does not surface with an iambic foot. Thus, it is out too.

[31] When loan words with consonant clusters are borrowed into CA, the clusters are broken up by a vowel in order to adhere to the phonotactics of the language which forbids clusters word-initially. Therefore, CA always exhibits a typical iamb in the formation of broken plurals.

Tableau [9]:

O: [nʕa:l] /n/+μ_{PL} 'shoe'	ONSET	*μμμ]σ	UNEVEN IAMB LH > H > LL	DEPOO (μ)
☞ a.(nuʕ.la:).n				**
b. (nʕla:).an	*!			*
c. (an.ʕa:l).n	*!	*	*	**
d. n.(ʕla:n)		*!		*
e.(na.ʕa:).(la:).n				***!
f. (nu.ʕa).la.n			*!	*

Candidates (b) and (c) fatally violate ONSET. Candidate (d) has a syllable with three morae. Such a structure is highly marked and is not permitted in MA. Candidate (e) is ruled out because it has more morae than the optimal output[32]. Candidate (g) violates UNEVEN IAMB. The optimal candidate completely adheres to the well-formedness constraints of the language and incurs two violation marks to the low-marked DEP_{OO} (μ).

This tableau illustrates that the locus of mora insertion accords with the prosodic structure licensed in the language.

Another intriguing shape of MA broken plurals is derived from singulars with a sole long syllable.

(29) Broken plurals derived from a sole long syllable

a. ħo:ʃ	ħiʃa:n	'backyards'
b.ɣu:l	ɣila:n	'snakes'
c.zo:ʕ	ziʕa:n	'vomitings'

When these singular forms map onto the broken plurals, they surface with an extra mora and map onto a typical iamb.

Tableau [10]

O: [na:r] /n/ +μ_{PL}'fire'	ONSET	*μμμ]σ	DEPOO (μ)
☞ a.(ni.ra:).n			*
b. (nra:n)		*!	*
c. (an).(ra:).n	*!		**
d. (na.wa:).ra:.n			***!

[32] It is important to note that although candidate (f) is more harmonic as it surfaces with the regular typical iamb, it is out because it is dual in CA. MA no longer marks duality. It only has two numbers: singular and plural. The input of the dual should be different, in a way that results in a candidate with an extra mora being optional. Therefore, there is no need to have a constraint that specifically excludes this candidate since it is less faithful in the ranking proposed here.

All candidates have extra morae. However, the locus of the affixed mora differs from one candidate to another. The high-ranking well-formedness constraints ensure a well-established position for the extra mora that conforms to the prosody of the language. All the above candidates with the exception of candidate (a) (the optimal candidate) violate one of the high-ranking constraints. For example, the first syllable of candidate (c) is onsetless. Candidate (b) has a trimoraic syllable. Candidate (d) is ruled out because of the excessive number of morae it adds. The optimal output obeys all the well- formedness constraints at the expense of violating the low ranked constraint DEP$_{OO}$ (μ).

In MA, singular forms with exactly similar shapes as those forming the typical shapes map onto a different shape of broken plurals. Instead of the usual (CV.CV:).CV.C shape, they map onto (CCV:).CV.C.

(30) Broken plurals with consonant cluster

a. mqamʃ-ah	mqa:miʃ	'spoons'
b. mbaxr-ah	mba:xar	'baskets with holes'

These broken plurals collapse the first two syllables contained in the expected typical iambic foot into even iamb and surface with a cluster at their left-edge. Shaaban (1977) observes free variation between broken plurals with the typical iamb and plurals collapsing the two syllables into one even iamb. For example, [mqa:miʃ] and [maqa:miʃ] are both possible broken plurals[33]. Phonologically, MA admits consonant clusters word-initially and *Complex is minimally violated. Therefore, a broken plural with an initial cluster freely surfaces in the speech of some MA speakers.

This tendency for shaping the first foot of the broken plurals into CCVV instead of the typical foot CVCVV can also be analyzed phonologically. MA is attested to have an active process of vowel deletion (Shaaban 1977; Glover 1988) in which [a] drops in unstressed positions. Adjectives and plural nouns of MA, as reported in Shaaban, exhibit free variations between the following patterns:

(31) Plural nouns

a. m**a**da:ris	*vs.*	mda:ris	'schools'	
b.m**a**ra:waħ	*vs.*	mra:waħ	'fans'	(Shaaban 1977: 91)

(32) Adjectives

a. sqi:m	*vs.*	s**a**qi:m	'sick'

[33] According to Shaaban (1977), there is a socio-linguistic factor involved in this variation. Despite exposure to education and CV syllable shape, young Omanis of Muscat in 1977 still have a great preference and tendency to retain their parents' way of pronouncing these plurals with the clusters at their left edge. Currently, there are many tribal groups in Muscat, and it really matters which tribe you belong to. Some tribes intensively delete the vowel between C_1 and C_2 word-initially and others do not exhibit such a tendency in their speech.

b. qdi:m *vs.* qadi:m 'old'

The plural nouns in (31) drop [a] between C_1 and C_2 without exhibiting any shift in meaning. The adjectives in (32) alternate in whether to have [a] between C_1 and C_2 or leave it out. Shaaban (1977) proposes the following linear rule to account for this variation in the broken plural formation.

(33) $V_1 \rightarrow Ø$ / $CV_1.CV$: resulting in a cluster at the left edge of the plural forms and heavy syllable CCV:. Observe the following ranking:

Tableau [11]

O: [(mad).ra.s-ah] +μ_{PL} 'school'	MAX$_{OO}$ (μ)	UNEVEN IAMB	*μμμ]σ	DEP$_{OO}$ (μ)
☺ a.[(ma.da:).ri.s]				*
☞ b. [(mda:).ri.s]	*!	*		
c. [(ma:d).ri.s]			*!	*
d. [(ma.da).ri:.s]		*!		*
e. [(mad).ra.s]	*!			

Both candidates (a) and (b) are actual outputs in MA. However, the candidate with the typical iamb is the most harmonic because candidate (b) loses on MAX$_{OO}$ (μ).

MA has a group of broken plurals with only a sole heavy foot and clusters at their left-edge. These broken plurals are similar to the forms discussed above in that they collapse the expected typical iamb into even type.

(34) Broken plurals with a cluster and long vowel

a. mlaf mla:f 'folders /binders'

b. mnaz mna:z 'cribs'

c. naqʃ nqu:ʃ 'decorations'

d. baħθ bħu:θ 'research papers'

e. gabal gba:l 'mountains'

f. gamal gma:l 'camels'

To sum up, McCarthy's (2000) proposal that the distinction between the singular forms and broken plurals lies in an affixed mora provides an adequate analysis to the most common broken plurals in MA. It can successfully account for the broken plurals exhibiting two distinct types of iambs (typical and even). The affixed mora chooses a locus that does not disturb the existing association lines in the singular → plural mapping and conforms to the syllabic well-formedness constraints.

The analysis of MA broken plurals is theoretically crucial as it develops a full analysis of the formation of broken plurals. Such theoretical exploration is unfortunately lacking in the literature of broken plural formation. I am not aware of any work that develops an integrated Optimality Theoretic analysis of broken plurals in Classical Arabic or broken plurals in any other variety of Arabic. Moreover, the variety of Arabic explored in this paper is pretty much underrepresented. Therefore, this paper is a breakthrough contribution as it (1) exposes a new variety of Arabic which has certain prosodic peculiarities and (2) develops a full OT analysis to the morphological phenomenon of broken plurals. This paper has advanced McCarthy's pre-Optimality Theoretic claims which have not been approached or tested against various shapes of broken plurals in the literature to date.

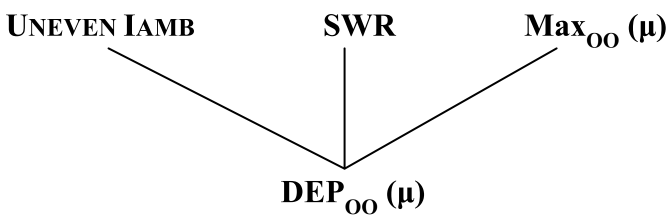
For convenience and preciseness of analysis, I will include all the constraints pertaining to the syllabic and prosodic well-formedness constraints such as ONSET and *μμμ]σ under the rubric **Syllabic Well-formedness Requirement (SWR)**. These constraints have the same priority, and they place a pivotal importance on the actual broken plural.

The general ranking established to account for the diverse shapes of the broken plurals is**,**

MAX$_{OO}$(μ), SWR, UNEVEN IAMB » DEP$_{OO}$- (μ)

The following lattice summarizes the grammar or ranking of the constraints adopted to offer an integrated analysis to the diverse shapes of the broken plurals in MA.

(35)



The lattice above derives the MA broken plural from diverse templatic shapes of the singular. The basic stipulation it makes is that an affixed mora gets added to the first foot of the singular form and makes it into an iamb. The iambic constructed is either **LH** or **H** and the whole shape of the plural must adhere to the syllabic and prosodic well-formedness of the language as a whole. Let us observe how this is done without the need to lexically index the constraints above. A trochaic foot of the singular form bearing the shape C_1VC_2 or C_1VC_2V or C_1VV gets an extra mora. However, the target shape onto which these diverse shapes are mapped is the same C_1VC_2VV. The mora attaches in a locus that confirms to the prosodic and syllabic well-formedness of the language, ensuring an actual shape of the broken plural to be realized. This mapping entails a violation of DEP$_{OO}$ (μ). It also entails a priority to parse the mora that comes attached to the singular form, and needs to be realized in the surface form of the broken plural. Finally, the C slots in the resultant mapped iamb are filled directly from the available consonants of the singular form.

6. Conclusions and Implications

This paper has examined the formation of broken plurals in Muscat Arabic (MA). It explored broken plurals with the typical and even iambs, with extra glides and broken plurals derived from geminated singulars. Unlike broken plurals in Classical Arabic or other dialects of Arabic which strictly shape into the typical iamb, broken plurals in MA may realize two distinct types of the iambic foot.

This paper also offers an integrated OT analysis of these shapes building on proposals made in McCarthy (2000). Canonical broken plurals are demonstrated to relate in their overall shapes to the singulars, and follow straightforwardly McCarthy's pre-OT claims that plural formation proceeds by affixing a plural denoting mora at a certain locus in the singular forms. The affixed **μ** enforces a particular foot structure namely an iamb to be realized in the broken plurals. Many broken plurals realize any expansion of the iambic foot: typical or even. Therefore, the constraint **UNEVEN IAMB** is required to rule out other foot types, and to determine the locus of the affixed **μ**. The analysis also entails that well-formedness and prosodic faithfulness constraints such as the requirement for a syllable to begin with an onset and for a prosodic word to end in a consonant play a major role in determining where the affixed **μ** is added, and how the shapes of the broken plurals are finally realized.

McCarthy's proposal provides a well-established mechanism that basically applies the general rule for forming broken plurals (affixed + **μ**) not in isolation from the well-formedness constraints that govern the structure of the language as a whole. Therefore, it has been demonstrated in the analysis of the shapes of broken plurals that when an extra mora gets attached at the first foot of a singular form with an idiosyncratic shape, new well-formedness constraints are used to basically filter the occurrence of a structure that the language does not permit. For example, in forming broken plurals from singulars with medial geminates, generally motivated constraints like 'geminates are banned from margins of syllables' are called upon to license the final shape of the admissible broken plural.

The basic argument that underlies the analysis of the shapes of the broken plurals is that although forming broken plurals imposes an extra mora to be realized in their surface structures, Universal Grammar filters how the final shape should be structured by defining the exact locus of the affixed mora.

To sum up, the cogent OT analysis of the two distinct shapes of broken plurals in the Muscat dialect of Omani Arabic tie in with previous work on OT. The constraints adopted as well as the general mechanism of constraint interactions and ranking OT offers provide a well-motivated mechanism. Reference to Prosodic Circumscription and pre- or under-specification to account for the diverse templatic shapes of broken plurals are challenged by the elegance of analysis provided by the Optimality Theory framework.

Acknowledgement

The author would like to express her heartfelt thanks to Suzanne Urbanczyk and Caroline Wiltshire for their insightful comments in earlier drafts of the paper. The paper has greatly benefited from comments addressed by two anonymous *Natural Language and Linguistic Theory* reviewers, and the comments of an *International Journal of Linguistics* internal editor and an *International Journal of Linguistics* external reviewer. All remaining errors are exclusively mine. This work has been supported by Sultan Qaboos University, Oman.

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