Negev, Dead Sea and Arava Studies 14 (2–4), 121–142 (2022) 142–121 ,(4–2) 14 מחקרי הנגב, ים המלח והערבה

Studies in Desert Archaeology in Honor of Uzi Avner
Edited by R. Galili, H. Ben-David, L. K. Horwitz, E. Ben-Yosef

מחקרים בארכאולוגיה מדברית לכבוד עוזי אבנר
בעריכת ר׳ גלילי, ח׳ בן-דוד, ל״ק הורביץ, א׳ בן-יוסף

Negev, Dead Sea and Arava Studies
מחקרי הנגב, ים המלח והערבה

מו"פ מדבר וים המלח
Dead Sea & Arava Science Center
בחסות אוניברסיטת בן גוריון בנגב
Under the auspices of Ben-Gurion University of the Negev

Research article
מאמר מחקר

Masseboth Shrine at Horvat Haluqim: Amalekites in the Negev Highlands–Sinai Region? Evaluating the Evidence

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Keywords:
Desert archaeology
Standing stones
Agro-pastoralists
Soil stratigraphy
Radiocarbon dating
Biblical texts

A B S T R A C T

The deserts of the Negev Highlands and north-eastern Sinai contain many rural settlements with roughly oval or elliptical fortresses dated to the Iron Age. One of these settlements is Horvat Haluqim, where the author has conducted investigations since 1982. His excavation methodology focused on archaeological soil stratigraphy, both in terraced agricultural fields and buildings, coupled with radiocarbon dating and micromorphology. A new finding is presented in this article: a *masseboth* shrine, situated near the Oval Fortress at Horvat Haluqim. In addition, the character and ethnicity of these desert settlements are evaluated and discussed. Runoff farming was practiced at Horvat Haluqim during the Late Bronze Age and earliest Iron Age, as dated by radiocarbon. The absence of stone building remains in these periods implies that the semi-nomadic agro-pastoralist inhabitants of the site were apparently living in tents. A bronze chisel dated to Late Bronze III or Iron I, belonging to this settlement phase, is isotopically linked to the Faynan copper ores in Jordan. A subsequent phase in the settlement, when stone buildings were constructed, began during Iron Age I. The Amalekites, a powerful desert polity, a monarchy according to the biblical narratives, inhabited the central Negev-Sinai desert region. Their settlements were attacked by Saul and David in the late 11th to early 10th century BCE. Similar radiocarbon dates from the Lower Fortress at Tell el-Qudeirat in Sinai and the youngest Iron Age I date of a ^{14}C series from a terraced field at Horvat Haluqim indicate a hiatus that could fit the time of warfare against the Amalekites by Israel's first kings. The newly discovered *masseboth* shrine at Horvat Haluqim may have been part of the religious pantheon of the Amalekites.

מקדש מצבות בחורבת חלוקים:
עמלקים בהר הנגב ובסיני? – הערכת העדויות

ה. ברוינס

אוניברסיטת בן-גוריון בנגב
המכונים לחקר המדבר ע"ש יעקב בלאושטיין
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ת ק צ י ר

באתרים כפריים רבים במדבריות הר הנגב וצפון-מזרח סיני נתגלו מצודות סגלגלות או לא סימטריות מתקופת הברזל. אחד האתרים הללו הוא חורבת חלוקים, שבה ערך המחבר חקירות מאז 1982. מתודולוגיית החפירה התמקדה בסטרטיגרפיה הארכאולוגית בקרקע, בטרסות חקלאיות קדומות ובמבנים, בד בבד עם תיארוך פחמן 14 ומיקרומורפולוגיה. במאמר הנוכחי מוצג ממצא חדש: מקדש מצבות, הממוקם בסמוך למצודה הסגלגלה בחורבת חלוקים. כמו כן יידונו במאמר אופיים ומוצאם האתני של תושבי יישובי המדבר הללו. חקלאות מי נגר התקיימה בחורבת חלוקים בתקופת הברונזה המאוחרת ובתקופת הברזל הקדומה, כפי שתוארך באמצעות פחמן 14. היעדר שרידי בנייה מאבן באתר בתקופות אלה מרמז על כך שתושביו האגרו-פסטורליסטים של האתר התגוררו ככל הנראה בשלב הנוכחות הקדום באוהלים, כנוודים למחצה. אזמל ברונזה שנמצא באתר משלב יישובי זה תוארך לתקופת הברונזה המאוחרת III או לתקופת הברזל I, ומאנליזה איזוטופית נמצא שמקורו בעפרות הנחושת של פינון בירדן. בשלב השני של הנוכחות באתר, בתקופת הברזל I, הוקמו בו מבני אבן. מהי הזהות האתנית האפשרית של התושבים? על פי הנרטיבים התנכ"יים העמלקים ישבו בנגב ובסיני, ישות מדינית מדברית רבת עוצמה, מונרכיה. יישוביהם הותקפו על ידי שאול ודוד בסוף המאה האחת עשרה ובתחילת המאה העשירית לפה"ס. מסגרת זמנים דומה תוארכה באמצעות פחמן 14 במצודה התחתונה בתל אל-קודיראת בסיני ובשדה חקלאי בחורבת חלוקים. ממצאים אלו מצביעים על קשר אפשרי לעימותים בין מלכי ישראל הראשונים והעמלקים. ייתכן שמקדש המצבות שהתגלה לאחרונה בחורבת חלוקים היה חלק מהפנתאון הדתי של העמלקים.

מילות מפתח:
ארכאולוגיה מדברית
מצבות
אגרו-פסטורליסטים
סטרטיגרפיה של קרקע
תיארוך פחמן 14
טקסטים מקראיים

1. Introduction

As year-round desert dwellers, not just seasonal visitors, Uzi Avner and I have had various meetings and shared field trips in the Negev since the 1980s. I became impressed by his novel approaches in desert archaeology, focusing on ancient human-related features in hyper-arid and arid landscapes that were hardly noticed and studied previously. For example, archaeological and anthropological research of the hyper-arid Uvda Valley by Uzi Avner (Avner, 1990) has revealed that the practice of grain farming by semi-nomadic pastoralists during wet years with sufficient natural runoff water flows, was well established by 4000 BCE and may have begun already in the Late Neolithic. The climax of runoff agriculture occurred during the third millennium BCE, based on 28 radiocarbon dates (Avner, 1990, p. 127; Avner, 2001–2002). Therefore, knowledge and experience about runoff farming in the Negev did not begin with the Nabateans or during the Roman-Byzantine periods, but was known already a few thousand years earlier (Bruins, 2012).

Radiocarbon dating has formed a very important part of the archaeological investigations by Uzi Avner (Avner et al., 1994; Avner and Carmi, 2001; Avner, 2002, 2006). In the southern Levant, typologies of pottery and flint implements as indicators of archaeological age, have usually been developed in relation to large sites, often located in more humid regions. However, these classifications do not necessarily work in remote desert areas (Avner, 2006; Rosen, 2010, 2017), where both pottery and flint implements may consist of types not encountered in sites to the north. Therefore, radiocarbon dating is of critical importance to obtain independent information about time in archaeological context, particularly in the desert periphery of the southern Levant (Figure 1). Evaluating the radiocarbon dating results of his investigations, Uzi Avner came to the following important conclusions: "In contrast to expectations based on the environmental conditions in the area, and commonly accepted ideas, there were no gaps in settlement in the desert from the Early Neolithic through the EB IV (and beyond) … The duration of habitation, industrial, cult and burial sites in the desert, as demonstrated by ^{14}C dates, is often far longer than expected, by hundreds and even thousands of years" (Avner, 2006, p. 68).

Notably, Uzi Avner has carried out extensive investigations concerning intricate patterns of human-made stone arrangements in the landscape. His archaeological surveys and excavations yielded a wealth of *masseboth*, accompanied by detailed descriptions and analyses (Avner, 2001, 2002; Avner and Horwitz, 2017). In my contribution in honor of Uzi Avner, I present a new finding: a *Masseboth* Shrine at Horvat Haluqim. The possible age and ethnic relationship of the *masseboth* will be discussed in relation to the special character of Iron Age settlements in the Negev Highlands and the adjacent area of north-eastern Sinai. My excavations at Horvat Haluqim, coupled with extensive radiocarbon dating (Bruins, 1986, 2012; Bruins and Van der Plicht 2005, 2007, 2017a, 2017b; Bruins et al. 2012, 2018, 2020), disprove the assumed settlement gap in the Negev Highlands, the so-called "missing" 2nd millennium BCE (Glueck, 1959; Cohen, 1986a).

2. The archaeological site of Horvat Haluqim

This rural desert site is situated in the Negev Highlands (Figure 1) along the southern hillslope of the Haluqim Anticline, about 2 km north-east of Kibbutz Sede Boker (Figure 2). Rudolph Cohen (1976) conducted excavations at Horvat Haluqim after he became the Southern District Archaeologist of the Israel Antiquities Authority in 1966 and continued in this function until 1989. Cohen also directed the Emergency Survey of the central Negev Highlands from 1978 to 1988. A wealth of new archaeological data was acquired in these desert regions (see Cohen and Cohen-Amin, 1999, 2004, with references, including the monographs of detailed archaeological surveys).

The Horvat Haluqim site includes a roughly oval-shaped Iron Age fortress, 23x21 m in diameter, with casemate rooms around a central courtyard. The walls are ca 80 cm wide. (Cohen, 1976). The characterization as "fortress" has been questioned by Finkelstein (1984, 1995), who suggested that these structures had no defensive purpose, but were merely enclosures, "oval compounds" in his terminology, to keep the domesticated herds of sheep and goats at night. If so, discrete layers of dung should have accumulated in these oval compounds, such as those present in rock-shelters in the Negev Highlands (Rosen et al., 2005). However, this is not the case in the central courtyard of the oval-shaped Negev fortresses, as also noted by Meshel (1994, p. 57).

Many animal pens have been recorded in archaeological surveys in the Negev Highlands, also by Cohen (1981a) in map sheet Sede Boqer – East, and for example by Haiman (1986, Har Hamran – Southwest; 1991, Mizpe Ramon – Southwest). However, such animal pens are smaller in size, having a simple architecture with thinner walls, even though their shape may be oval or round.

Figure 1: Location of archaeological sites and geographic regions mentioned in the text. Image © Google Earth Pro

It seems to me obvious that the oval fortresses in the Negev Highlands, characterized by massive stone structures with casemate walls, were not merely built to corral a herd of small stock. Whether you name them a fortress, fort, stronghold, or otherwise, they had a defensive purpose, an interpretation which is also accepted by Rothenberg (1967) and Meshel (1994, p. 39). The casemate rooms were probably inhabited and also used for storage. Therefore, animals may have been allowed to enter the central courtyard, for example donkeys and camels to unload their transported goods. Hence, a certain amount of animal dung remains may be present in the soil of the central courtyard, but discrete, accumulative, dung layers, such as found in rock shelters (Rosen et al., 2005) have not been found in the Negev Highland fortresses (Meshel, 1994).

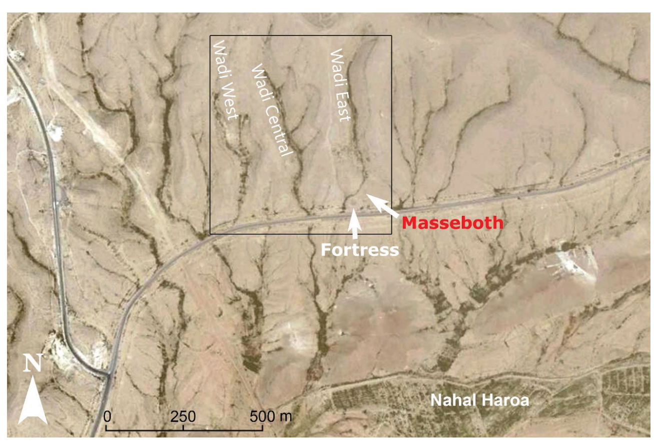

Figure 2: The rural archaeological site of Horvat Haluqim comprises building remains along three wadis with ancient agricultural terraced fields. The *Masseboth Shrine* is located 41 m northeast of the Oval Fortress, just north of the road from Sede Boker to Yeruham. Image © Google Earth Pro

Most of the building remains at Horvat Haluqim, including the oval fortress, were dated by Cohen (1976) to the Iron Age. The buildings are located along three small, terraced wadis, being of the 1st stream order (Bruins, 1986; Bruins et al., 2019), running southwards to Nahal Haro'a (Figure 2). Some of the main building structures, as well as cistern no. 1, were excavated by Cohen (1976). Based on the excavation methodology common in those days, architecture was the principal criterium for stratigraphy, combined with diagnostic ceramic remains. Hardly any attention was paid to subtle soil stratigraphy within or outside the buildings. Walls and floors were the principal objectives. Such a methodology, aptly termed "architectural bias" by Ben-Yosef (2019, 2020) may lead to oversimplification and erroneous conclusions in archaeological investigations. Thus, Cohen (1976) defined two architectural strata at the site. Stratum I relates to the Roman period, mainly represented by a square Roman watchtower with staircase. Stratum II was assigned to most other buildings at the site, dated by Cohen to Iron Age II and associated by him with the Solomonic kingdom in the 10th century BCE (Cohen, 1976; Cohen and Cohen-Amin, 2004). Radiocarbon dating was not used. Archaeological age assessment based on pottery was considered superior in those days.

Based on pottery evaluations, Rudolph Cohen (1986a) concluded that the central Negev and Sinai deserts were abandoned for about a thousand years during the entire 2nd millennium BCE. Following the end of the Middle Bronze Age I (usually defined today as Early Bronze Age IV or Intermediate Bronze Age), around 2000 BCE, renewed settlement in the region only began in his opinion during Iron Age II in the 10th century BCE (Cohen, 1986a; Cohen and Cohen-Amin, 2004). No diagnostic pottery sherds were found in the region, neither in surveys nor in excavations, that could be associated with the Middle Bronze Age II and III, the Late Bronze Age, and the Iron Age I.

Rudolph Cohen was not the first to arrive at this conclusion. He followed here the methodology and deductions of Nelson Glueck (1959), who had learned from W. F. Albright "how to identify and to use ancient pottery fragments in surface surveys", as noted by G. E. Wright (1959). The use of pottery to identify the presence of archaeological periods was based to a significant extent on the excavations at Tell Beit Mirsim (Albright, 1932). Following extensive surveys in the Negev during the 1950s, Nelson Glueck (1959) postulated a long gap of about a thousand years without archaeological remains between the end of MB I (= Intermediate Bronze Age) and the beginning of Iron Age II in the 10th century BCE. The rational for this conclusion is quite simply based on the absence of diagnostic MB II, LB and Iron Age I ceramic types, as defined for these periods at Tell Beit Mirsim and other major sites outside the desert in the center of the country.

However, Negbite pottery did not occur at Tell Beit Mirsim and other northern sites. Even in the northern Negev, at Tel Masos and the Beersheva-Arad Basin the presence of Negbite pottery is absent – apart from a few rare sherds (Meshel 1994, p. 59; Ben-Dor Evian, 2017)! This hand-made type of pottery is typical for the deserts in the central and southern Negev and Aravah Valley (Aharoni et al., 1960; Kleiman et al., 2017; Rothenberg, 1972; Smith and Levy, 2008; Tebes, 2006; Yahalom-Mack et al., 2015). However, it cannot be used for archaeological age assessment, as it occurs in rather similar shapes and forms in contexts ranging from the Early Bronze Age to the Early Islamic period (Haiman and Goren 1992), covering about four millennia.

Negbite sherds constitute the dominant type of ceramics at Horvat Haluqim, as noted in my own excavations and surveys at the site since the early 1980s (Bruins, 1986, etc., see references below). I have been using a different excavation methodology, as compared to Cohen (1976). My focus has been on archaeological soil stratigraphy, both in ancient agricultural terraced fields and in buildings, sampling charred organic material and bones for age determination with radiocarbon dating. This approach resulted in a much longer and more complex rural settlement history at Horvat Haluqim, as compared to the two architectural strata defined by Cohen (1976). The radiocarbon dates published so far bear witness to settlement activity at the site during the Middle Bronze–Late Bronze Age transition and the Late Bronze Age, Iron Age I, Iron Age II, as well as the Persian, Roman, and Early Islamic periods (Bruins, 1986, 2012; Bruins and Van der Plicht 2005, 2007, 2017a, 2017b; Bruins et al., 2012, 2018, 2020).

Besides the detailed 14C dating evidence from Horvat Haluqim, it was also noted by Uzi Avner that the 2nd millennium BCE cannot be considered an empty period in the southern Negev desert. Based on his evaluations and radiocarbon compilations, he concluded: "The Middle and Late Bronze Ages, generally considered as totally missing in the Negev, are presently covered by finds and by 26 14C dates" (Avner 2002, p. 149).

Additional evidence was found by Rosen et al. (2005) in the Negev Highlands concerning the study of ancient dung layers in rock shelters. The Atzmaut rockshelter, situated along the northern edge of the Makhtesh Ramon erosion cirque, was used in the past as a natural animal pen, in which many dung layers accumulated. Two radiocarbon dates of dung layer V yielded calibrated ages in the first half of the second millennium BCE, which is another sign of activity by pastoralists during this time period, usually considered devoid of archaeological remains.

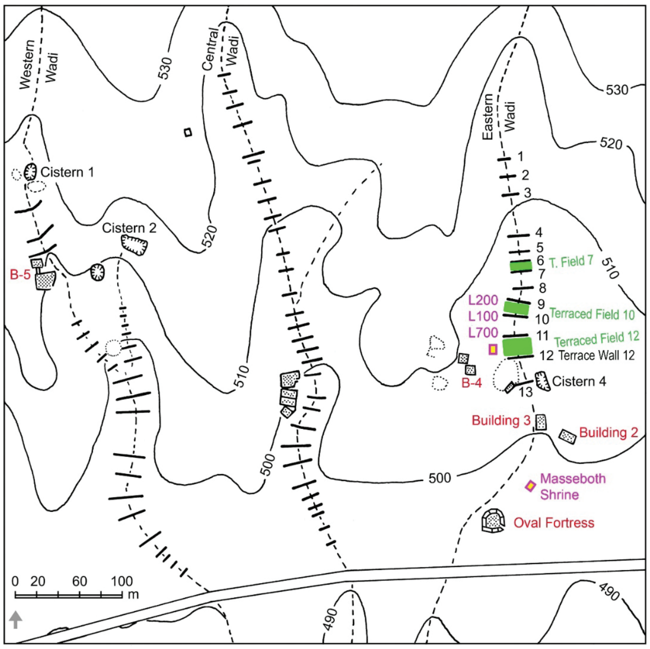

Figure 3: Archaeological features of Horvat Haluqim mentioned in the text. The Iron Age building remains with red lettering were excavated by Cohen (1976). The stone terrace walls of the ancient agricultural fields were mapped by Bruins (1986), who excavated various terraced wadi fields (in green). Terraced Field 12 yielded many radiocarbon dates (Table 1). Bruins also excavated building remains west of Terraced Field 12, indicated by a small yellow-purple rectangle. Here Loci 200, 100 & 700 (see Figure 9) gave radiocarbon dates (Table 2). The recently discovered *Masseboth* Shrine is located between the Oval Fortress, Building 2 and 3

3. *Masseboth* Shrine at Horvat Haluqim

Sometimes it may take many years in archaeological investigations before one realizes or recognizes the meaning of a certain feature, in this case the erratic presence of a few large stones, which cannot be interpreted as the remains of a building. While walking at the site with a student during the spring of 2017, I suddenly realized that the erratic large stones between the Oval Fortress and Building 2 (Figures. 3, 4, 5) appear to be a *Masseboth* Shrine. Rudolph Cohen did not mention the presence of *masseboth* in his publication of Horvat Haluqim, but he placed an unexplained mark on the site map (Cohen 1976, p. 36), which indeed fits the position of the *masseboth*.

The very location of the *Masseboth* Shrine seems to emphasize its past importance for the ancient inhabitants, situated close to the Oval Fortress, the most prominent Iron Age structure, and two other significant Iron Age buildings (Figure 3). The gate of the Oval Fortress is located at its south-eastern side (Figure 4), which facilitates easy movement towards the *Masseboth* Shrine, as well as to Buildings 2 and 3. The numbering of buildings, as designated by Rudolph Cohen (1976), has been retained.

Figure 4: Location of the *Masseboth* Shrine at Horvat Haluqim between the Oval Fortress and Building 2, and south of Building 3. Kibbutz Sede Boker is visible in the background, as well as the modern road to Yeruham. Composite photo courtesy of K. Quinn, view to the SSW

The Oval Fortress, measuring 23x21 m in diameter, is composed of seven casemate rooms around an inner courtyard with a diameter of 14 m (Cohen 1976, pp. 34–35). The walls are ca 80 cm wide. Building 2 has a size of 8x8 m, comprising three long rooms and an inner courtyard, while an outer courtyard is situated on its south-eastern side (Cohen 1976, pp. 36–37). Building 3 is situated about 15 m to the north-west of the former building. It is a rather large structure of 14x9 m, composed of six rooms of unequal dimensions, built around an inner courtyard (Cohen 1976, pp. 37–38).

The location of Building 3 is quite close to the streambed of Wadi East (Figure 3), which is quite narrow at this section. However, there is no danger here of catastrophic flooding, because the three wadis at Horvat Haluqim are of the 1st stream order, i.e. the beginning of a natural drainage system. Even after strong precipitation for several hours, the flow in these wadis remains rather gentle, as observed during various rainfall events by the author (Bruins, 1986, 2012; Bruins et al., 2019). The ancient agricultural terraced wadi fields are situated more upstream in Wadi East, beginning about 35 m north of Building 3, where the wadi becomes much wider (Bruins, 1986).

Figure 5: Position of *Massebah* 1 (standing upright), and *Masseboth* 2 and 3 (both lying down and possibly dislocated) near the Oval Fortress at Horvat Haluqim. The white arrow indicates the entrance/exit of the Oval Fortress. View to the south-west towards Kibbutz Sede Boker and Midreshet Ben-Gurion (Photo by H. J. Bruins, 28.3.2017)

Three limestone *Masseboth* can be discerned (Figure 5). *Massebah* 1 is still standing upright in its apparent original position, but *Masseboth* 2 and 3 are lying horizontal, partly embedded in soil. Their original spatial location cannot be ascertained, requiring excavations and study of the soil stratigraphy around and below the stones. Massebah 1 is situated 41 m north-east from the Oval Fortress and 51m south-west from Building 2 (Figures 3, 4).

Massebah 1 has a height of 56–60 cm above the present soil surface. Its top part is more or less square, measuring 27 cm width at its front and back side, 29 cm at its south-western side and 28 cm at its north-eastern side. Its base, as visible at the present level of the soil surface, is rectangular, being 45 cm wide at the front of the *Massebah*, 47 cm at its back side, 38 cm at its south-western side, and 36 cm at its north-eastern side. The color of the limestone rock of *Massebah* 1 is basically greyish, but a strong secondary red-brown color is particularly visible at its front side (Figures 5, 6), and to a lesser extent at the other sides.

Massebah 2 also shows some red-brown tinting (Figure 5). The cause of such coloring is usually related to biochemical processes associated with the establishment of lichens and cyanobacteria on the rock surface (Danin and Garty, 1983; Nir et al., 2022). Large protruding rocks, such as standing *masseboth*, tend to cool down more at night, thereby facilitating the accumulation of more dew, which enhances the growth of micro-organisms on the rock surface.

Figure 6: *Massebah* 1, rising ca 60 cm high above the soil surface, stands upright in its apparent original position. A distinct reddish-brown coloring is visible on the south-east side of the *Massebah* pillar, probably its cultic front side. Notice here also a large flat stone, perhaps an offering bench. The disturbed positions of smaller stones may mark enclosure patterns of the shrine area. View to the north-west (Photo by H. J. Bruins, 28.3.2017)

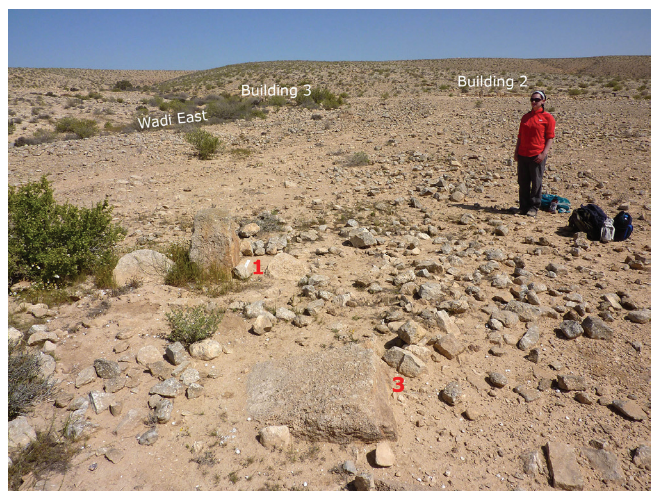

Figure 7: Looking to the north-east, the positions of *Massebah* 1 (upright in its original position) and *Massebah* 3 (lying down) with Buildings 2 and 3 in the background. A circular stone, tilted and partly embedded in the soil, is visible next to *Massebah* 1 and a prominent green *Zygophyllum dumosum* shrub. Ancient agricultural terraced fields are situated in Wadi East further north, where the streambed is much wider (Photo by H. J. Bruins, 28.3.2017)

Avner (2002, p. 66) noted that the front side of a *massebah* may sometimes bear a special natural feature. Indeed, among the four vertical rock sides of *Massebah* 1, it seems that the most colorful side was purposefully selected by the ancient inhabitants as the forward-facing side for cultic practices. The above line of reasoning is supported by the fact that in front of this colorful *Massebah* side, a large flat stone is situated, which may have functioned as an offering bench (Figures. 5, 6, 7). Moreover, the front side of *Massebah* 1 faces south-east, which fits the general eastern orientation pattern of *masseboth* in the region, as investigated by Avner (2002), occurring in 72.1% of the studied cases.

Since the original position of the two fallen *masseboth* (Figures 5, 7) is so far unknown, we cannot be sure whether the three *masseboth* were placed together as a triad (for examples see Avner, 2002, pp. 66–67, Figures. 3:1–3:38), or each one separate in a more individual pattern. Seen from a different angle (Figures 7), another rather large, partly circular stone in a tilted position can be seen at the north-western side of *Massebah* 1. This stone formed also part of the *Masseboth* Shrine, probably standing vertical with its rounded part upward. Various examples of rounded *masseboth* stones have been documented by Avner (2002, Table 11), who focused on older periods from the Late Neolithic to the Early Bronze Age. However, the *Masseboth* Shrine discovered at Horvat Haluqim dates probably to the Iron Age, as suggested below.

4. Age assessment, settlement character, ethnicity

4.1. Age assessment with emphasis on radiocarbon dating

No excavations have been conducted so far below and around the *masseboth* to obtain possible stratified organic material (charred plant remains or animal bones) for radiocarbon dating. Ceramic sherds lying on the surface in the *masseboth* area belong to the hand-made Negbite type of pottery, which cannot be used for age assessment, as described above.

The *Masseboth* Shrine may be related to the age of the adjacent Oval Fortress, in view of their juxtaposition. Following his excavations during the 1970s, Rudolph Cohen proposed that the fortress and settlement at Horvat Haluqim, together with other Iron Age sites in the central Negev Highlands, were established in the mid-10th century BCE by a royal initiative during the reign of King Solomon to defend the southern borders of his kingdom. These settlements had a short lifespan in the opinion of Cohen, who attributed their destruction to the campaign by Pharaoh Shishak, only a few decades after their establishment (Cohen 1976, 1979, 1986a; Cohen and Cohen-Amin, 2004).

The vexing question of ethnicity at Horvat Haluqim and other similar sites in the Negev Highlands is discussed in section 4.3. Concerning dating, archaeological age assessment was based primarily on diagnostic wheel-made pottery, which Rudolph Cohen assigned exclusively to the 10th century BCE. However, other scholars considered also older dates in both the 10th or 11th century BCE (Herzog, 1983, 1990; Meshel, 1994), the 12th century BCE (Finkelstein, 1984, 1988; Rothenberg, 1967, pp. 86–88), and even the 13th century BCE, based on the presence of Negbite pottery together with dynastic Egyptian finds at Timna (Rothenberg, 1972, pp. 153–182).

It should be emphasized that in the above assessments, published by scholars in the 20th century, no distinction was usually made regarding the time of establishment of the Negev Highland sites and the time of construction of the oval fortresses. Barkay (1992, p. 324) remarked: "It is difficult to reach a conclusion concerning the fortresses, as their interpretation depends on their dating, and their dating involves serious difficulties. In many studies, scholars appear to be caught up in a circular argument". Meshel (1994, p. 59), who discussed the origin of the sites in terms of two prevailing theories – "imposed settlement by the kingdom of Israel" *versus* "self-initiated sedentarization by desert nomads" – remarked: "Dating is, of course, crucial for both theories: a date earlier than the establishment of the kingdom of Israel would settle the argument once and for all".

Therefore, independent dating based on radiocarbon, which was not a factor in the above interpretations, is of crucial importance. The author introduced radiocarbon dating at Horvat Haluqim and Tell el-Qudeirat in north-eastern Sinai (Bruins, 1986; Bruins and Van der Plicht, 2005, 2007, 2017a, 2017b; Bruins et al., 2012, 2018, 2020). He also excavated the soil stratigraphy in various parts of the Oval Fortress at Horvat Haluqim and found organic material for radiocarbon dating. The detailed results will be published elsewhere, in cooperation with Van der Plicht of the University of Groningen, where the organic samples were dated. What can be mentioned in the context of this article is the following: radiocarbon dating suggests that the Oval Fortress originated before the mid-10th century BCE. If so, its origin *cannot* be attributed to a royal initiative by Solomon, as suggested by Cohen (1976, 1979, 1986a, 1986b).

Additional support that Iron Age settlement in the region preceded the 10th century BCE, hence preceded Iron Age IIA, is given by radiocarbon dates from Tell el-Qudeirat in north-eastern Sinai (Bruins, 1986, Bruins and Van der Plicht, 2005, 2007; Gilboa et al., 2009). The area of Ein el-Qudeirat with its copious spring was considered by Woolley and Lawrence (1914–15) and Cohen (1981b) as a potential candidate for biblical Kadesh Barnea. A sample of fine charcoal (KB-109) was taken by Bruins in December 1981, in cooperation with Rudolph Cohen, from the lowermost dark layer exposed in the center of Tell el-Qudeirat (Area C, Squares K/6–7, western profile), about 5 meter below the surface of the tell mound. The excavations were still ongoing in 1981 and no definitive report existed of Squares K/6–7, when sample KB-109 was taken. Therefore, I followed the (preliminary) suggestion by the excavator, Rudolph Cohen, who attributed the dark ash layer to the destruction of the Lower Fortress.

However, more than two decades later, the final reports (Cohen and Bernick-Greenberg, 2007) revealed a much more complicated stratigraphic picture. The Lower Fortress, apparently roughly oval in shape (Stratum 4b-a) was preceded by an earlier occupation (Stratum 4c). The authors stated: "No chronologically diagnostic artifacts were associated with this occupation; its date is thus unclear" (Cohen and Bernick-Greenberg, 2007, p. 7). Nevertheless, the authors maintain a 10th century BCE date for the entire Stratum 4, including its earliest phase Stratum 4c.

In addition, they also recognized an unfortified settlement (Stratum 4b-a) adjacent to the Lower Fortress. In fact, Squares K/6–7, in which the fine charcoal sample GrN-12330 was taken in 1981, are situated slightly west of the Lower Fortress (see Cohen and Bernick-Greenberg, 2007, Plan 3 and 4). Thus, radiocarbon date GrN-12330 appears to belong to the unfortified settlement Substrata 4b-a and not to Substratum 4c. However, the stratigraphic relationships between the substrata remain unclear, as acknowledged by the excavators: "Substrata 4b and 4a in the fortress on the one hand and in the settlement on the other do not necessarily correspond" (Cohen and Bernick-Greenberg, 2007, p. 8).

I agree with Singer-Avitz (2008) and Finkelstein (2010) that reevaluation of the stratigraphic position of the above radiocarbon date is necessary. They suggested to relate GrN-12330 (2930 ± 30 BP) to Substratum 4c, which they assigned to Iron Age I. Yet, the position of Squares K/6–7 is placed by the excavators in the unfortified settlement Substrata 4b-a.

Calibrating GrN-12330 (2930 ± 30 BP) with the IntCal20 calibration curve (Reimer et al, 2020) and the OxCal program (Bronk Ramsey (2009, 2022), yields a 1σ age range of 1201–1056 cal BCE (68.3% probability); the 2σ age range is 1222–1016 cal BCE (95.4% probability); the calibrated median value is 1133 cal BCE. These results make it clear that settlement at Tell el-Qudeirat predated the 10th century BCE and Iron Age IIA, as also concluded by Singer-Avitz (2008) and Finkelstein (2010) on the basis of ceramic evaluation.

The result of the above radiocarbon date (GrN-12330) of the unfortified settlement west of the Lower Fortress was augmented by older than expected 14C dating results by Gilboa et al. (2009) of a room within the Lower Fortress itself. In 2007, the authors obtained two samples of charred seeds of Bitter Apple (*Citrullus colocynthis*) from the archaeo-botanist Mordechai Kislev. The seeds, excavated by Cohen in 1979, originated from Locus 820 (Area E, Square O/9), a floor of a room within the inner courtyard of the Lower Fortress, just south-west of the casemate wall (Plan 3). The excavators assigned this room/floor to Substratum 4b (Cohen and Bernick-Greenberg 2007, pp. 104, 380; Plan 3). The samples were measured independently by three radiocarbon laboratories (Gilboa et al., 2009): the Weizmann Institute, Groningen University, and Tucson University. Each laboratory received two seeds from each of the two samples. All the 14C measurement results from the three laboratories turned out to be close to each other. The weighted average date is 2826 ± 10 BP (Gilboa et al., 2009).

Using the latest IntCal20 calibration curve (Reimer et al., 2020), I calculated with the OxCal 4.4 program (Bronk Ramsey (2009, 2022) the calibrated age ranges. The highest relative probability is as usual given by the 1σ (68.3% probability) range: 1007–976 (44.0%), 953–935 (24.3%) cal BCE. The wider 2σ range (95.4% probability) also includes the comparatively less probable tails, the result being 1015–924 (95.4%) cal BCE. The calibrated median value is 976 cal BCE. The range with the highest relative probability is 1007–976 (44.0%) cal BCE. These results indicate that the Lower Fortress at Tell el-Qudeirat is older than the time attributed to the reign of Solomon. If the charred seeds reflect a destructive end of the Lower Fortress, then its initial construction must be even older than the above radiocarbon date.

Table 1: Radiocarbon dates at Horvat Haluqim of an ancient agricultural terraced field and adjacent living floors not related to building structures (Eastern Wadi, Terraced Field 12; Bruins and Van der Plicht, 2017a; Bruins et al., 2018). Calibrations from conventional radiocarbon years BP into historical years BCE were carried out using the IntCal20 calibration curve (Reimer et al., 2020) and the OxCal program 4.4 (Bronk Ramsey, 2009, 2022). The calibrated median value should not be regarded as a point date; it designates the central value of the calibrated age range, 50% being older and 50% being younger. COM means Charred Organic Material, usually very fine fragments, situated in black spots up to about 1 cm in size. Notice that COM sample GrA-27535 is a C4 plant (δ13C is -11.97 ‰)

Area and Year of Excavation	Depth (cm) or Altitude (m)	Material	Groningen AMS #	^{14}C date (year BP)	δ^{13}C (‰)	1σ Calibrated date (year BCE)	2σ Calibrated date (year BCE)	Calibrated Median Value (year BCE)
Area 5-2004	19 cm	Bone	GrA-34271	2825 ± 35	-17.71	1016–922 (68.3%)	1110–900 (95.4%)	978
Area 5-2004	25 cm	Bone	GrA-34272	2830 ± 35	-17.11	1042–1036 (3.3%) 1016–926 (65.0%)	1111–903 (95.4%)	984
Area 5-2004	34 cm	COM	GrA-27533	2840 ± 40	-23.71	1048–930 (68.3%)	1125–899 (95.4%)	999
Area 5-2004	41 cm	COM	GrA-27535	2875 ± 40	-11.97	1121–991 (68.3%)	1201–1142 (9.6%) 1132–926 (85.8%)	1053
Area 5-2007	502.64 m	COM	GrA-37496	2915 ± 40	-22.95	1197–1172 (11.1%) 1163–1143 (9.5%) 1131–1047 (44.7%) 1028–1021 (3.0%)	1257–1246 (0.9%) 1229–997 (94.5%)	1109
Area 5-2007	502.64 m	Bone	GrA-37497	2940 ± 40	-18.23	1216–1108 (57.8%) 1095–1081 (5.6%) 1068–1056 (4.8%)	1261–1016 (95.4%)	1147
Bronze chisel Area 5-2007	502.64 m 502.63 m	See Figure 8						
Area 5-2007	502.61 m	Bone, sheep/ goat ca 2 yr old	GrA-37493	2960 ± 40	-17.12	1259–1243 (5.9%) 1232–1116 (62.3%)	1369–1358 (1.0%) 1291–1045 (93.3%) 1031–1019 (1.1%)	1172
Area 5-2007	502.58 m	Bone, rib, mammal	GrA-37515	3020 ± 40	-18.27	1380–1344 (16.5%) 1307–1213 (51.8%)	1400–1156 (91.4%) 1147–1127 (4.0%)	1269
Area 5-2007	502.50 m	COM	GrA-48874	3115 ± 40	-23.14	1434–1378 (40.3%) 1347–1305 (27.9%)	1495–1477 (3.0%) 1456–1268 (92.5%)	1382
Area 5-2004	50 cm	COM	GrA-27648	3240 ± 30	-23.53	1536–1447 (68.3%)	1612–1573 (10.4%) 1566–1428 (85.0%)	1508
Area 5-2010	77 cm	COM	GrA-51084	3245 ± 30	-22.35	1540–1447 (68.3%)	1612–1433 (95.4%)	1508

Extensive radiocarbon dating at Horvat Haluqim of an ancient agricultural terraced field (Terraced Field 12 in the Eastern Wadi, see Figure 3) and adjacent living floors (Bruins and Van der Plicht, 2017a; Bruins et al., 2018), revealed a sequence of layers from the Middle/Late Bronze Age transition until the end of Iron Age I and the beginning of Iron Age II (Table 1). The median calibrated values range in a consistent stratigraphic series from 1508 to 978 cal BCE. The youngest date (GrA-34271, 2825 ± 35 BP) of this Horvat Haluqim series (Table 1) is very similar as the above average date (2826 ± 10 BP, Gilboa et al., 2009) of the charred seeds in the Lower Fortress at Tell el-Qudeirat. The 2σ calibrated ages of the above Horvat Haluqim series range from 1600 to 900 BCE, deriving from an area just 120 m north of the *Masseboth* Shrine.

The excavations near the western edge of Terraced Field 12 along the Eastern Wadi (Figure 3) uncovered a bronze chisel (Figure 8) in the western part of Area 5 within a context of finely stratified living floors (Bruins et al., 2018). The related sequence of radiocarbon dates (Table 1) indicates that the bronze chisel can be dated to the late 13th or 12th century BCE. Its shape and size look very similar to a bronze chisel of the 19th Dynasty in the Petrie Museum of Egyptian Archaeology in London. The age of the 19th Dynasty, ca 1320–1200 BCE, though slightly older, partly overlaps with the radiocarbon determined date for the bronze chisel at Horvat Haluqim (Bruins et al., 2018).

Figure 8: The Horvat Haluqim bronze chisel (4.7 cm long and 0.4 to 0.9 cm wide) shows varying degrees of weathering and oxidation. Radiocarbon dating of stratigraphically related animal bones (Table 1) place the chisel in the late 13th or 12th century BCE (highest relative probability). Its tapered end to the right was probably hardened and flattened by repeated heating and hammering. The chisel may have been broken at its wider and thicker left end. Here a sample was drilled for chemical analysis, exposing the bronze metal (after Bruins et al., 2018, p. 303)

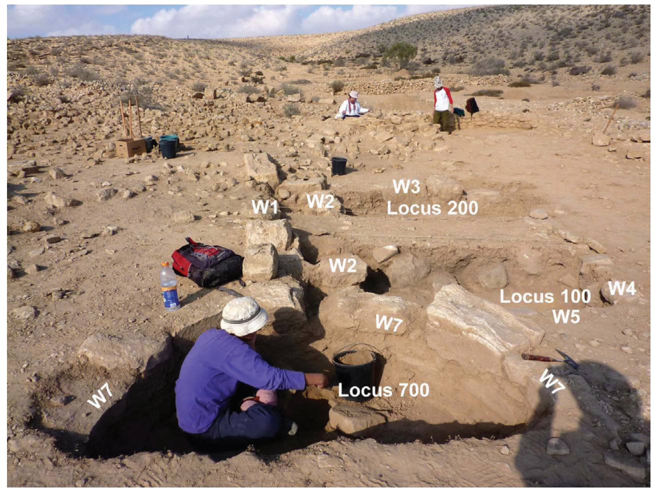

Figure 9: Small and rather crude building remains, excavated by Bruins et al. (2012), situated west of Terraced Field 12 along the Eastern Wadi. The positions of Loci 200, 100 and 700 (Figure 3), which yielded radiocarbon dates (Table 2), are indicated. The view is towards the north, looking upstream (Photo by H. J. Bruins, 26.11.2009)

Besides the excavations in Terraced Fields 12, 10 and 7 of the Eastern Wadi of Horvat Haluqim, excavations were also conducted by Bruins et al. (2012) in remains of small buildings, situated just west of Terraced Field 12 (Figure 9). Loci 200 and 100 are related to meagre and rather chaotic rectangular building remains, which had not been excavated before by Cohen. Only the wall foundations were partly preserved. The size of the building stones, roughly-hewn local Turonian limestone, is quite variable. Building stones may have been removed for usage in the adjacent Roman watch-tower (next to Iron-Age Building 4, see Figure 3), excavated by Cohen (1976, pp. 47–49), situated ca 40m west of Loci 200 and 100.

A small round building structure (Locus 700) borders Locus 100 to the south, stratigraphically partly overlying the latter to a small extent (Figure 9). This round building is composed of relatively large and more uniform roughly-hewn limestone blocks. It may have been a silo, as suggested by Haiman (personal communication, 2009), who participated in the excavation.

The archaeological soil within the three building loci was carefully excavated. Only a few Negbite sherds were found, but no wheel-made pottery remains. Therefore, age assessment based on ceramics proved impossible. However, tiny black spots, from a few millimeters up to 1 cm, were occasionally encountered in the archaeological soil, containing fine Charred Organic Material (COM). These black spots were sampled for radiocarbon dating (Table 2). The δ13C measurements showed that four black spots (GrA-48455, GrA-48459, GrA-48376, GrA-48422) contained charred organic material from C4 plants, found in all three loci.

The many radiocarbon dates from Horvat Haluqim (Tables 1 and 2) show most interesting results regarding temporal settlement history at the site. It seems that Horvat Haluqim was settled in the mid-2nd millennium BCE by semi-nomadic agro-pastoralists, who apparently lived in tents. No building structures were found at the site dating to the Late Bronze Age. However, the ancient agricultural soil strata in Terraced Field 12 of the Eastern Wadi show a consistent series of radiocarbon dates from about 1500–980 BCE (Table 1). These dates are from comparatively dark to dark-grey soil layers, which also contain animal bone fragments, both large and small (microscopic). The darker color is caused in particular by the presence of finely distributed charred organic fragments, visible in micromorphology studies, described in more detail in the following section 4.2.

Table 2: Radiocarbon dates at Horvat Haluqim from excavations in small buildings (Bruins et al., 2012), situated just west of Terraced Field 12 in the Eastern Wadi. Calibrations from conventional radiocarbon years BP into historical years BCE were carried out using the IntCal20 calibration curve (Reimer et al., 2020) and the OxCal program 4.4 (Bronk Ramsey, 2009, 2022). The calibrated median value should not be regarded as a point date; it designates the central value of the calibrated age range, 50% being older and 50% being younger. COM means Charred Organic Material, usually very fine fragments in black spots up to about 1 cm in size. Notice the presence of four COM samples from C4 plants, having δ13C values in the range of -10.12 ‰ to -11.45 ‰.

Locus & Sample No.	Depth (cm)	Material	Groningen AMS #	^{14}C date (year BP)	δ^{13}C (‰)	1σ Calibrated date (year BCE)	2σ Calibrated date (year BCE)	Calibrated Median Value (year BCE)
L700-01	28	COM	GrA-48453	2430 ± 35	-24.29	725–706 7.1%) 662–651 (4.2%) 545–413 (56.9%)	751–684 (19.1%) 668–634 (8.5%) 622–614 (0.9%) 591–404 (67.0%)	522
L700-02	33	COM	GrA-48454	2680 ± 35	-24.84	896–873 (20.5%) 839–803 (47.8%)	903–797 (95.4%)	834
L700-03	40	COM	GrA-48455	2755 ± 40	-11.45	930–813 (68.3%)	1000–817 (95.4%)	895
L700-04	42	COM	GrA-48458	2445 ± 40	-22.61	746–690 (19.2%) 665–645 (6.9%) 551–452 (33.3%) 446–416 (9.0%)	756–680 (23.4%) 671–606 (15.4%) 597–408 (56.7%)	561
L700-05	49	COM	GrA-48459	2460 ± 40	-10.61	751–684 (23.2%) 668–634 (10.9%) 621–614 (1.8%) 591–481 (32.4%)	758–678 (26.4%) 673–416 (69.1%)	598
L200-02	32	COM	GrA-48376	2605 ± 35	-10.12	806–779 (68.3%)	831–753 (92.2%) 682–669 (1.5%) 610–593 (1.7%)	793
L200-03	36	COM	GrA-48377	2680 ± 35	-22.15	896–873 (20.5%) 839–803 (47.8%)	903–797 (95.4%)	834
L200-04	45	COM	GrA-48450	2675 ± 35	-24.10	895–875 (17.4%) 837–802 (50.8%)	901–796 (95.4%)	830
L200-06	56	COM	GrA-48451	2670 ± 35	-21.87	894–877 (14.1%) 836–799 (54.2%)	901–793 (95.4%)	827
L100-01	13	COM	GrA-48370	2780 ± 35	-22.19	985–898 (58.7%) 867–847 (9.5%)	1011–832 (95.4%)	927
L100-02	22	COM	GrA-48445	2810 ± 35	-25.45	1007–921 (68.3%)	1055–892 (90.3%) 880–837 (5.1%)	963
L100-04	43	COM	GrA-48373	2790 ± 35	-24.96	999–930 (68.3%)	1042–1038 (0.5%) 1016–833 (94.9%)	942
L100-05	56	COM	GrA-48422	2870 ± 60	-11.45	1125–970 (60.5%) 958–932 (7.8%)	1256–1248 (0.4%) 1227–899 (95.0%)	1050

The oldest indications for stone building activities appear to be (Table 2) in the 12th or 11th centuries BCE, continuing in the 10th and 9th centuries BCE. After about 800 BCE, there seems to be a break in human activities at the site. However, renewed settlement occurred in the Babylonian-Persian period (587–332 BCE), as indicated by three radiocarbon dates in Locus 700, a small round building structure, which probably functioned as a grain silo. The fact that also two Iron Age radiocarbon dates (GrA-48454, GrA-48455) occur in Locus 700 may indicate that the silo structure was built in the Iron Age and later reused in the Persian period.

Concerning Table 2, rather similar radiocarbon dates were obtained for Iron-Age building remains at Atar Haro‘a (Boaretto et al., 2010), another rural site in the Negev Highlands situated about 5 km north-east of Horvat Haluqim. The oldest date here is from a dung pellet 2825 ± 40 BP (RTT-5488), having a 2σ calibrated age range of 1120-890 BCE (Boaretto et al., 2010, p. 7). No Iron Age radiocarbon dates younger than about 800 BCE occur at Atar Haro‘a, similar to the results from Horvat Haluqim. Concerning the Persian period, unlike Horvat Haluqim, no radiocarbon dates of this period have been reported for Atar Haro‘a, although a square fortress of the Persian period (Cohen, 1986b) is located opposite the Iron Age village.

4.2. Settlement character

Following his excavations at Horvat Haluqim, Cohen (1976, p. 39) suggested that Iron-Age "Building 5 is part of a farm unit… The nearby terraced fields, walls and cisterns are connected with this unit and belong to the same period", i.e. the Iron Age IIA. During the early 1980s, when I was partly employed by the Negev Archaeological Emergency Survey, directed by Rudolph Cohen, I asked him about a suitable site in the Negev Highlands to investigate ancient desert agriculture possibly related to the Iron Age? His answer was Horvat Haluqim. Thus, I began excavations in ancient agricultural terraced wadi fields at this site, which required experience in soil science, a significant part of my university education.

Unique anthropogenic features of soil formation, described below in sections 4.2.1 to 4.2.4, were discovered (van Asperen et al., 2014; Bruins, 1986, pp. 82–83; 2007, 2012; Bruins and Jongmans, 2012; Bruins and Van der Plicht 2017a, 2017b; Bruins et al., 2019, 2020). These soil features together with radiocarbon dating (Table 1), give unmistakable evidence of ancient runoff farming at Horvat Haluqim during the Late Bronze Age and Iron Age I, as well as in younger periods.

The ancient inhabitants used two sources of fertilizers, which they applied to selected agricultural terraced fields. One source is interpreted as refuse from kitchen/household fires (cooking and/or heating), containing charred organic fragments, ash, and bones. The other source is interpreted as dung derived from animal pens, as the soil contains non-burned dung fragments and faecal spherulites in ancient soil layers dated by radiocarbon (Bruins and Jongmans, 2012; Bruins and Van der Plicht, 2017a, 2017b).

Experimental archaeology in the Negev Highlands, conducted by the author in cooperation with colleagues and students (van Asperen et al., 2014; van Bommel et al., 2021), supported the above interpretations. Biochar (Stavi and Lal, 2013) was used in the first investigation (van Asperen et al., 2014). The second investigation (van Bommel et al., 2021) used ash and charred organic matter from Bedouin kitchen fires (cooking and heating) as a fertilizer, and sheep dung as another fertilizer, imitating the two types of ancient fertilizers uncovered by micromorphology in the ancient agricultural soil layers at Horvat Haluqim. The agricultural experiments were carried out at the Sede Boker Campus of the Jacob Blaustein Institutes for Desert Research (Ben-Gurion University of the Negev).

The crops involved were wheat and barley varieties used for decades by a Bedouin family in ancient runoff farming fields in the Negev Highlands. The dual “ancient” fertilizer combination of ash/charred organic material from the traditional Bedouin fireplace (cooking and heating) together with sheep dung resulted in the largest wheat and barley grains in the controlled pot experiments (van Bommel et al., 2021). The latter research project also included stable isotope measurements of wheat and barley grains, which gave interesting results in relation to the two types of "ancient fertilizers", water irrigation amount in the pot experiments, as compared to present Bedouin runoff farming in fields that received more runoff and less runoff water. The Bedouin do *not* apply fertilizers to the soil.

4.2.1. Ferric nodules (Figure 10a)

The concentrations of iron-(hydro)oxides, up to about 0.5 mm in diameter, are extraordinary for an arid desert environment. Iron, present in soil minerals, can only become mobile in a wet reduction environment (temporary waterlogging). "Through diffusion processes the iron may move to certain micro-sinks in the soil, near spots where voids facilitate the entry of air (oxygen). Here the iron is again oxidized and immobilized as a result" (Bruins, 1986, p. 83). The formation of ferric nodules may take place in the order of one hundred to a few hundred years (van Breemen, 1988; Brinkman, 1970). These ferric nodules occur in soil layers of ancient terraced wadi fields at Horvat Haluqim, radiocarbon dated to the Late Bronze and Iron

Ages. The ferric nodules constitute unmistakable evidence of seasonal waterlogging, caused by the building of terrace wall dams and the resulting capture of runoff water.

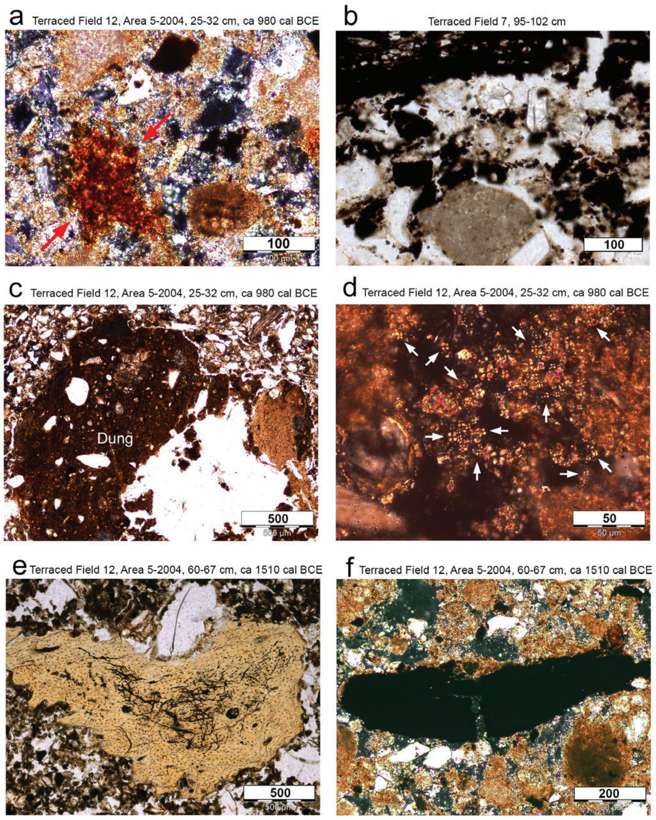

Figure 10: Diagnostic soil features of runoff farming and manuring in radiocarbon dated Late Bronze and Iron Age soil layers of ancient agricultural terraced fields in the Eastern Wadi of Horvat Haluqim. Microscope pictures (PPL = Plane Polarized Light, XPL = Cross Polarized Light) of thin sections. (a) Ferric nodule (XPL), indicated by red arrows, about 0.2 mm in length (scale bar in micron). Notice also various black fragments of charred organic material. (b) Charred organic material (PPL) ranging from mm size to less than 10 µm. (c) Dark brown dung fragment (PPL), 2x1 mm in size. (d) Faecal spherulites, derived from dung, ca 10 micron in size, showing the typical cross-shape extinction pattern (XPL). (e) Bone fragment (PPL), up to 2 mm in size, from kitchen refuse used as fertilizer. (f) Charred organic fragment (XPL), 0.8x0.2 mm, probably also from kitchen fire refuse

Figure 10a shows a ferric nodule from a soil layer in Terraced Field 12 of the Eastern Wadi. This nodule has been formed in situ, chemically overprinting other soil constituents. Only multiple iron redox cycles (runoff water, trapped by Terrace Wall 12, followed by natural drainage and return of air – oxygen – to the soil) can explain the genesis of this ferric nodule from Area 5, profile 2004, situated at a depth of 25–32 cm (thin section 04075). This depth layer is radiocarbon dated by an adjacent animal bone at 25 cm depth (GrA-34272, 2830 ± 35 BP) and Charred Organic Material (COM) at 34 cm depth (GrA-27533, 2840 ± 40 BP), very similar dates indeed! The combined 1σ calibrated age range of both dates is 1048–926 cal BCE (Table 1). Notice near the reddish-brown ferric nodule also various black fragments of charred organic material, applied to the soil by ancient agro-pastoralists as a fertilizer, mentioned above (van Asperen et al., 2014; van Bommel et al., 2021).

4.2.2. Dung fragments and faecal spherulites (Figures 10c, 10d)

The anthropogenically influenced soil layers in the ancient terraced wadi fields at Horvat Haluqim are also characterized by the presence of dung fragments and faecal spherulites, both of which are *not* charred. Dung fragments under the petrographic microscope in plane-polarized light (ppl) usually have a dull brown color, containing much less silty quartz particles than the surrounding loess soil. They often exhibit randomly distributed brown "stripes" (Bruins and Jongmans, 2012). These dung aggregates indicate soil fertilization with animal manure, derived from goats and/or sheep that were kept by the ancient inhabitants of Horvat Haluqim, as also indicated by diagnostic bone fragments (Liora Horwitz, personal communication, 2010). The dung fragments seem to make up about 30% of the Iron Age soil layer in Area 5-2004 at a depth of 25–32 cm.

Additional confirmation for manuring with animal dung is provided by the ubiquitous presence of calcium carbonate spherulites, usually of fine silt size (10–20 micron or larger), in the anthropogenically influenced soil layers of the ancient terraced fields at Horvat Haluqim (Bruins and Jongmans, 2012). The intestines of sheep and goats are high producers of such faecal spherulites (Canti, 1999). These small rounded faecal particles show a typical cross extinction pattern in thin sections under crossed polarized light (Figure 10d).

4.2.3. Charred organic material and animal bone fragments (Figures. 10b, 10e, 10f)

Various ancient soil layers in the excavated Terraced Wadi Fields 12, 10 and 7 (Figure 3) were found to have a somewhat darker color, which is clearly visible along excavated stratigraphic sections (van Asperen et al., 2014; Bruins, 1986, pp. 76–78; Bruins, 2007; Bruins and Van der Plicht 2017a, p. 9). This phenomenon can be compared with the famous Terra Preta soils in South America (Preta means black in the Portuguese language), which are much more fertile than the surrounding natural soil (Glaser et al., 2001). The dark color of these ancient pre-Columbian anthropogenic soils is derived from charred organic material, which is understood to be derived from lowheat smoldering domestic fires commonly used by the native population for cooking and heating (Smith, 1980), subsequently added to the soil as a fertilizer.

The same mechanism was suggested by Bruins (2007) to explain the darker color of certain soil layers in agricultural terraced wadi fields at Horvat Haluqim (Bruins and Van der Plicht, 2017a, 2017b). The agro-pastoralists living at the site during the Late Bronze and Iron Ages, as well as in later periods, used the refuse from domestic cooking and heating fires, rich in partly burned charred plant material, ash, bone fragments, and occasionally also flint and ceramic fragments, as noted in thin sections. They applied this dark refuse to the surface of selected terraced fields. Successive sedimentation and resulting aggradation of the soil by runoff flows caused the surface of the soil to "grow upward", albeit mixed by seeding, ploughing and bioturbation (Bruins et al., 2020), gradually burying and preserving (!) these darker colored anthrosol layers.

4.2.4. Contrasting soil features in more recent surface layers in the terraced fields

In the more recent surface soil layers of terraced wadi fields at Horvat Haluqim, where soil accumulation has aggraded until the top of the stone terrace walls, distinct sedimentary layering from runoff flows may be visible in thin sections (Bruins and Van der Plicht, 2017a; Bruins et al., 2020). This is clear evidence that the soil was neither sown nor ploughed in these more recent finely stratified layers. Such human activities would have mixed the soil and destroyed the sedimentary laminae (Bruins et al., 2020). No ferric nodules occur in these soil layers, because the soil surface has reached the top of the stone terrace wall and hardly any runoff water is trapped as a result. The soil does not become temporarily waterlogged and a reduction environment without air cannot develop in the arid desert environment. Hence, iron in the soil cannot become mobile and ferric nodules will not be formed.

No charred organic material or small bone fragments occur in these layers, as the soil was neither farmed nor manured with kitchen-fire refuse or dung. Hence, the content of faecal spherulites is much lower as compared to ancient soil layers that were farmed and manured (Bruins and Van der Plicht, 2017a, p. 10), even though Bedouin herds graze in the wadis of Horvat Haluqim during the spring, dropping some dung on the soil surface on the go, as observed by the author.

4.2.5. Implications for the settlement character during the Late Bronze and Iron Ages

No stone building (dwelling) remains were found at the site dating to the Late Bronze Age, whilst radiocarbon dated anthrosol layers in terraced wadi fields show unmistakable evidence of Late Bronze Age runoff farming and soil manuring. Therefore, the people involved can be classified as *semi-nomadic agro-pastoralists* who probably lived in tents. The presence of diagnostic, large animal bone fragments at Horvat Haluqim (sheep and goats, Liora Horwitz, personal communication, 2010), besides microscopic-size bone fragments in the terraced fields, as well as the use of animal dung as manure (Figure 10) show that these people raised livestock.

They were also involved in the *copper trade*, possibly already in the Late Bronze Age, as well as in Iron Age I, as indicated by the bronze chisel found at Horvat Haluqim (Figure 8), derived from the Faynan copper area. Negbite pottery, also from Horvat Haluqim, was found to contain copper slag temper (Martin et al., 2013), which also seemed to relate isotopically to Faynan (Yahalom-Mack et al., 2015). This Negbite pottery is not restricted to Iron Age IIA, as suggested by Martin et al. (2013), but may also be older, in view of the radiocarbon dates from both Horvat Haluqim (Tables 1 and 2) and Tell el-Qudeirat, mentioned above.

An abundance of camel bones was uncovered at Tell el-Qudeirat, including the oldest Stratum 4 (Cohen and Bernick-Greenberg, 2007, p. 9; Hakker-Orion, 2007). Camel bones were also excavated in the Aravah Valley (Sapir-Hen and Ben-Yosef, 2013). These important findings regarding camels underline the capacity for copper trade over large distances, for example to Egypt via Tell el-Qudeirat, along the biblical way of Shur.

4.2.6. Both criticism and additional evidence for Iron Age cereal farming in the region

Based on phytolith research within rooms and courtyards of Iron Age *buildings* at Atar Haro‘a (Shahack-Gross and Finkelstein, 2008) and Nahal Boqer (Shahack-Gross et al., 2014), Shahack-Gross and Finkelstein (2015, p. 253) came to the amazing conclusion that agriculture was not practiced in the entire Negev Highlands during the Iron Age. Why is it amazing? First, the methodology is indirect. They did not investigate ancient agricultural fields, but supposed dung remains in building structures. Second, the scope of the methodology in terms of scale and the subsequent extrapolation is astonishing.

Imagine that scientists would investigate rooms of a house and its courtyard in Sede Boker and rooms of another house and its courtyard in Yeruham, looking for pieces of jigsaw puzzles. Following careful investigations in these two houses, they did not find such pieces. Subsequently, they concluded that people did not play with jigsaw puzzles in the entire Negev Highlands, from Dimona to Mizpe Ramon and from Masshabe Sadeh to Nizzana.

Regarding their indirect methodology, the use of phytoliths has limitations. The phytoliths from cultivated cereals and wild cereals look similar. Microscopic investigations of thin sections from ancient soil layers at Horvat Haluqim showed multicellular phytolith stomata of grasses (Bruins and Van der Plicht 2017b, Figure 1). Though such phytoliths can be indicative for cereal farming, they can also be derived from wild cereals. The latter are growing profusely nowadays in the ancient terraced wadi fields at Horvat Haluqim during an average or wet rainfall/runoff year, eagerly grazed by Bedouin herds. If one would investigate their dung afterwards, how can you tell the difference whether the phytoliths came from wild cereals or cultivated cereals?

Similarly, regarding dung of domesticated animals in archaeological deposits, how do you know whether the phytoliths came from dung remains consumed by the animals in the spring, summer, autumn or winter, which are characterized by different plant food availability in the Negev, different preferences by the animals themselves, and for example, different Bedouin grazing management in the 1970s (Ben-David, 1982), and probably also in the past. In a critical review article about current debates in archaeological phytolith analysis, Shillito (2013) advised caution concerning conclusions based on phytoliths, as indicated by the title of her paper: "Grains of truth or transparent blindfolds?" For additional critical comments regarding the investigation by Shahack-Gross and Finkelstein (2015) see Bruins and Van der Plicht (2017a, 2017b).

In contrast to the views of Shahack-Gross and Finkelstein, there is quite extensive evidence for cereal farming at Horvat Haluqim during the Iron Age, as well as in other areas of the Negev Highlands and north-eastern Sinai. Besides the evidence in soils of terraced agricultural fields dated by radiocarbon, as described above (Figure 10) in sections 4.2.1 to 4.2.4, a flint sickle blade with gloss was found at Horvat Haluqim within a complex of silos. The typology of this sickle blade belongs to the Bronze or Iron Age, according to Steve Rosen (personal communication, 2010). These findings have not yet been published.

Extensive archaeological surveys by Haiman (1994, p. 51) in the western Negev Highlands led to the discovery of an "*abundance* of sickle blades, silos, and threshing floors", attributed by Haiman to Iron Age II. The "*abundance* of sickle blades" , as described by Haiman (1994, p. 51), was "devalued" by Shahack-Gross and Finkelstein (2015, p. 258) to "*small* amounts of sickle blades have been found at Iron IIA sites".

Concerning Tell el-Qudeirat, Cohen and Bernick-Greenberg (2007, p. 9) concluded: "Subsistence at Kadesh Barnea during the 10th century BCE was based on agriculture, as evidenced by the flint sickles (Chapter 17) and the numerous limestone and basalt groundstone tools (Chapter 13). Animal husbandry comprised the usual domesticates."

4.3. Ethnicity: Israelite, Amalekite or Edomite?

Who were these ancient inhabitants of the Negev Highlands who built a unique series of roughly oval-shaped fortresses? The first scholarly interpretations favored Israelite settlement during the Iron Age, both with regard to ancient runoff farming in terraced wadi fields and building structures (Aharoni et al., 1960; Aharoni, 1967; Evenari et al., 1958).

The possible ancient Israelite connection included a number of variations, reviewed by Barkay (1992) and Meshel (1994): (a) Nomadic settlement (Eitam, 1988) of the Israelite tribe of Simeon; (b) Israelite settlements built during the early monarchy by Saul and David in the late 11th or early 10th century BCE as a state initiative against desert nomads; (c) A royal initiative by Solomon in the mid-10th century BCE to guard the southern border by fortresses (Aharoni, 1967). The latter interpretation was subsequently advocated by Rudolph Cohen in all his publications regarding the Iron Age settlements in the Negev Highlands (Cohen, 1976, 1979, 1981a, 1981b, 1986a, 1986b; Cohen and Cohen-Amin, 2004; Cohen and Bernick-Greenberg, 2007). Viewpoints (b) and (c) were defined by Meshel (1994) as the *Theory of Imposed Settlement*, which he also favored himself, though leaving open the question to which Israelite king it should be attributed.

The other major line of reasoning in the literature was defined by Meshel (1994) as the *Theory of Self-initiated Sedentarization by Desert Nomads*. The first advocate of this interpretation was Beno Rothenberg (1967, 1972), who attributed the fortresses and related settlements in the Negev Highlands to the biblical Amalekites. He presented a detailed account of this interpretation (Rothenberg, 1967, pp. 86–106), based on his extensive archaeological surveys in the Negev and Sinai, as well as his excavations at copper production centers in Timna with findings of Negbite pottery (Rothenberg 1972). Thus, he was also the first to link the inhabitants of the Negev Highlands, Amalekites in his opinion, to the Aravah copper industry.

Sedentarization by desert nomads has also been advocated by Finkelstein, who wrote a detailed review regarding the Iron Age fortresses (1984), in which he presented his own reasons for nomadic settlement. He interpreted the oval-shaped casemate "fortresses" as an important stage in the nomadic sedentarization process to create a protected "oval compound" for protection of the domesticated herds (Finkelstein, 1984, 1990). A similar view concerning oval courtyards was also expressed by Herzog (1990) regarding more northern sites, such as Beersheba Stratum VII and by Finkelstein (1988a) concerning Izbet Sarta Stratum III. I do not agree with this interpretation viewing the Negev fortresses as animal pens, as described above in section 2. Finkelstein (1984, 1988b, 1990, 1995) is less specific about the possible ethnic identity of the nomads in the Negev Highlands, but he consistently advocated the economic importance of their relation with the Aravah copper industry.

Eitam (1988) was apparently one of the first scholars who considered the Edomites as possible nomadic settlers in the Negev Highlands, after he initially suggested the Israelite tribe of Simeon as a candidate (Meshel, 1994, pp. 60–61). More recently, following extensive research in the Faynan and Timna areas, Levy (2004, 2009) and Ben-Yosef (2019) presented new ideas and models concerning the rise of the Edomite Kingdom, and its possible extension also in the Negev Highlands (Ben-Yosef et al., 2019; Ben-Yosef, 2019, 2020, 2021).

5. Discussion and conclusions

The Negev Highlands and adjacent area of Sinai (Figure 1) forms a unique ecological region, characterized by an arid desert climate, which is suitable for runoff farming (Bruins, 2012; Bruins et al., 2019; Evenari et al., 1982), in contrast to the adjacent areas more to the south and east, which have a hyper-arid climate (Bruins 2012). The 'Uvda Valley and the Nahal Paran site (Avner, 2002) are exceptions to this rule (Bruins, 2012). The Negev Highlands and north-eastern Sinai are unique in the presence of many Iron Age fortresses (Cohen, 1979; Cohen & Cohen-Amin, 2004; Meshel, 1994) with a roughly oval or irregular shape, often planned in relation to the topography of the landscape, including hill spurs and hill tops (Meshel, 1994). Such a design and configuration of fortresses neither occurs by the Judean Hebron hills nor on the mountainous Edomite Plateau (MacDonald, 2015).

Another unique archaeological feature in the Negev Highlands is the dominant type of hand-made Negbite pottery, which does not occur, surprisingly, in the neighboring Beersheva – Arad basin, except for a few sherds (Ben-Dor Evian, 2017; Tebes, 2006). Thus, the northern boundary of the roughly oval-shaped Iron Age fortresses (Cohen, 1979; Cohen and Cohen-Amin, 2004) coincides with the northern boundary of Negbite pottery. Eastwards, this type of hand-made pottery also occurs abundantly in the Aravah Valley (Figure 1) in the copper producing areas (Glass, 1988; Kleiman et al., 2017; Rothenberg, 1972; Smith and Levy, 2008). But, surprisingly, it does not seem common on the mountainous Edomite Plateau (Tebes, 2006), considered the heartland of the Edomite Kingdom (MacDonald, 2015)!

The lack of oval fortresses and the lack of Negbite pottery in the latter region weakens, in my opinion, the argument for Edomite domination of the Negev Highlands during the Iron-Age, as proposed by Ben-Yosef (2019, 2020, 2021; Ben-Yosef et al., 2019). The Edomite Plateau (Figure 1) is the only area with a semi-arid Mediterranean climate in the entire southern region of Jordan and Israel! Here is located the site of Busayra, identified with Bozrah (MacDonald, 2015, p. 29), considered the capital of the Edomites (Gen. 37:33; Isaiah 34:6), and linked to the Edomite monarchy. "Now these are the kings that reigned in the land of Edom, before their reigned any king over the children of Israel: Bela the son of Beor; and the name of his city was Dinhabah. And Bela died, and Jobab the son of Zerah of Bozrah reigned in his stead" (1 Chr. 1:43–44 JPS).

I consider it more likely that the Amalekites were the inhabitants of the Negev Highlands during the Late Bronze Age and Early Iron Age, as suggested by Rothenberg (1967, pp. 86–106, 1972). But who was Amalek? From where did he come to the Negev Highlands? Ancient Hebrew texts mention that *Amalek* had an *Edomite* ethnicity. He was the grandson of Esau (Edom), according to Gen. 36:10–12 (JPS): "These are the names of Esau's sons: Eliphaz the son of Adah the wife of Esau… And Timna was concubine to Eliphaz Esau's son; and she bore to Eliphaz Amalek". Josephus Flavius also mentions Amalek in his Judean Antiquities, Book 2, verse 5, translated from Greek by Feldman (2004): "Now Amalekos was a bastard born to him from a concubine, Thamnaes by name".

Being a "bastard", according to Josephus, there was perhaps pressure on Amalek to move away from the family in the sense that he could not inherit land together with his half-brothers. Amalek perhaps established his own tribal agro-pastoral polity, going westwards from the Edomite plateau to the second-best area in the region in terms of climate and ecology (Bruins, 2012), suitable for pastoralism and runoff farming: the Negev Highlands. Keeping connections and business relations with his Edomite relatives, they may have developed together the copper mining and trade, whereby the Amalekites, living in the Negev Highlands, became responsible for the transport of copper to

Egypt via the biblical "road to Shur". Building upon the earlier ideas by Rothenberg (1967, 1972), I propose this Amalekite hypothesis, which I find more plausible than Edomite rule in the Negev Highlands (Ben-Yosef, 2019, 2020, 2021). Nevertheless, Amalek is of Edomite descent, according to the literary sources cited above.

The Amalekites are mentioned as inhabitants "of old - מעולם" in the Negev Highlands – Sinai region "as thou goest to Shur, even unto the land of Egypt" (1 Samuel 27:8). Their settlements were eventually destroyed by the Israelites (Saul and David) in the late 11th and early 10th century BCE, according to the biblical narratives. Based on my excavations at Horvat Haluqim and the radiocarbon dates (Table 1 and 2), two settlement phases may be distinguished. At first, semi-nomadic Amalekites, while still living in tents, established themselves in the Negev Highlands and adjacent region in Sinai during the Middle Bronze – Late Bronze transition (Table 1), controlling the "road to Shur" until the border with Egypt. It is remarkable that ancient Hebrew texts mention the Amalekites as the first powerful ethnic polity attacking the ancient Israelites in Sinai (Ex. 17:8).

Based on the archaeological evidence at Horvat Haluqim, the Amalekites engaged in agro-pastoralism, building stone terrace walls in suitable small wadis in the Negev Highlands and possibly also in Sinai. The more sophisticated terrace walls in larger wadis, having a neat architecture (Bruins, 1990; Ore and Bruins, 2012) were built much later during the Roman-Byzantine period. Early settlement in the area of Tell el-Qudeirat (Substrata 4c and possibly 4b, Cohen and Bernick-Greenberg, 2007) may date to the 12th or even 13th century BCE, according to radiocarbon date GrN-12330 (Bruins, 1986; Bruins and Van der Plicht, 2005, 2007) and ceramic evaluation of painted Qurayyah ware (Singer-Avitz, 2008), described above. The latter ceramic group is usually dated to Late Bronze Age III and Iron Age I. Indeed, the early settlement at Tell el-Qudeirat may have been a way station in the copper trade, as suggested by Singer-Avitz (2008).

The second stage of Amalekite settlement involved the construction of stone buildings in Iron Age I and II. The origin and rational of the roughly oval fortresses in the central Negev/Sinai deserts, including the Lower Fortress at Tell el Qudeirat, may perhaps be related in both time and narrative to the Amalekite-Israelite confrontations in the days of Saul and David, probably during the late 11th and early 10th century BCE. The average radiocarbon date 2826±10 BP from within the Lower Fortress at Tell el-Qudeirat (Gilboa et al., 2009) fits this time period, the highest relative probability of the calibrated range being 1007–976 (44.0%) cal BCE. It is quite remarkable in this context that the above date is similar to the youngest date 2825±35 (GrA-34271) in the series from Area 5 at Horvat Haluqim (Table 1), hinting at a temporary hiatus around this time period in Tell el-Qudeirat and Horvat Haluqim.

I agree with Ben-Yosef (2020, 2021) that Bedouin nomadism cannot necessarily be used as a model for understanding biblical-era nomads. Concerning the Negev Bedouin, Kressel et al., (1991, p. 29) concluded that until the mid-19th century "livestock constituted the sole source of livelihood, land was exclusively for grazing". Bedouin nomads were proud raisers of livestock, considering their way of life superior to that of fellahin farmers. Only later, agriculture began to be part of Bedouin land-use, due to three main reasons (Kressel et al., 1991, p. 29): (1) "… restoration of Ottoman rule helped to stabilize the tribes and encourage investments in agriculture"; (2) "the failure of nomadism to continue to serve as an effective means of political adaptation"; (3) "continuous emigration of fellahin rebels from the Nile Valley". Nevertheless, the social change to adopt farming as an additional type of land-use was not straightforward. Many traditional Bedouin pastoralists did not farm themselves, but "sought ploughers (*harathin*) as part of land tenancy transactions" (Kressel et al., 1991, p. 29). These examples show how particular pastoralist developments may be in each period.

Recent Bedouin farming in the Negev Highlands is definitively more simple than Late Bronze and Iron Age agriculture at Horvat Haluqim. Unlike the ancient agro-pastoralists, the Bedouin do not fertilize the soils, neither with animal dung, nor with kitchen-fire refuse. The author always got a negative answer when he asked Bedouin in north-eastern Sinai and the Negev Highlands whether they applied fertilizer to the terraced wadi fields they farmed (Bruins, 1986, pp. 143, 183–185; Bruins, 2007). Moreover, the Bedouin use *ancient* terraced wadi fields, but generally do not engage in significant repair of eroded terrace walls, while it is rare for them to build new terrace walls.

Yet, similarities may also be found in terms of comparative anthropology. During fieldwork in north-eastern Sinai and the Negev Highlands, the author observed during the 1980s that Bedouin *practiced runoff farming in ancient terraced wadi fields, while they lived nearby in tents* (Bruins 1986, pp. 143, 183–185). Therefore, semi-nomadic pastoralists do not have to live in stone houses in order to engage in agriculture, a model I propose for Horvat Haluqim in the Late Bronze Age (Table 1) before the building of stone houses in the Iron Age (Table 2).

Besides being agro-pastoralists, the Amalekites in the Negev Highlands and north-eastern Sinai, were engaged in the copper trade, together with the Edomites. Finkelstein (1984, 1995) has consistently emphasized the economic importance of the Aravah copper industry for the Negev Highlands population. The findings by Rothenberg (1972) and Glass (1988) of copper slag fragments, used as temper, in Negbite pottery sherds at Timna, showed a clear archaeological relationship. A comprehensive investigation by Martin et al. (2013) found slag inclusions from the copper industry in the Aravah Valley in Negbite pottery from many Negev Highland sites: Atar Haro‘a, Horvat Haluqim, Horvat Ritma, Har Eldar, Ramat Matred, Nahal La‘ana, Har Sa‘ad, and Har Khemet. A connection between Negbite pottery from the Negev Highlands and copper smelting operations at Faynan was established by lead isotope analysis of slag fragments (Yahalom-Mack et al., 2015). Chemical analyses of the Horvat Haluqim bronze chisel (Figure 8) by Irina Segal (89.7% copper, 2.5% tin and 1% lead) also showed a connection with the copper ore in the Faynan area, the Dolomite-Limestone-Shale (DLS) unit, according to the lead-isotope data (Bruins et al., 2018). Therefore, relations existed between the inhabitants of Horvat Haluqim and the Faynan copper production area at the transition from the Late Bronze to Iron Age. This is even earlier than the radiocarbon dates by Levy et al. (2008) from the Khirbat en-Nahas and Rujm Hamra Ifdan sites in the Faynan area. But additional dating at Faynan from Khirbat al-Jariya (Ben-Yosef et al., 2010a, 2010b) as well as Timna, gives evidence of copper production from the late 14th–13th centuries BCE until the end of the 9th century BCE.

The renewed excavations at Timna by Erez Ben-Yosef produced a wealth of new findings. Archaeomagnetic dating of copper smelting site F2 pointed to copper production activities during the 2nd millennium BCE in general and the 13th–11th centuries BCE in particular (Ben-Yosef et al., 2010b). Therefore, as more slag heaps are being investigated, the full chronological history of copper production in both the Faynan and Timna areas may eventually fill even more gaps in the 2nd millennium BCE.

Finally, the semi-nomadic Amalekite desert polity, living in the Negev Highlands and parts of Sinai, according to Rothenberg (1967, 1972) and my own interpretations, as described above, was a monarchy. The name of their king in the days of Saul was Agag, according to 1 Sam. 15:1–35 – אֲגַג מֶלֶךְ עֲמָלֵק. Consequently, there was not only an Edomite Kingdom but also an Amalekite Kingdom. The former may have ruled the Edomite Plateau and the Aravah Valley, while the latter ruled the Negev Highlands and parts of Sinai. The newly discovered *Masseboth* Shrine at Horvat Haluqim, first reported in this paper, may have been part of their religious pantheon.

Funding: This research received no external funding.

Data Availability Statement: The data are contained within the article.

Conflicts of Interest: The author declares no conflict of interest.

Acknowledgments

I very much thank the late Rudolph Cohen for including me in the Negev Emergency Survey and the excavations at Tell el-Qudeirat in the early 1980s. Thus, I became exposed to some of the puzzling issues in desert archaeology in relation to ancient Israel, as discussed in this paper. Although I came to somewhat different conclusions, I understand the line of his reasoning, which seemed logical within the context of methodologies and state of knowledge current in those days. I am grateful to the Israel Antiquities Authority for the various excavation and survey permits regarding Horvat Haluqim. My thanks to Emily M. Rubinstein, who assisted in field measurements of the *masseboth* in the context of a Research Internship at Ben-Gurion University of the Negev. Reviewer comments, for which I am grateful, stimulated to expand the content of this article and discuss various issues in more detail.

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