Chapter 6

Tiberian Hebrew Phonology

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Until the second half of the first millennium A.D., the text of the Hebrew Bible was transmitted in a form of writing that represented the consonantal phonemes but left the majority of the vowels and also consonantal gemination without graphic expression. When the Bible was read aloud, the reader followed a tradition of pronunciation that was transmitted orally and changed with the passage of time. At some period between the seventh and ninth centuries A.D., a circle of scholars in Tiberias known as Masoretes recorded in written form many of the missing details of the pronunciation of Biblical Hebrew, including the vowels, consonantal gemination, and even the distinction between the allophones of some of the consonantal phonemes. They also recorded the musical cantillation of the reading tradition. The system of signs created by the Tiberian Masoretes to represent these details is known as the Tiberian vocalization system. During the Middle Ages other vocalization systems were developed, which used different signs. The Tiberian system, however, became standardized and gradually replaced the others.

We must distinguish the Tiberian vocalization system from the original Tiberian Hebrew pronunciation, which it was designed to represent. This was the pronunciation of Hebrew which was used in the traditional reading of the Bible in the region of Tiberias during the seventh–ninth centuries A.D. Whereas the Tiberian vocalization tradition has survived in written form, the Tiberian pronunciation of Hebrew, which was an orally transmitted tradition, is extinct. None of the pronunciation traditions of the Hebrew Bible that are in use among Jewish communities today derive from the Tiberian pronunciation.

The original Tiberian pronunciation that lies behind the vocalization signs can be reconstructed from several sources. These include:

1. Masoretic and grammatical texts. Of primary importance are the texts from Palestine, especially the work *Hidāyat al-qāri* 'Guide for the reader'. The grammarians from medieval Spain sometimes describe the articulation

of a sound in greater detail than the Eastern sources. Their descriptions have to be treated with caution, however, since they could in some cases reflect a local type of pronunciation that differed from the Tiberian.

2. Transcriptions of the Tiberian pronunciation tradition into Arabic script which are found in medieval manuscripts written by Karaites (a medieval sect of Judaism).

3. The use of Hebrew letters and Tiberian vocalization signs to represent other languages. Of particular importance are medieval texts that represent Arabic in this way.

In this chapter an attempt is made to present the main features of the Tiberian pronunciation tradition based on the latest research on the aforementioned medieval sources.

6.1. Consonants

The letters are discussed in alphabetical order.

'Alep̄ (א). /ʔ/

Phonetic realization: Glottal plosive [ʔ].

Bet̠ /b/

Phonetic realization: Two allophones: (1) (בּ) Voiced bilabial stop [b] and (2) (ב) voiced labiodental [v].

Hidāyat al-qāri describes the [b] allophone as primary (*'aṣl*) and the [v] allophone as secondary (*far'*) (fols. 8b, 10a; cf. Eldar 1980-81: 254 n. 58).

Gimel /g/

Phonetic realization: Two allophones: (1) (גּ) Voiced velar stop [g] and (2) (ג) voiced uvular fricative [ʁ].

Hidāyat al-qāri describes the [g] allophone as primary (*'aṣl*) and the [ʁ] allophone as secondary (*far'*) (fol. 8b; cf. Eldar 1980–81: 254 n. 58).

Dalet̠ /d/

Phonetic realization: Two allophones: (1) (דּ) Voiced post-dental stop [d] and (ד) voiced post-dental fricative [ð].

The *Hidāyat al-qāri* describes the [d] allophone as primary (*'aṣl*) and the [ð] allophone as secondary (*far'*) (fol. 8b; cf. Eldar 1980–81: 254 n. 58).

The medieval scholar Isaac Israeli (9th–10th centuries A.D.), who had expert knowledge of the Tiberian reading tradition, is said to have pronounced [ð] with a secondary "emphatic" (i.e. velarized or uvularized) articulation [ð̣] in two words, viz. [ʔappað̣'no:] 'his palace' (Dan. 11:45) and [ˌva:jjað̣ra'χu:] 'and they have bent' (Jer. 9:2) (cf. Schreiner 1886: 221; Mann 1931–35, 1: 670 n. 106; Dukes 1845–46: 9, 73; Grossberg 1902: 24).

He (ה) /h/

Phonetic realization: Glottal fricative [h].

Waw (ו) /w/

Phonetic realization: Two allophones: (1) Labiodental [v] and (2) labio-velar semivowel [w].

The usual realization of /w/ was [v]. The allophone [w] occurred when the letter was preceded or followed by a *u* vowel, e.g. [ufuw'wɔ:] 'and Puwwa' (proper name) (Gen. 46:13), [vajjiʃta:ḥa'wu:] 'and they prostrated themselves' (Deut. 29:25), [ṭɔ:'wu:] 'they span' (Ex. 35:26) (see David ben Abraham al-Fāsī 1936, 1:451–52; Mishael ben Uzziel 1965: 20; Eldar 1978, 1:85, 1980–81: 259, 1984: 10–11).

Zayin (ז) /z/

Phonetic realization: Voiced alveolar sibilant [z].

The *Hidāyat al-qāri* mentions a variant of the letter *zayin* which is referred to by the Tiberian scholars as *zāy*[1] *makrūk̠* (Eldar 1984–85: 32).[2] The epithet *makrūk̠* was used by the Tiberian scholars to describe also a variant type of *reš*. It apparently referred to an emphatic (i.e. velarized or uvularized) articulation of the letter (cf. Khan to appear a). It appears, therefore, that *zayin* had an emphatic allophone [z̭], though its distribution is unknown.

Ḥet̠ (ח) /ḥ/

Phonetic realization: Unvoiced pharyngeal fricative [ḥ].

Ṭet̠ (ט) /ṭ/

Phonetic realization: emphatic (i.e. velarized or uvularized) unvoiced alveolar plosive [ṭ].

Yod (י) /j/

Phonetic realization: palatal unrounded semivowel [j].

According to one medieval source (Saadya Gaon 1891: 42–43), the Tiberians pronounced geminated *yod* like Arabic *jīm*, i.e. as a voiced palatal stop [ɟ] (cf. Roman 1983: 101–6, 218), which had the same place of articulation as *yod* [j]. This was the result of strengthening the articulation of [j] to a stop.

Kap̄ /k/

Phonetic realization: Two allophones: (1) (כּ) Unvoiced velar stop [k] and (2) (כ) unvoiced uvular fricative [χ].

1. The *Hidāya* uses the Arabic letter name.

2. The Yemenite orthoepic treatise known as the Hebrew *Maḥberet ha-Tījān*, which was based on the long version of the *Hidāya*, contains a similar statement (1870: 81, cf. Morag 1959–60: 219 n. 45): *wkn yš lhm zyn nqr' mkrwk v'ynw ydw' 'ṣlynw* 'They (i.e. the Jews of Palestine) have a *zayin* called *makrūk̠*, but it is unfamiliar to us (i.e. the Jews of Yemen)'.

We know from Greek transcriptions that in the first half of the first millennium A.D. plosive *taw* was pronounced with aspiration (cf. Kutscher 1965: 24–35). This was likely to be the case also in the Tiberian pronunciation tradition.

6.1.1. Distribution of the allophones of /b/, /g/, /d/, /k/, /p/, /t/

In general the fricative allophones of these letters (i.e. [v], [ʁ], [ð], [χ], [f], and [θ] respectively) occurred after a vowel when the letter was not geminated, e.g. [ʁa:v] 'much', [ʃɔ:'va:ʁ] 'he broke', [jiʃka'vu:] 'they lie down'. In many cases, however, the preceding vowel had been elided some time in the history of the language before the period of the Masoretes but the letter nevertheless remained a fricative, e.g. [baʃɔχ'vo:] < **bašuku'bō* 'when he lies down', [mal'χe:] < **mala'kē* 'kings', [ʃɔ:χ'vu:] < **šāka'bū* 'they lay down'. In a few such cases a plosive and a fricative are in free variation, e.g. [ʁiʃ'fe:] and [ʁiʃ'pe:] 'flames'. The distribution of the plosive and fricative allophones, therefore, is not completely predictable from the phonetic context in Tiberian Hebrew, since it is an alternation that was inherited from an earlier stage of the language.[3]

In theory the phonetic processes described above could have given rise to a phonemic opposition between the plosive and fricative forms of the letters. However, no certain minimal pair that proves this opposition is attested in the corpus of the Hebrew Bible. Z. Harris (1941: 143–67) proposed the hypothetical minimal pair [ʔal'fe:] 'thousands' vs. [ʔal'pe:] 'two thousand'. The form of the second word in the pair is deduced from what we know about Hebrew morphology but is not attested.

6.1.2. Consonant gemination

This is marked in the Hebrew script by placing a dot in the letter known as *dageš*. According to the *Hidāyat al-qāri*, "*dageš* makes the letter heavy." This "heaviness" of letters is brought about by increased muscular pressure of speech organs (*Hidāyat al-qāri* fol. 9a–9b, ed. Eldar 1980–81, lines 15–16, 37–38). A geminated consonant, therefore, was pronounced with greater pressure than its ungeminated counterpart. Some consonants could not be geminated. These included the laryngeals (/ʔ/, /h/) and pharyngeals (/ʕ/, /ḥ/) and also /ʁ/, except in a few isolated cases.

3. This is a simplified account of the distribution of the allophones of /b/, /g/, /d/, /k/, /p/, /t/. For a more detailed description see Yeivin 1980: 285–96.

6.2. Vowels

Tiberian Hebrew had the vowel system shown in Table 6-1.

Table 6-1. Tiberian Hebrew Vowels

i	u
e	o
ɛ	ɔ
a	

Pataḥ (ַ) /a/

Phonetic realization: Open, unrounded. There was no phonemic opposition between front and back vowels in the open position, so the allophonic scatter of /a/ is likely to have included both front [a] and back [ɑ] qualities. Evidence for this can be found in Judaeo-Arabic texts with Tiberian vocalization.[4]

Segol (ֶ) /ɛ/

Phonetic realization: front, half-open unrounded [ɛ].

Qameṣ (ָ) /ɔ/

Phonetic realization: back, half-open rounded [ɔ].

Ṣere (ֵ) /e/

Phonetic realization: front, half-close unrounded [e].

Ḥolem (ֹ) /o/

Phonetic realization: back, half-close rounded [o].

Ḥireq (ִ) /i/

Phonetic realization: front, close, unrounded [i].

Šureq (וּ), **qibbuṣ** (ֻ)[5] /u/

Phonetic realization: back, close, rounded [u].

6.2.1. Vowel length

Vowel length is in most cases predictable from syllable structure and the placement of stress. Meaningful contrasts between words were not usually

4. In one text (T-S Ar. 8.3), for instance, which uses both *pataḥ* and *qameṣ* signs, *pataḥ* is used to represent Arabic *fatḥa* both in the environment of emphatic consonants, where it would be expected to have had a back quality [ɑ] (e.g. [ʔɑʕẓɑm]), and also in the environment of non-emphatics, where a front quality [a] would have been expected (e.g. [watafī]). The *qameṣ* sign is used in this text to represent a back vowel somewhere in the region of mid vowels [ɔ] and [o] which resulted from the contraction of the diphthong [aw], e.g. [fo:q].

5. These are orthographic variants of the same vowel.

made by differences in vowel length alone. Differences in length are in virtually all cases relatable to differences in syllable structure or stress placement. Length was not an independent contrastive feature of vowels. The vowel *qameṣ* may have been an exception, since pairs of words can be found in which a contrast of meaning appears to have been made only by a difference in length of the vowel, e.g. [ʔɔχ'lɔ:] 'food' vs. [ʔɔ:χlɔ:] 'she ate'. Possible other minimal pairs are words such as [dɔ'mi:] 'silence' and [dɔ:'mi:] 'my blood'. The validity of both such minimal pairs, however, is not completely certain (see below).

The basic contexts for the occurrence of a long vowel are (1) a stressed syllable or (2) an open unstressed syllable. Examples: ['mɛ:lɛχ] 'king', [jiʃ'ma:ʕ] 'he hears', [ha:'hu:] 'that'. Many words carry a secondary stress in addition to the main stress, e.g. [ˌhɔ:ʔɔ:'ðɔ:m] 'the man', [ˌni:θḥakka'mɔ:] 'let us deal wisely' (Ex. 1:10).

As has been remarked, a vowel in an unstressed closed syllable was, on principle, short. If, however, it was followed by a series of contiguous consonants of relatively weak articulation (e.g. /ʔ/, /h/, /ʕ/, /ḥ/, /j/, /n/, /l/), then the vowel was sometimes lengthened even when not stressed. This occurred in certain prefixes of the verbs [hɔ:'jɔ:] 'he was' and [ḥɔ:'jɔ:] 'he lived', namely the [i] of prefixes before [h]/[ḥ], e.g. [ji:h'jɛ:] 'he will be', and the [a] of the conjunctive prefix [va] before [j], e.g. [va:jhi:] 'and it was'. It is occasionally found elsewhere, e.g. [ha'ʃɔ:ma:ʕ 'ʕɔ:m] 'did any people hear?' (Deut. 4:33).

The duration of long vowels varied considerably. From the medieval sources we are able to infer the existence of several different degrees in the relative duration of long vowels. Most of these were conditioned by differences in stress, vowel height, or consonantal strength. We shall mention here some of the conditions of these variations that are known in the present state of research.[6] This list does not include all the variations that we have evidence for. There were likely to have been, moreover, a number of other variations for which we have no evidence from the extant sources.

1. Stressed long vowels were longer than unstressed long vowels, e.g. in the word [ha:'hu:] 'that' the [u:] was longer than the [a:].

2. A long vowel with secondary stress was longer than a long vowel in an unstressed syllable, e.g. in the word [ˌhɔ:ʔɔ:'ðɔ:m] 'the man' the second [ɔ:] was shorter than the other two.

3. A close vowel [i, u] in a closed syllable with secondary stress was shorter than an open vowel [a] in the same conditions, e.g. in the words [ˌni:θḥakka'mɔ:] 'let us deal wisely' (Ex. 1:10) and [ˌva:ttiṣpa'ne:hu:] 'and she hid him' (Ex. 2:2), the [ˌi:] vowel of the first was shorter than the [ˌa:] of the second.

4. The close vowel [i] of prefixes of the verbs [hɔ:jɔ] 'he was' and [ḥɔ:jɔ:] 'he lived' was shorter than the open vowel [a] in prefixes of these verbs, e.g. in the words [ji:hjɛ:] 'he will be' and [va:jhi:] 'and he was' the [i:] of the first was shorter than the [a:] of the second.

5. The close vowel [i:] of the prefixes of the verbs [hɔ:jɔ:] 'he was' and [ḥɔ:jɔ:] 'he lived' was shorter than [i:] in a stressed syllable or an unstressed open syllable but longer than [i:] in a closed syllable with secondary stress, e.g. in the words ['ʔi:m] 'if', [ji:hjɛ:] 'he will be', and [ˌni:θḥakka'mɔ:] 'let us deal wisely' the three [i:] vowels were of decreasing degrees of length.

6. The [a:] vowel in prefixes of the verbs [hɔ:jɔ:] 'he was' and [ḥɔ:jɔ:] 'he lived' (e.g. [va:jhi:] 'and he was') and in other words before two weak consonants (e.g. [ha'ʃɔ:ma:ʕ 'ʕɔ:m] 'did any people hear?' Deut. 4:33) was longer than an [a:] vowel in a closed syllable with secondary stress (e.g. in [ˌva:ttiṣpa'ne:hu:] 'and she hid him' Ex. 2:2).

6.2.2. *Syllable structure and the šewa*

In the Tiberian pronunciation tradition, many short vowels occurred in open syllables, e.g. [jiʃma'ʀu:] 'they guard', [ja:ʕa'sɛ:] 'he does'. These were represented in the vocalization system by the *šewa* sign or one of the *ḥaṭep̄* signs. These were different from the regular vowel signs. From the Masoretic sources and Judaeo-Arabic texts with Tiberian vocalization, we know that these vowels were equivalent in length to short vowels in unstressed closed syllables (see Khan 1987: 37–39, 1992: 105–11). Does the occurrence of these short vowels in apparently open syllables contradict the vowel length principle stated above?

According to the medieval Masoretic sources, a consonant with one of these vowels did not constitute a syllable. In a word such as [tispa'ʀu:] 'you count', the syllable structure would be, according to the medieval sources, [tis-pa'ʀu:]. This concept of the syllable reflects the phonotactic rules of Tiberian Hebrew and corresponds to the phonotactic definition of syllables espoused in modern times by linguists such as Pulgram (1970: 40ff.). The basic principle of Pulgram's definition is that a sequence of consonant and vowel segments has the status of a syllable only if the onset of the sequence can stand in word-initial position and the coda (i.e. closure) can stand in word-final position. There is no structural reason why it cannot stand by itself as a word. In the medieval Tiberian reading tradition of Biblical

6. For the evidence for these variations see Khan 1987, 1989, 1994b.

Hebrew, a short vowel did not occur in word-final position. According to this definition, therefore, the sequence consonant + short (CV) vowel did not have the status of a syllable. Only consonants and long vowels could occur in word-final position, and so only these could constitute permissible codas of syllables.[7] The sequence CV occurred in word-initial position. It could, therefore, form the onset of a syllable. This allowed it to be attached to the beginning of a sequence which had a permissible coda and so had the status of a syllable, viz. CV+CVC or CV+CV̄. The sequences CVCVC and CVCV̄, therefore, were regarded by the Masoretes as single syllables.

Rather than denying the status of syllable completely to a CV sequence on the basis of this phonotactic definition, it is helpful to distinguish between principal and dependent syllables. Principal syllables are those that can stand independently, since they have onsets and codas that can open or close an independent word. A dependent syllable is one that cannot stand independently, but only in combination with a following principal syllable. The aforementioned distribution of vowel length, therefore, refers to principal syllables. Any open syllable with a short vowel must be a dependent syllable. This is a phonotactic distinction. It is not usually taken account of by the accent system of Tiberian Hebrew, which counts beats on syllable nuclei between accents without distinguishing between dependent and principal syllables.

The reality of the phonotactic distinction between dependent and principal syllables is reflected by the concept of the syllable that is expressed in the medieval Masoretic literature. It is also reflected by the vocalization system, which represents the vowel nuclei of dependent syllables with signs (*šewa* and *ḥaṭepīm*) that are different from those representing the nuclei of principal syllables. Furthermore, some features of Tiberian Hebrew phonology are sensitive to the distinction. The occurrence pattern of the allophones of Tiberian /r/ is a clear example of this. The apico-alveolar allophone of /r/, i.e. [ɾ], occurred when it was preceded by one of the dental/alveolar consonants /d/, /z/, /ṭ/, /s/, /ṣ/, /t/, /l/, /n/ and when either (a) the *reš* was in direct contact with one of these letters or (b) the *reš* occurred together with one of them in the same syllable, e.g. [daɾkamoːˈniːm] 'drachmas', [vɔːʔezˈɾeːm] 'and I winnowed them' (Jer. 15:7) [bamizˈɾɛː] 'with a pitchfork' (Jer. 15:7), [ṣaɾuːˈfɔː] 'smelted',

7. The only possible exceptions are words ending in a consonantal cluster such as וַיַּשְׁקְ 'and he watered', נֵרְדְ 'nard'. Some medieval sources state that the second *šewa* in these words was vocalic (e.g. David Qimḥi 1952: 16–17). Most sources, however, state that both *šewa*s were silent (e.g. Ibn Janāḥ 1880: 275, Abraham ibn Ezra 1791: 3).

[limˈṭaːɾ] 'through the rain'. When the dental/alveolar was followed by a full vowel the /r/ was realized with the uvular allophone [ʀ], e.g. in [tɔːˈʀuːṣ] 'you run'. How did words such as [limˈṭaːɾ] and [ṣaɾuːˈfɔː] differ from [tɔːˈʀuːṣ]? The most obvious answer is that in [limˈṭaːɾ] and [ṣaɾuːˈfɔː] the *reš* was in the same syllable as the dental/alveolar, whereas in [tɔːˈʀuːṣ] it was in a different syllable.

We may, therefore, elaborate the description of the contexts for the occurrence of a long vowel as follows: A vowel is long if it occurs in a stressed syllable or in an open principal syllable.

There are no phonological oppositions between the vowel of a dependent open syllable CV (represented by vocalic *šewa* or a *ḥaṭepē* sign) on the one hand and zero (represented by silent *šewa*) on the other. The vowel in the syllable CV, therefore, can be regarded as an allophone of zero. It is no doubt for this reason that the Masoretes did not consider vocalic *šewa* to be a vowel and represented it with the same sign as they represented zero. A word such as [ʃaˈvuː] 'sit! (pl.)', therefore, should be represented phonologically as /šbu/. There are phonological oppositions, on the other hand, between the vowel of the dependent syllable CV and that of the principal syllable CVː, e.g. [ʃaˈvuː] 'sit!' (imperative pl.) vs. [ʃɔːˈvuː] 'they captured'.

In the Tiberian reading tradition, a short vowel in the dependent syllable CV, which was represented by the *šewa* sign, was usually pronounced with the quality of [a]. Where, however, *šewa* preceded a guttural consonant it took the quality of the vowel after the guttural and where it preceded [j] it had the quality of a short [i], e.g. בְּאֵר [beˈʔeːɾ] 'well', מְאוֹד [moˈʔoːð] 'very', בְּיוֹם [biˈjoːm] 'on the day' (Baer and Strack 1879: 12–15; Yeivin 1980: 281–82). In places the Masoretes considered that the reader may be uncertain whether to pronounce the *šewa* as vocalic or silent and may have been unsure about the pronunciation of *šewa* where its quality differed from the norm. In such circumstances, the Masoretes added a vowel sign to the *šewa* sign creating a composite sign known as a *ḥaṭepē* sign. The marking of the *ḥaṭepē* signs under the gutturals was fixed in the Tiberian Masoretic tradition, and the Tiberian model codices do not exhibit significant differences. The marking of these signs under the non-gutturals, however, was not fixed, and considerable differences are found in the manuscripts.

Some scholars have claimed that the quality of the *ḥaṭepē* vowels was phonemic on the basis of pairs such as אֲנִיָּה [ʔanijˈjɔː] 'mourning' vs. אֳנִיָּה [ʔɔnijˈjɔː] 'ship'; חֲלִי [ḥaˈliː] 'ornament' vs. חֳלִי [ḥɔˈliː] 'illness'; עֲלִי [ʕaˈliː] 'go up!' (imperative fem.sg.) vs. עֳלִי [ʕɛˈliː] 'pestle' (cf. Cantineau 1950: 114–16, Garbell 1958–59: 154). If this is the case, they could not be interpreted as

allophones of zero. It will be shown below, however, that the validity of these minimal pairs is doubtful.

Although vowel length is in general predictable from the syllabic context, it would appear that the syllable structure was determined by the length of the vowels. This is because a sequence containing vowels of unspecified length could have been syllabified in various ways, e.g. *tisparu* 'you count' could be [tis-pa:-ʀu:] or [tis-paʀu:]. The correct syllabification [tis-paʀu:] could only have been achieved if the length of the vowels had already been fixed.

The length of vowels in the Tiberian pronunciation tradition was determined by the earlier history of the language or by phonetic processes that were operative during the masoretic period. Some long vowels were originally long, e.g. [ko:'he:n] 'priest' < **kāhin*. Others were lengthened through phonetic processes that took place at various periods, e.g. lengthening of a vowel in an open syllable before the stress (pretonic lengthening), e.g. [jɔ:'qu:m] 'he rises' < **ya'qūm*; the lengthening of stressed vowels, e.g. [miðˈbɔ:ʀ] 'desert' < **mid'bar*; lengthening of vowel as compensation for the loss or absence of gemination in the following consonant, e.g. [javɔ:'ʀe:χ] 'he blesses' < **yabarrik*, [ha:'hu:] 'that' < **hahhū*. Most of the phonetic processes had ceased to operate by the time of the Tiberian Masoretes. For instance, pretonic short vowels in open syllables were not lengthened ([ʃɔ:ma'ru:] 'they guarded' did not shift to [ʃɔ:ma:'ru:]). In such cases, and also in the case of originally long vowels, vowel length was an inherited feature of the language. Some phonetic processes seem to have been still active in the masoretic period. One such process is the general lengthening of all stressed vowels. We know this was a relatively late process (see Khan 1987, 1994a: 133–44).

As a result of the historical background of the Tiberian pronunciation tradition, the vowels *ṣere* /e/ and *ḥolem* /o/ were always realized as long. The other vowels were realized as either long or short.

In some circumstances there appear to have been differences in duration between stressed vowels that were historically long and those that were historically short. The term "historically long" here refers to vowels that were originally long or that were lengthened by phonetic processes that took place before the masoretic period. "Historically short" refers to vowels that were short or were lengthened by phonetic processes that took place during the masoretic period. In the Tiberian pronunciation tradition, a *šewa* on a letter coming after a historically long vowel was usually silent, e.g. [ʃo:mʀi:m] 'guards'. Such a closed syllable before the main stress could take secondary

stress in the form of an accent: שׁוֹמְרִים [ˌʃo:m'ʀi:m]. This implies that the vowel was long enough to accommodate the musical melisma of the accent associated with the secondary stress. Normally, secondary stress was separated from the main stress by an unstressed, buffer syllable, so that the two stress beats did not come together. In a form such as [ˌʃo:m'ʀi:m] it appears that the first vowel was lengthened to the extent that it included both the beat of the secondary stress and the unstressed buffer. This would mean that it contained two syllabic peaks: [ʃó:ŏmʀĭ:m]. Historically short vowels, on the other hand, could not take the secondary stress in the form of a regular musical accent. When they took secondary stress it was marked by a sign known as a minor *ga'ya*, e.g. [niθḥakka'mɔ:] > [ˌni:θḥakka'mɔ:] (נָתְחַכְּמָה) 'let us deal wisely'. Such cases of *ga'ya* rarely occur immediately before the syllable bearing the main stress since they were not long enough to accommodate both the beat and buffer in contrast to the first vowel in [ʃó:ŏmʀĭ:m]. The Arabic transcriptions, moreover, indicate that a vowel with the so-called minor *ga'ya* (i.e. the type found in closed syllables with a historically short vowel) was shorter than one that could take secondary stress in the form of a regular accent (i.e. syllables with a historically long vowel as in [ʃó:ŏmʀĭ:m], [ˌhɔ:ʔɔ:'ðɔ:m] 'the man').

A vocalic *šewa*, which was a historically short vowel, was sometimes lengthened by secondary stress marked by *ga'ya*, e.g. [bana:ḥa'lɔ:] > [ˌba:na:ḥa'lɔ:] (בְּנַחֲלָה) 'as an inheritance' (Josh. 13:6). There is evidence that also these vowels were not as long as a historically long vowel in an open syllable with secondary stress, e.g. [hɔ:ʔɔ:'ðɔ:m] > [ˌhɔ:ʔɔ:'ðɔ:m] 'the man' (see Khan to appear b).

The analysis of the historically long vowel in a closed syllable with secondary stress as having two peaks has implications for the phonemic status of *qameṣ*. It was remarked above that pairs such as [ʔɔχ'lɔ:] (אָכְלָה) 'food' vs. [ˌʔɔ:χ'lɔ:] (אָכְלָה) 'she ate' seem to require us to identify short and long *qameṣ* as two separate phonemes. If the syllable structure of the second word was in fact [ˌʔɔ:ɔχ'lɔ:], then this would not be a minimal pair proving the phonemic status of the length of *qameṣ*.

There was ambiguity in the syllabic status of some short vowels in open syllables, notably [ɔ] (represented by the *ḥaṭep̄ qameṣ* sign) in words such as דֳּמִי [dɔ'mi:] 'silence', צֳרִי [ṣɔ'ʀi:] 'balsam', צִפֳּרִים [ṣippɔ'ʀi:m] 'birds', כֻּתָּנֹת [kutɔ'no:θ] 'tunics' (Ex. 28:40), הַגֳּרָנוֹת [haggɔʀɔ:'no:θ] 'the threshing floors' (Joel 2:24). The vowel [ɔ] in these words was the reflex of an originally short [o] or [u]. The syllable with the short [ɔ] vowel sometimes took secondary stress

and the *ḥaṭep̄* sign was replaced by an ordinary *qameṣ* in the model Tiberian manuscripts, e.g. [qɔðɔːˈʃiːm] (קָדָשִׁים) > [ˌqɔːðɔːˈʃiːm] (קָדָשִׁים) 'holy things'. This differs from the occurrence of secondary stress marked by *gaʿya* on a vocalic *šewa* sign, which was not replaced by a full vowel sign, e.g. [banaːḥaˈlɔː] > [ˌbaːnaːḥaˈlɔː] (בְּנַחֲלָה) 'as an inheritance' (Josh. 13:6).

Moreover, the writing of ordinary *qameṣ* in place of *ḥaṭep̄ qameṣ* is found in some model Tiberian manuscripts also in a pretonic syllable. The medieval grammarian Ibn Janāḥ refers to the vocalic *šewa* being "lighter" than *ḥaṭep̄ qameṣ* in such words. This implies that there was a difference in length. According to Saadya Gaon (1891: 79), the rules for the occurrence of the apical-alveolar allophone of the Tiberian *reš* treated the word [ṣɔˈʀiː] 'balsam' as having two syllables. As we have seen, these rules treat a consonant with vocalic *šewa* as belonging to the following syllable.

There is reason to believe, therefore, that in words such as [ṣɔˈʀiː], [dɔˈmiː] the *ḥaṭep̄ qameṣ* vowel was longer than a vocalic *šewa*. This applies both to cases where the syllable was unstressed and those in which it had secondary stress. This difference in length was sufficient to give the consonant + vowel sequence the status of a independent syllable as reflected by the rules for the distribution of the allophones of Tiberian /r/. We may describe these vowels as half long (CV·), lying in between short vowels (CV) and long vowels (CV:). It appears that a half long vowel could act as a coda of a principal syllable, whereas a short vowel could not.

If the *ḥaṭep̄ qameṣ* was a principal syllable nucleus, then the long and short *qameṣ* in minimal pairs such as [dɔ·-ˈmiː] 'silence' and [dɔː-ˈmiː] 'my blood' would have to be identified as separate phonemes, since vowel length is the only feature that contrasts them. Since the phonemic contrast is between only two degrees of length, the phonemes could be represented as short /ɔ̆/ vs. long /ɔ̄/.

This could apply in general to cases of *ḥaṭep̄* vowels that have not been leveled to the normal quality of *šewa* but have a quality close to that of the original short vowel from which they developed. If this is correct, the validity of the aforementioned pairs as proof of phonemic contrasts of short vowels in open syllables would be in doubt, viz. [ʔanijˈjɔː] 'mourning' vs. [ʔɔnijˈjɔː] 'ship', [ḥaˈliː] 'ornament' vs. [ḥɔˈliː] 'illness', [ʕaˈliː] 'go up!' (imperative fem.sg.) vs. [ʕɛˈliː] 'pestle'. This is because the two members of each pair would have had a different syllable structure. The syllables with [ɔ] and [ɛ] had a quality close to that of the original vowel:[8] [ʔɔ·-nij-ˈjɔː] < **ʾoniyyā*

8. The original quality is preserved in the Babylonian tradition of Hebrew; cf. Yeivin 1985, 2: 876–79.

vs. [ʔanij-ˈjɔː] 'mourning', [ḥɔ·-ˈliː] 'illness' < **ḥuly* vs. [ḥaˈliː] 'ornament', [ʕɛ+-ˈliː] 'pestle' < **ʿily* vs. [ʕaˈliː] 'go up!' (fem.sg.).

6.3. Summary of the phoneme inventory with the known allophones

6.3.1. Consonants

6.3.1.1. Labials

/b/ [b], [v]
/m/ [m]
/p/ [pʰ], [f], [p̪]
/w/ [v], [w]

6.3.1.2. Dentals/alveolars

/t/ [tʰ], [θ]
/d/ [d], [ð], [ð̪]
/ṯ/ [ṯ]
/s/ [s]
/z/ [z], [z̪](?)
/ṣ/ [ṣ], [z̪]
/š/ /ʃ/
/n/ [n]
/l/ [l]

6.3.1.3. Palatal

/j/ [j], [ɟ]

6.3.1.4. Velars and uvulars

/k/ [kʰ], [χ]
/g/ [g], [ʁ]
/q/ [q]
/ʀ/ [ʀ], [ɾ]

6.3.1.5. Laryngeals and Pharyngeals

/h/ [h]
/ʔ/ [ʔ]
/ḥ/ [ḥ]
/ʕ/ [ʕ]

6.3.2. Vowels

(In the following phonemic notation, /V/ is a phoneme unspecified for length, /V̆/ and /V̄/ are phonemes which contain length as a component feature.)

/a/ [a], [aː], [ɑ], [ɑː]
/ɛ/ [ɛ], [ɛː]
/ɔ̆/(?) [ɔ], [ɔ˙]
/ɔ̄/(?) [ɔː]
/e/ [eː]
/o/ [oː]
/u/ [u], [uː]
/i/ [i], [uː]
/Ø/ [Ø], [a], [ɛ], [ɔ], [e], [o], [i], [u]

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