Secondary burial cemeteries, visibility and land tenure: A view from the southern Levant Chalcolithic period

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Abstract

Off-site secondary burial cemeteries in the southern Levant are an innovation of the Chalcolithic period. Ethnographic studies suggest that location of burial places was one of the means used to establish and socially mediate ownership over the landscape. The current research examines whether the spatial pattern of burial sites during the Chalcolithic period in the southern Levant represents a land tenure system. Spatial analyses of burial and habitation sites located mainly along the central Israeli coastal area indicate that Ghassulian communities avoided locating their burial sites near habitation sites concentrations. Viewshed analysis indicates that the areas observed from burial sites are significantly larger than those observed from habitation sites, and that their location scattered across an area which increases rather than overlaps the size of area visible from the habitation sites. Furthermore, our results show that communities which wanted to claim land tenure over a larger territory use burial sites locations in order to maximize the observed area within habitation sites surroundings.

Introduction

Mortuary practice, a common cultural aspect encountered by archaeologists, is an important feature in understanding past societies social and economic systems, ideologies, and worldviews (e.g. Binford, 1971; Carr, 1995; Chapman et al., 1981; Hodder, 1982; Kuit, 1996; Metcalf and Huntington, 1991; O’Shea, 1984). Data obtained from archaeological excavations of burial sites usually includes artifacts, installations, structures, and bones. While these remain the traditional focus of archaeological study and interpretation, additional important information can be derived from studying the location of burial sites in the landscape (Clarke, 1977; Goldstein, 1981, 2002; Williams, 1999). Significant changes in mortuary practices were introduced during the Chalcolithic period in the southern Levant. The most prominent entity of the Chalcolithic period is the Ghassulian culture (ca. 4500–3900 BC cal.), which features assemblages broadly similar to those found at the upper levels of Tell el-Hesi, the Ghassulian type-site (Gilead, 2011; North, 1959). They include specific sets of artifact-type categories such as V-shaped bowls, churns, cornets, fish bones, miroliths, basalt bowls, and copper and ivory artifacts. Geographically, the Ghassulian is distributed in the Jordan valley, the Sheph-ella and the central hill country, the central and southern coastal plain, the Dead Sea basin and in the northern Negev (Gilead, 2007, p. 35; Gilead, 2009, p. 345). Surveys and studies indicate a pronounced population growth during this period (Finkelstein and Gophna, 1993; Gophna and Portugal, 1988; Gophna and Tsuk, 2005; Khalaily and Marder, 2010). This is apparent not only from the increase in the number of known sites but also from the increase in site size and from the expansion into areas which were unpopulated or sparsely populated prior to the Chalcolithic period, such as the semi-arid Northern Negev (Golden, 2009, p. 9; Khalaily and Marder, 2010, p. 15; Lev-Tov Chattah and Smith, 2006, p. 472; Lev-Tov et al., 2003, p. 122; Rowan and Golden, 2009, pp. 27–28; Winter-Livneh et al., 2010, p. 284).

The Chalcolithic communities, mainly of sedentary farmers, practiced mixed agriculture; cultivation of cereals, pulses and fruit trees, herding of sheep-goats and raising of, pigs and cattle (Gilead, 1988a; Levy, 1995; Rowan and Golden, 2009). Craft specialists such as ivory and copper producers are worth noting (Gilead, 1988a; Golden, 2009; Levy, 1995; Rowan and Golden, 2009). The nature of the socio-political organization of the Chalcolithic communities is controversial. There are scholars who follow Service (1962) and suggest a hereditary chiefdom society with centers that coordinate social, economic and religious activities (Gibson and Rowan, 2006; Golden, 2009; Levy, 1986, 1995, 2006). Other scholars find the archaeological evidence to reflect a lesser level of complexity (Epstein, 1998; Gilead, 1988a, 1993, 1995; Gophna and Tsuk, 2005; Hermon, 2008; Rosen, 1993). The society consisted of rural...
communities whose social and economic activities were influenced by groups of seniors household heads (Gilead, 1988a, p. 436), similar to what Maisels (2001, pp. 156–168) calls “augmented and stratified households”.

It is within this geographic, demographic, economic and social contexts that profound changes in mortuary practices took place, and most notable is the establishment of off-site cemeteries of secondary burials in ossuaries (Gilead, 1988a; Levy, 1986). In such burials the body is interred in habitation deposits such as pits, silos and below floors walls (Gilead, 1988a, p. 428), and later on, after a culturally determined length of time, the remains are retrieved and re-interred in a new location (Schroeder, 2001, p. 79). In this respect, secondary burial, which usually involves a primary burial, is perceived here as an exclusive class or type of mortuary practice. During preceding periods most burials were primary ones, and most of them are located within the habitation or household surroundings (e.g. Kuijt, 1996). Chalcolithic period secondary burials are known only from cemetery sites, mostly from burial caves. The goal of this study is to explore and analyze the spatial aspects of burial sites and their relation to the location of the habitation sites.

Pre-Chalcolithic and Chalcolithic secondary burials in the Levant

A relatively small numbers of secondary burials have been reported from the southern Levant prior to the Chalcolithic period. The earliest selective skull removal has been recently reported from the Middle Epipalaeolithic period (c. 23,000–11,600 cal BP) at ‘Uyun al-Hammam in northern Jordan (Maher et al., 2011). The practice of skull removal continued into the Late Natufian (c. 13,000–10,300 BC) as has been demonstrated at Hayonim Cave (Belfer-Cohen, 1988, p. 300; Belfer-Cohen, 1991, p. 171), Hayonim Terrace (Valla, 1986), Nahal Oren (Stekelis and Yizraeli, 1963), and Eynan (Perrot and Ladiray, 1988) (see Fig. 1). During the Pre-Pottery Neolithic A (PPNA) (ca. 10,300–8500 BC) and Pre-Pottery Neolithic B (PPNB) periods (ca. 8500–6250 BC), skull removal became more frequent (Kuijt, 1996, p. 319; Kuijt, 2001, p. 84; Kuijt and Goring-Morris, 2002, p. 376), although, by far, the majority of burials are primary (Peterson, 2010, p. 254; Verhoeven, 2002, Tab. 1B, p. 7). During the Pottery Neolithic (PN) period (ca. 6250–4500 BC), secondary burials (including skull manipulation) became rare (Verhoeven, 2002, p. 7). Although secondary burials and skull manipulation were practiced during the Epipalaeolithic and Neolithic periods, off-site cemeteries are virtually unknown, excluding Kfar HaHoresh as suggested by Goring-Morris (2000) (Fig. 1).

During the Chalcolithic period the number of secondary burials as well as off-site cemeteries is unprecedented. While it is reason- able to assume that during the Pre-Pottery and Pottery Neolithic periods secondary burials did not exceed a few hundred (Hershkovitz and Gopher, 1990, p. ’12), during the Chalcolithic period secondary burials probably reached well into the thousands. This is based on the fact that during this period more than 50 formal burial sites are known in this region, most of which are caves (see below). An estimation of the number of individuals buried within each burial cave has reached in some cases well into the hundreds.

In the Peqi’in cave, for example, it is estimated that remains of 600–1000 individuals were recovered (Gal et al., 2011, p. 204; Lev-Tov et al., 2003, p. 123 with reference therein). Remains of 174 individuals were uncovered at the recently excavated burial caves site of Horvat Qarqar South (Yosef Nagar personal communication). Considering the recent serious damage caused to the site, the possibility that about 500 individuals were buried at the caves cannot be excluded (Peter Fabian personal communication). Moreover, these figures should be related to the time duration of the Chalcolithic period. While periods such as the PPNA, PPNB or PN lasted approximately 2000 years each, the Chalcolithic period is about 600 years (Gilead, 2011). Thus, secondary burial practice is a hall- mark of the Chalcolithic period and is marginal in earlier time spans.

Although beyond the scope of this paper, it should be emphasized that the very concept of “secondary burial” has been discussed and critiqued in recent archaeological studies (e.g. Chénier, 2009; Weiss-Krejci, 2004, 2011). The too common and unqualified use of the term “secondary burial” masks an impressive cross-cultural heterogeneity and hides pronounced differences of a wide range of burial practices, their symbols, and their social and economic implications. This is valid also for the archaeology of the southern Levant. The pre-Chalcolithic practice of skull removal and reburial on the one hand, and the Chalcolithic practice of collecting bones after natural decarnization and placing in ossuaries, on the other hand, have very little in common. The origins, consequences and meanings of each of these practices differ considerably. Yet, most archaeologists working in the southern Levant will use the same term – secondary burial – to describe them.

Beside the profound differences described above, most of the pre-Chalcolithic secondary burials as well as primary burials, occur in intramural, subfloor and other residential contexts, excluding Kfar HaHoresh (Goring-Morris, 2000). ‘Uyun al-Hammam, for example, where the earliest documented secondary skull removal has been recently uncovered, is an open-air site, covering an area of 1000–1500 m². The excavators documented “potential trampled earth surface, ash dumps and several discrete refuse middens”, “The burials are dug into pre-existing Epipaleolithic deposits” (Maher et al., 2011, p. 2).

During early stages of the Natufian occupation at Hayonim cave, the dwellings structures were built in front of the cave while the burials were located to the rear. In the later stages, the burials were placed in the front while the dwelling were located in the inner part of the cave (Belfer-Cohen, 1988, p. 297). Though some sort of separation can be recognized between the domestic and the burial activity, both are placed within the same site, within the same cave (Belfer-Cohen, 1991, p. 171). Natufian burial and habitation structures were within the confines of the same site is also apparent at Eynan (Perrot and Ladiray, 1988). Clearly, during these early periods burial or sacred activities were not differentiated spatially from everyday or domestic activities, into which they were strongly integrated.

Although during the PPN and PN periods skull removal proliferated as mentioned above, interment was still carried out within the perimeter of the sites. At the PPN site of ‘Ain Ghazal for example, three skulls (two adults and one child) were placed in a row, were recovered from beneath the floor of the southeast corner of a house. In another room, within the same structure, a skull of an adolescent was placed beneath the southwest corner of the floor (Rollefson, 1986, pp. 50–51).

There are three exceptions in which primary burial, skull removal and secondary treatment were observed in non-residential sites: At the Natufian site of Hilazon Tachtit (Grosman and Munro, 2007; Grosman et al., 2008), at the PPNB site of Kfar HaHores (Goring-Morris, 2000; Goring-Morris and Horwitz, 2007) and at Nahal Hemar (Arensburg and Hershkovitz, 1989). These are not residential sites, but the burials there are not in contexts that can be regarded as representing cemeteries.

The Natufian site at Hilazon Tachtit cave is unique in many aspects. It contains a burial of a woman interpreted as a shaman (Grosman et al., 2008, p. 17668), with a high concentration of tortoise shells and remains of three aurochs which are interpreted as remains of a feast (Munro and Grosman, 2010, p. 15365). However, the flint and faunal assemblages recovered at the site “represent a broad spectrum of everyday activities” (Grosman and Munro, 2007, p. 12). Moreover, “the raw materials used for tools manufacture were collected from the wadi below the cave -confirming that the Natufians were using local environments rather than visiting
the area only for specific burial activities.” (Grossman and Munro, 2007, p. 12).

The PPNB site of Kfar HaHores produced a number L-shaped walls and lime-plastered floors below which a large number of burials were found. The burials were both primary and secondary, totaling more than 60 individuals, including three plastered skulls. Animal carcasses were associated with some of the burials. Fifteen of the primary burials show evidence of post-depositional head removal (Goring-Morris, 2000; Goring-Morris et al., 1998; Goring-Morris and Horwitz, 2007; Horwitz and Goring-Morris, 2004, pp. 168–169 and see references within). This site was interpreted by the excavator as a “regional funerary center for nearby communities” (Goring-Morris, 2000, p. 109). Others, however, doubt it (Gafinkel, 2006, p. 114). In any case, the site yielded evidences of daily activities as well as areas for lime plaster production, flint knapping and midden deposits rich in burnt organic remains and ash (Horwitz and Goring-Morris, 2004, pp. 166–167). Another PPNB site, Nahal Hemar, is a non-residential site with numerous unique artifacts as well as burials. It is interpreted as a special storage place for cultic objects (Bar-Yosef, 1986). The sites of Hilazon, Tachtit and Kfar HaHores lack remains of domestic architecture. Nonetheless, the heterogeneity of the archaeological remains indicates that both domestic and burial activities took place within these special sites.

The pre-Chalcolithic mortuary practices indicate that secondary burials were far less frequent during these early periods. In most cases the secondary burial practice consists of skull removal. Moreover, both primary and secondary burial are generally un-differentiated spatially. In addition, the burials tend to be located within or adjacent to dwelling areas. It seems that long term coexistence of the living and the dead was an important attribute of Neolithic ideology. During the Chalcolithic period secondary burials shifted from within habitation sites to off-site locales, explicitly and solely to provide space for the dead.

Ghassulian burial caves are the most common form of off-site mortuary grounds in the southern Levant, although four sites with burial structures are also known at Shiqmim (Levy, 1987), Palmahim North (Gorzalczyan, 2006), Kissufim Road (Goren and Fabian, 2002) and Adeimeh (Neuville, 1930). The remarkable change in the spatial aspect of mortuary behavior is very obvious but detailed locational analyses of this phenomenon are yet lacking. It is the goal of our study to shed some light on this aspect, and investigate what does the spatial change of the secondary burials from within habitation sites to the off-site locations represent and what may have stimulated this change.

A brief description of the layout and geographical distribution of the cemeteries and their contents follows. This overview is complemented by discussing current interpretations of the mortuary practices and their relevance to a better understanding of social and economic issues of the Chalcolithic period.

Chalcolithic secondary burials in the Levant

Sukenik (1937) was the first to excavate a Ghassulian burial cave that was quarried into the kurkar ridge at Hadera and was filled with ceramic ossuaries, pottery and human bones. Since then, many burial caves have been discovered. In addition to the assemblage of cemeteries excavated by Perrot and Ladiray (1980) at Azor and Ben Shemen, worth noting are Nahal Qanah (Gopher and Tsuk, 1991), Qula (Milevski, 2001), Sha’ar Efrayim (Van den Brink, 2011a), Shoham North (Van den Brink and Gophna, 2005), Ma’abarat (Porath, 2006), Et-Taiyiba (Yannai and Porath, 2006), Peki’in (Gal et al., 1999), Palmahim (Gophna and Lifshitz, 1980), Giv’atayim (Sussman and Ben-Arie, 1966) and Horvat Qarqar South (Fabian, personal communication).

Many off-sites cemeteries consist of several adjacent caves, e.g. Giv’atayim – seven burial caves; Sha’ar Efroyim – seven burial caves; Qula – 10 burial caves; Shoah (North) – six burial caves; Ben Shemen – six burial caves; Palmahim – 11 burial caves. There are natural karstic caves such as Peqi’in, Nahal Qanah, alongside artificially hewn caves such as Azor, Hadera, Bene-Berak, Giv’atayim, Tel-Aviv, Ma’abarat, and Shoahm North (Van den Brink, 1998, 2011a). (Fig. 1).

The hewn caves can be found either in kurkar ridges or lime-stone hills. They are of oval, irregular-oval, or semicircular form quarried into the bedrock surface, some of which feature pillars as roof supports and additional niches. They are only few meters in size (e.g. Ma’abarat: 4 x 8 m; Tel Ifshar: diameter of c. 1.5 m; Et-Taiyiba: c. 4.5 x 6 m) but there are also larger chambers (e.g. Shoah (north) Cave 3: c. 21 x 18 m and Cave 4: c. 15 x 12 m). Their maximum height varies between 1.5 and 2.5 m. Several phases of use, within the Chalcolithic period, were reported from several caves (e.g. Ma’abarat, Shoah (north), Azor, and Ben Shemen). The stratigraphy and the typology, mainly of bowls, within burial sites such as Azor and Ben Shemen indicate change over time (Nativ and Gopher, 2011; Perrot and Ladiray, 1980). It seems, therefore, that these caves were used recurrently for secondary burials and maybe “on other occasions” too (Van den Brink, 2005, p. 184).

Chalcolithic secondary burials are characterized by the intensive use of ossuaries, ceramic or stone receptacles for depositing disarticulated bones that signify a secondary treatment. The Ghassulian ossuaries vary greatly in shape: there are rectangular ‘chest-shapes’ or open-tub ossuaries which are usually made of stone (Perrot and Ladiray, 1980, pp. 28–29: Group I), ‘house-shaped’ ossuaries (Perrot and Ladiray, 1980, pp. 28–35: Group II), rounded krate ossuaries, ‘urns’ or ‘domed jars’ (Perrot and Ladiray, 1980, pp. 36–37: Group III). Considerable variability of the ossuaries within and between burial caves is apparent. In most cases several categories of ossuaries can be found in the same burial cave. Some burial caves include both ceramic and stone ossuaries (e.g. Giv’atayim, Qula). Others, however, show less variability in the different types of ossuaries within the same cave (e.g. Mazor West, in Khalaily and Marder, 2010, p. 15; Milevski, 2007). Ossuary fragments have also been recovered from a few Chalcolithic sites, not in burial caves (e.g., Megiddo, Yehud, Tel Lod, see Table Exc. 1.2. in Van den Brink (2005)).

The ossuaries are accompanied by ceramic vessels of various types (such as ‘V-shaped’ bowl holemouth jars, goblets, cornets), few flint artifacts and, less frequently basalt vessels, hematite maceheads, figurines, ivory and copper objects, all of which are known from habitation sites. In addition, recent excavations indicate that flint artifacts and ceramic vessel, including ossuaries were locally produced (Cohen-Weinberger, 2011, p. 64; Khalaily, 2011, p. 62). Use of upright limestone slabs also known as mazzebot (stele), have been identified in several burial caves such as Giv’atayim (Sussman and Beit-Arie, 1966) and the mortuary site of Kissufim Road (Fabian and Goren, 2002 with references therein).

Most burial caves are distributed along the coastal plain, between the modern towns of Hadera in the north and Gedera in the south, and slightly further inland in the hills of the Shephella. Very few burial caves have been found outside these boundaries, and worth mentioning is the site of Peqi’in in the Upper Galilee (Gal et al., 1997, 1999). In a recent survey carried out further inland, in the karstic regions of Jordan, no Chalcolithic burial caves were found (Lovell, 2009).

Of special interest are the burial caves of Peqi’in (Gal et al., 1997) and Nahal Qanah (Gopher and Tsuk, 1991), both of which contain mortuary assemblage with some unique findings. The most richly decorated ossuaries are those of Peqi’in, including painted faces on façades and lids with human facial features and three
dimensional heads (Gal et al., 1999). In Nahal Qanah cave, in addition to V-shapes, jars, holemouth and churns, a unique group of eight gold and electrum rings was recovered (Gopher and Tsuk, 1991).

Mortuary practices have frequently been used to reconstruct the nature of Ghassulian social complexity. Haas and Nathan (1973), who studied burials in the Judean desert caves, stated that the mortuary behavior reflects social hierarchy. Perrot and Ladiray (1980) interpret each of the coastal plain burial caves as a family burial ground of a generally egalitarian society. Levy and Alon (1985) and Levy (1986) based on his analysis of Shiqmim cemetery I stone circles, attributes the burials to a chieftain society. An examination of the Shiqmim dataset have shown that the analysis is problematic and that the nature of the stone circles do not support the chieftain model (Gilead, 1988b, p. 148). Moreover, since most Chalcolithic burials lack prestige grave goods, the idea of clear social stratification cannot be maintained (Gilead, 1988a, p. 429; Rowan and Golden, 2009, p. 68). Prestige artifacts of gold and electrum were found only at Nahal Qanah, a secondary burial cave (Gopher and Tsuk, 1996), but their relation to individual or group burials as suggested by Gopher and Tsuk (1996, pp. 223–226) cannot be confirmed. Golden (2009, pp. 68–70) argues that burials in which “valuable luxury goods” are found, such as complex metal, ivory or basalt objects, indicate that the burial cave was used by members of powerful elite lineages. Similarly, Gal et al. (2011), argue that the finding from Peqi’in burial cave reflect social hierarchy, and only individuals of higher social status were buried within the cave (Gal et al., 2011, p. 205). However, copper, ivory or basalt objects are found in many habitation sites as well, where no claims for activities of an elite can be established. Furthermore, considering the quantity of individuals buried within some burial caves, such as Peqi’in, where at least 600 individuals were buried, the quantity of such items is negligible, consisting of one head of a small ivory figure, ten ‘violin-shaped’ figurines, fragments of basalt bowls on fenestrated bases, four copper objects (Gal et al., 1997, pp. 150–153), and 190 beads (Bar-Yosef Mayer et al., 2004). Joffe (2003, p. 45) argues that the burials represent a religio-political ritual led by shamans. The role of shamanism in the ritual behavior in the Chalcolithic period is acknowledged in other contexts too (Gilead, 2002, pp. 116–122).

Interpretation of the distribution of Ghassulian burial site has been problematic in the past, primarily due to what seemed to be a lack of residential sites in the central coastal plain. It was therefore suggested that the burial sites there were used by nomadic pastoralists (Perrot, 1984; Perrot and Ladiray, 1980). The discoveries of cemeteries at Shiqmim have invalidated this suggestion. Levy and Alon (1987, p. 348) suggest, on the basis of ethnographic data, that secondary burials characterize sedentary rather than semi-nomadic societies. During recent years many habitation sites have been discovered in these regions (Gophna and Portugali, 1988; Van den Brink, 2008; Van den Brink and Gophna, 2005). Thus, it is currently agreed that the burial caves were used by sedentary communities living nearby (Khailaiy and Marder, 2010, pp. 19–20; Porath, 2006, pp. 58–59; Van den Brink, 2011a, pp. 45–46; Van den Brink and Gophna, 2005, pp. 168–169; Yannai and Porath, 2006, pp. 1–2).

Previous studies propose that the formal cemeteries of the Chalcolithic period located at sites distinct from habitation sites reflect a concern for territoriality (Levy, 1986, 1995). In addition, Joffe (2003) suggests that the visibility of cemeteries, like Shiqmim in the northern Negev and Adeimeh near Teleilat Ghassul in Jordan, is a statement of territorial claims (Joffe, 2003, p. 51). Golden (2009) suggests that the burial caves served Ghassulian elites who used the remote and concealed locations to protect the wealth deposited in the tombs (Golden, 2009, p. 68). It should be noted, however, that these propositions have not been examined yet.

The significance of the spatial aspect to mortuary analysis has been recognized and demonstrated by many researchers (e.g. Bradley, 1998; Cannon, 2002; Clarke, 1977; Goldstein, 2002; Hutchinson and Aragon, 2002; Renfrew, 1976; Williams, 1999). Despite the growing number of Ghassulian secondary burial sites, the spatial component of these burials has received relatively little attention by scholars (excluding Joffe, 2003). Moreover, very little attention has been paid to the role these burial sites play in structuring and organizing past landscape, a role that most probably goes far beyond their use as funerary sites. The archaeological evidence just presented indicates that the construction of these numerous caves involved considerable knowledge, effort, and costs. Their distribution along the kurkar ridges and the limestone hills, as well as the fact that they were recurrently used, shows that the exact location of such sites was preserved for generations by communities. Their location outside and away from the settlements seems intuitively to imply attempts to conceal the burials, and therefore may have involved only a segment of the communities. But additional data indicates that this spatial as well as conceptual knowledge was most probably shared among members of the communities. This is based on the frequency of individuals buried within each cave and the variability of the ossuaries within and between burial caves. Moreover, most Chalcolithic burials and cemeteries lack prestigious grave goods and are usually accompanied by pottery vessels, flint artifacts and other objects, similar to those known from habitation sites. The deposition of funerary offerings similar to the domestic vessels, and the evidence indicating local manufacture of ossuaries, pottery vessels, and flint artifacts, suggest that the caves were probably associated with the nearby settlements. Understanding the relationship between the habitation sites and the burial caves may reveal how and why their specific locations were determined and the way it is related to the socio-economic organization during this period.

**Secondary burial in recent societies**

At this point, it is helpful to overview some social and economic implications derived from studying ethnographic parallels where secondary burial in cemeteries is practiced. These examples, however, are not used here as a direct analogy but merely to provide a general interpretive framework and to broaden our interpretive horizons (see Peregrine, 2001; Wylie, 1985). One of the best ethnographic description of secondary burials is the well-known “Feast of the Dead” (Thwaites, 1898, pp. 279–305), practice by the Hurons. The Hurons are native Americans who lived in Ontario until 1649 (Kidd, 1953; Tooker, 1964; Trigger, 1969, 1976). According to the Jesuit priest, Jean de Brébeuf, who witnessed and recorded the “Feast of the Dead” during the spring of 1636, every 10–12 years all the contents of the graves of individuals who had died unexceptionally and who were not too old or too young at the time of death, were transported from their individual graves and placed in a large ossuary for communal reburial. The ossuary was a large pit into which all the corpses or bones were deposited and arranged around three large kettles intended for the use of the deceased souls (Kidd, 1953, pp. 372–375; Robb, 2007, pp. 290–291; Thwaites, 1898, pp. 279–305; Trigger, 1976, pp. 88–91).

Nonetheless, secondary burial practice is by no means a legacy of past societies. Up-to-date descriptions of secondary burial practices can be found even in daily newspapers, such as in the case of Ambohimiaray, Madagascar (Bearak, 2010). A different but a relevant example of reburial of bones in recent societies can be found in Hawaii: a patent that has recently been published consists of an apparatus and method for removing the flesh from the bone prior
to burial (Nihipali, 2007). A recent cross-cultural survey shows that 61 (32.7%) out of 186 current societies practice secondary burial, and its intensity is similar in all regions of the world (Schoeder, 2001, pp. 85, 87, Tab. 1).

Such a widely distributed phenomenon has triggered different ideological, sociological and economic interpretations. Hertz (1960 [1907]) wrote one of the important synthesis of secondary burials and influenced many archaeologists and anthropologists. His study of the Dayak of Borneo (Old Ngaju) stressed that the transfer of the remains to their final burial place is not a mere change of place, but rather a release of the deceased from the isolation into which he was plunged with death and the reunification of his soul, embedded in the bones, with his ancestors who reside in the communal ossuary (Hertz, 1960, p. 55). Hertz compared the Dayak rituals to parallel practices in other societies, such as the above mentioned. He emphasized that secondary burial among the Hurons is a rite performed by the larger community and not by the family (Hertz, 1960, pp. 70–71).

Other scholars, however, argued that Hertz failed to address important economic aspects of the rites, suggesting that secondary burial is based upon accumulation of wealth needed to perform the burial rites (Metcalf, 1981; Miles, 1965; Poyil, 2009). Nevertheless, the same argument applies to any of a whole host of non-secondary-ary memorial ceremonies for the dead that are conducted months and sometimes even years after the primary funeral. Thus, the outstanding feature of this rite, moving the deceased remains from the temporary grave to its final resting place, remains unexplained.

Burial location and land tenure in recent societies

In order to understand the shift from pre-Chalcolithic burials within the settlement to Chalcolithic off-settlement burials, we address here the wider issues of practical and symbolic aspects of the location of burial sites in recent societies. Many ethnographic studies indicate that locations of cemeteries are associated with land tenure rights of communities. Goldstein (1981, p. 61) following Saxe (1970), regards territorial claims as “...group rights to use and/or control crucial but restricted resources”. In order to clarify and simplify this claim of territory, a claim that is implemented by actually observing the landscape, and not to be mixed with other territorial behavior, that typically is associated with areas which are carefully marked (using fencing) and/or defended by organized warfare, we use here the term land tenure. Land tenure, based on Adler’s definition (1996, p. 338), indicates a strategy to socially define the realms and rights to access and use the natural resources scatted in the landscape. The resources may range from arable lands to grazing pastures, from transportation roads to fruit trees. Accordingly, the relocation of the deceased into his/her final resting place determines and reinforces the rights of the community over a given area (Bloch, 1989; Bradley, 1998; Earle, 1991; Fleming, 1973; Goldstein, 1981; Renfrew, 1973b; Saxe, 1970). The following ethnographic examples demonstrate the role of the locations of ancestors’ graves as markers of groups’ rights over certain territories.

This point was stressed by Bloch (1982) in his analysis of the Merina people of central Madagascar: “The presence of the tombs of a certain deme [kin-group] in an area is what makes this area the ancestral land of that deme” (Bloch, 1982, p. 213). Moreover, in Mozambique, ancestral burial location signify a legitimate claim for land acceptable by state administration (Unruh, 2006, pp. 767–768).

In Mbeere, a Bantu people of east central Kenya, lineages have customarily exercised corporate control over the land. Overall rural development in their region promote seeking critical indicators for proving ones land ownership, reinforcing “the importance of identifying the forebearers, who, in many cases were among the first people buried” (Grazier, 1984, p. 142). Accordingly, burials location became a fundamental part of recording the relationship between the lineages and the land. “That is, a grave site now establishes a visible connection between a particular territory and forebearers buried within it, there by forging new and socially valued links between the land and its claimants” (Grazier, 1984, p. 144).

Other societies in Kenya, which strongly identify ancestors’ graves with particular land, are the Nilotic, Kenyan Luo. The Luo are the third largest ethnic group in the country. They consist of segmentary lineages, practicing mixed farming and herding. According to Shipton (1984, pp. 123–124) ancestral graves are the most important fixed points in a Luo’s life, and the land associated with them is regarded with considerable reverence”. Population growth during colonial years has promoted rising concern towards landholdings, and involved “bitter feuds over fields and boundaries, using ancestral graves as the most important fixed points” (Shipton, 1984, p. 127).

Another example can be found in the central Ugandan region of Buganda. During pre-colonial times, the lands of Buganda were owned by the 52 clans (Green, 2006, p. 373). The Ganda clans of Buganda, for example, established, during the 16th-century, a relationship of obligation between the ancestors and the leaders (chiefs) and their followers (Mair, 1933). The presence of graves was reported as an additional dimension to the manner in which the individual Ganda clans remembered their ancestors (Hanson, 2003, p. 34). The clan’s primary estate, a public property, consisted mainly of two features – a sacred site and burial grounds (Kodesh, 2008, p. 204).

Meggitt (1965a,b) studied the Mea-Enga in highland New Guinea and argues that pressure on agricultural land was linked to descent groups’ members who held the rights to high quality agricultural land. Therefore, the descendants of the dead seek to affirm their group membership by ritual that would connect them to the group ancestors. “On the one hand, rituals regularly reaffirm the cohesion and continuity of the patrilineal group; on the other, the dogma in itself implies title to land by relating living members of the group to a founding ancestor who is believed to have first selected that locality for settlement”. (Meggitt, 1965b, p. 131). Another ethnographic example from Papua-New Guinea is the community of the Rumu. The Rumu practice secondary burial that consists of ‘centralized clan ossuaries’ which are burial caves. These burial caves are known as “...ancestral claims to territory” (David et al., 2008, p. 163). As a result, the Rumu landscape is understood by community members “not only by reference to spirits... but as spiritiscapes” (David et al., 2008, p. 165).

The ethnographic data provide valuable information concerning the location of burials and their territorial implications. It demonstrates that locations of graves and cemeteries play an important role in establishing or preserving land tenure. They provide direct evidence for land tenure and territorial behavior. Naturally, not all societies use burials as a physical marker of land tenure. Other markings of the landscape such as walls, rock piles, stone mounds sometimes in lines, ditches, hedge-rows, rock art or other non-burial monument such as shrines, are known in the ethnographic and archaeological research to have been used as means for declaring land tenure (Adler, 1996; Bintliff, 1982; Gleason, 1994; Johnson and Earle, 1987; Stone, 1994). The present study, thus, aims to find whether Ghassulian secondary burials were used in a manner similar to those observed in the ethnographic record, as landscape markers in a land tenure system. In addition, we discuss the implications of our analyses results in relation to previous studies and their reconstructions of Ghassulian social organization. We use GIS base analyses in order to assess the possibility that the innovation of secondary off-site cemeteries during the Chalcolithic may have been, at least partly,
motivated by a necessity to enhance communities’ control over its landscape to establish land tenure.

Land tenure, control and visibility

But how can one actually evaluate a social behavior such as control? In archaeological landscape research, as well as in social studies, visibility or field of visibility is considered by many cultures as one of the means to establish territorial rights (Brighenti, 2007; Llobera, 2003, 2007; Wheatley, 1995). Broadly speaking, the complex phenomenon of the field of visibility can be understood as a relevant symbol of control or recognition for the social relation within the studied culture (Brighenti, 2007, p. 324). Accordingly, many studies have shown the implications and approaches to the subject of the field of visibility, as a mode to enforce control or surveillance (Brighenti, 2007; Eason and Stamps, 1992; Foucault, 1995 (1975), pp. 195–199; Renfrew, 1976; Yekutieli, 2006).

It has been demonstrated that the location of features (such as settlements or cemeteries) can be explained by visible control over the landscape (Antrop, 1988; Sevenant and Antrop, 2007). A recent example of an early application of visibility control was demonstrated by Yekutieli (2006). According to his analysis, during EB II-III and the Roman periods “people in a desolate place such as the Judean Desert were capable of using the panoptic effect through an intelligent management of their natural environment” (Yekutieli, 2006, p. 85).

GIS environment provides the ability of assigning concepts such as control or recognition into a quantitative value by using viewshed analysis. Viewshed are considered to represent cognitive perceptual acts which structured and organized the location of cultural features (such as settlements and burial sites) as well as their inherited landscape (Wheatley and Gillings, 2000) p. 3). Viewshed have been frequently assigned as an integral part of the landscape and proven to be a useful tool in understanding spatial distribution of archaeological sites (Fry et al., 2004; Kvamme, 1990; Llobera, 2003, 2007, 2010; Sevenant and Antrop, 2007; Wheatley, 1995; Wheatley and Gillings, 2000).

Specifically, we start with examining the burial sites spatial pattern in relation to the rest of the sites spatial pattern. That is, quantitatively sustain the assumption that Chalcolithic burial grounds were indeed located in an off-site location away from habitation sites areas. Subsequently, in order to examine whether secondary burial are related to land tenure system, we use a simple set of assumptions and constraints on our viewshed analysis. It is reasonable to propose that areas which are visible from habitation sites are most likely to have been included as parts that are controlled by the sites. Furthermore, terrain which is visible from a burial site can also be regarded as a controlled area. However, since areas which are visible from a particular observation point represent the areas from which the site (habitation or burial) is visible, our assumption does not suggest that the burial sites were intended to be used as actual watch towers of any kind. It is those areas, within the landscape, from which the burial sites locations are visible, that are of particular interest. What influences the society is the likelihood of recognizing and remembering the burial site as a landscape feature, a physical marker in the landscape. The question is if such landscape features could be recognized. Were they visible from the surrounding arable lands near the habitation sites? Could both the habitation sites and the burial sites be observed at the same time (overlapping viewsheds)? And if so, to what extent? Subsequently, we will examine whether the areas visible from burial sites were organized so that they could complete or enhance the visible area seen from habitation site (contributing viewsheds) and thus establishing together (the burial location and the habitation location) a continuous visible landscape within the habitation sites surrounding. Revealing the extent of the visible landscape helps understanding the off-site location of Ghassulian secondary burials. Being similar to secondary burials of traditional societies, it implies that it was one of the ways to manifest the rights of Ghassulian communities over the landscape.

Dataset and study area

There are 974 Chalcolithic sites according to the Israel Antiquity Authority (IAA) GIS MENORA database, which provides a solid and relatively well researched and updated body of data. A thorough search of the database and additional archival records resulted with 53 burial sites (5.4%) (Fig. 2). Van den Brink (Van den Brink, 1998, 2005) has recently prepared a list of 47 such sites. His list includes the site of ‘Qurnat Haramiyah (MizpeAlek)’ (van den Brink, 2005: Table Exc. 1.1) which lacks clear evidence of Ghassulian secondary burials since no ossuary fragments were found as is stressed by the site excavator (Torge personal communication). Furthermore, burial cave sites Nos. 25–28 in the list of van den Brink (2005 Table Exc. 1.1), located in the vicinity of Shoaham, were registered by us as one burial site named “Shoanoh North”. The additional burial sites included in our inventory are the recently discovered burial sites of Horvat Qarqar South and Palambahim North. Although these 53 burial sites are spread over a large area of 21,000 km², we restrict our study to the burial caves of the coastal plain and the Shephella (ca. 2484 km²) since here more than 50% of the sites (n = 29) are concentrated within 10% of the total area.

To study the spatial relationship between the burial sites and all other sites within this study area, we selected out of the IAA MENORA database the burial sites within this study area and an additional group of their neighboring habitation sites. The habitation sites have been chosen according to two criteria: (1) The assessments of the burial sites excavators and researchers who consider them to be related to the burial sites. Porath (2006, pp. 58–59), for example, writes: “it seems that these burial sites [Ma’abarot and Tel Ihsar] served the communities who lived in the lower basin of Nahal Alexander”. (2) Their proximity, in terms of nearest neighbor analysis, to the burial site in the cases the excavator did not mention a possible relationship. Five burial sites (Palambahim, Palambahim North, Benaya, Yavneh, Tel Lod) were excluded from our sample since they are relatively isolated compared with other burial site in the research study area. Thus, the dataset consists of a sample of 24 burial sites and a sample of 24 of their nearest neighboring habitation sites. Both are referred to below as the study group.

We wish to note that in comparison with the burial sites most of the paired habitation sites within the study group have not been excavated and mainly consist of survey data. This raises the question whether the paired sites are contemporaneous? In the coastal plain and the Shephella region the sites of the Chalcolithic period are of the Ghassulian culture and sites of cultural entities such as the Besarian, the Timnian or the Golanian are unknown in this part of the country. Moreover, during recent years and thanks to salvage excavations carried out by the IAA in this area, it becomes more and more evident that there are more habitation sites than previously known and they are all Ghassulian. A good recent example can be found in Van Den Brink excavations at the site of Namir road in Tel-Aviv (Van den Brink, 2006, 2011b).

To evaluate the significance of the results based on examining the study group, we created a matched control group. The results obtained from studying the spatial relationship within the study group were compared to the results which were gained from analyzing the matched control group. The latter consists of a random selection of non-burial sites (n = 24) out of the main database of such sites (n = 921) and within the research area, named here sample 1 (comparable to the area of the burial sites dataset). An additional matching set of 24 sites, named here sample 2 (comparable with the
habitation sites dataset), was selected based on the site proximity to sample 1 sites, by using nearest neighbor analysis and limited to the same ranges of distances that were measured between the burial sites and the non-burial sites of the study group. To validate measurement compatibility the distances between the two datasets were compared by means of a t-test analysis which has resulted in $p > 0.503$. An additional way to validate measurement compatibility was to compare the two datasets of elevations by using the t-test which resulted in $p > 0.05$. These results indicate that the elevation and distances between the sites of the study group and the elevation and distances between sites of the matched control group are similar.

Topographic information on the research area was measured and quantified using a contour-based DEM layer with 10 m vertical and 25 m horizontal resolutions (Hall, 1993). The research study area includes the coastal plain and the Shephella (Fig. 3). The coastal plain is topographically a low land belt that stretches from the Mediterranean Sea shore to the eastern edge of the Shephella. This landscape is relatively wide in the south and center of Israel (20–40 km), and narrow in the north of the country. The Shephella is located east of the coastal plain, slightly inland in the low piedmont foothills. It is a narrow, hilly region which separates the southern coastal plain from the Judean Mountains. It extends from the vicinity of Beer Sheva in the south to the environs of Lod in the north. Its eastern higher part (380–500 m) consists of flat hilltops. The western lower part (130–270 m) contains broad and leveled valleys, frequently attaining the aspect of foothill plains. The valleys and plains, and

frequently even the plateau-like hilltops, are covered with fine-grained, alluvial sediments (Singer, 2007, pp. 23–26).

Methodology

Our methodology consists of two stages: (i) Kernel density spatial analysis; (ii) viewshed analysis. A simple way to explain the methodology is to describe it as a process in which we first map the locations of all burial sites within the study area and compare them to the locations of all non-burial sites in order to statistically sustain the assumption that during this period secondary burial migrate to off-site locations. The second stage involves mapping and measuring viewsheds, the areas within the landscape which are visible from (or observe) each of the burial sites and compare it to the areas within the landscape which are visible from (or observe) it’s nearest neighboring habitation site. Next, we examine how much of the viewshed of each pair of sites (the burial and the nearest neighboring habitation site) overlap and what is the contribution of the burial site to the broadening of the area viewed from the habitation site (Fig. 4). Furthermore, in order to evaluate the significance of the viewshed measurements, we compare them to the viewshed measurements abstained from a matched control group, that is, from pairs of non-burial sites that are located within similar geographical conditions. The following is a detailed description of these methodological processes.

Spatial analysis

Kernel density is a method used to construct an estimation of a relative density from a given dataset. It calculates the density of points (e.g. sites) in the neighborhood around them. The aim of using this spatial analysis is to identify locations with concentrations of burial sites, and concentrations of non-burial sites. Kernel density creates a continuous raster surface output from the point (i.e., site) dataset. In this surface output the cell value is highest at the location of the point and diminishes with increasing distance from the point, reaching zero at the search radius distance from the
point. The kernel function is based on the quadratic function described by Silverman (1986, p. 76, Eq. 4.5). Since the site datasets have no field value other than location, NONE has been specified, and therefore the volume under the surface equals one. The density at each output raster cell is calculated by adding the values of all the kernel surfaces where they overlay the raster cell center. Increasing the search radius will not greatly change the calculated density values. Although more points will fall inside the larger neighborhood, this number will be divided by a larger area when calculating density. The main effect of a larger radius is that density is calculated considering a larger number of points, which can be further away from the raster cell, this results in a more generalized output raster (Mitchell, 2005; Silverman, 1986).

To examine the correlation between burial sites density pattern and habitation sites density pattern, kernel density analysis was applied to the burial site dataset \( (n = 29) \) and habitation site dataset \( (n = 117) \). All are located in the study area, along the coast plain and in the Shephella (ca. 2484 km\(^2\)). We used 1 km, 2 km, and 3 km search radius. We generated vector grids using the sampling tools of Hawth’s analysis tools version 3.26 (Beyer, 2004). All sampling grids covering the research area are equal in their size, but differ in their cell sizes. To avoid any possibility that the correlation results will be influence from the sampling grid cell size, we repeated the sampling of the research area by using three cell sizes of \( 1 \times 1 \text{ km} \) \( (n = 2484) \), \( 2 \times 2 \text{ km} \) \( (n = 632) \), and \( 3 \times 3 \text{ km} \) \( (n = 275) \). Then, we calculated the zonal statistics of the kernel density raster layers within each cell of each of the grids (Fig. 5). A correlation

![Fig. 5. Sampling grid of 2 × 2 km cell size spread over the kernel density map of non-burial sites using search radius of 3 km.](image)

![Fig. 6. The relative density locations of (a) habitation sites; (b) burial sites; (c) habitation and burial sites.](image)

![Fig. 7. Mean and standard error bar of viewshed areas of burial and habitation sites.](image)

<table>
<thead>
<tr>
<th>Grid (cell size)</th>
<th>1 × 1 km</th>
<th>2 × 2 km</th>
<th>3 × 3 km</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kernel density (search radius)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 km</td>
<td>−0.515</td>
<td>−0.462</td>
<td>−0.496</td>
</tr>
<tr>
<td>2 km</td>
<td>−0.552</td>
<td>−0.526</td>
<td>−0.638</td>
</tr>
<tr>
<td>3 km</td>
<td>−0.749</td>
<td>−0.726</td>
<td>−0.785</td>
</tr>
</tbody>
</table>
test was conducted on the zonal statistics results from all the sampling grids between the burial site kernel density layers and the non-burial site kernel density layers. However, since most areas of the kernel density maps are empty of sites, that is, equal zero, the correlation was made only on grid cells with a zonal statistical average (of the non-burial site kernel density layer or the burial site kernel density) greater than zero. The Kernel density and Ripley’s K-function analyses were carried out using ArcGIS 9.3.

**Viewshed analysis**

To test our ethnographically based assumption concerning the potential role of the burial sites location in terms of the enhancing controlled visible landscape areas of Ghassulian communities, we first calculated how much can be seen from each burial location in relation to the area size that is visible from each of the habitation site by using viewshed analysis.

Viewshed analysis calculation, given a digital elevation model (DEM), requires a straight line be interpolated between the observe point (i.e., site) and every other cell (pixel) within the elevation model. The elevation of all the cells which occur on the straight line between the observing and the target cells can then be obtained in order to ascertain whether or not the cell exceeds the height of the line. The result of each of these calculations is either positive (coded 1) for a visible cell or negative (coded 0) for a cell that is not visible. Calculated for the entire raster layer it produces a binary image with those areas of the landscape that have a direct line of sight from the observed point and those areas with no line of sight (Wheatley, 1995, p. 171; Wheatley and Gillings, 2002, p. 205).

Furthermore, we examined whether the visibility of the surrounding area from each burial site interact with the neighboring habitation site by adding additional visible area within its surrounding landscape. At first, we calculated the visible area (viewshed analysis) around each incident from the study group datasets and each incident from the matched control group datasets. The target area was limited to a maximum radius of 5 km distance, excluding the sea. A vertical distance (offset) of 2 m was added to each observation point height value in all incidences in each of the datasets group in order to simulate human visual ability over the topography. A comparison between the visible areas was made by means of a student t-test analysis. In the second stage, a buffer zone of 5 km radius distance was interpolated around each of the habitation sites. Within each of these buffer areas, we calculated the contributing and the overlapping viewshed areas of each burial site to its nearest habitation site (Fig. 4). Overlapping viewshed areas is the normalized percentage of visible area (viewshed) observed from both the specific burial site location and its nearest neighboring habitation site:

$$O_i = \frac{V_{bi} \cap V_{hi}}{V_{hi}} \cdot 100$$

(1)

where \(O_i\) is the overlapping visible area of the \(i\) couple of burial site viewshed (\(V_{bi}\)) and habitation viewshed (\(V_{hi}\)) sites. Note that the raw overlapping area (the numerator of equation number 1) is divided by the raw area of the habitation site, which normalizes \(C\) to percentage units. The Contributing area is the normalized percentage of additional visible area contributed by the burial site to the visible area from the habitation site within its buffer zone area of 5 km distance radius:

$$C_i = \frac{(V_{hi} \cup V_{bi}) - V_{hi}}{V_{hi}} \cdot 100$$

(2)

where \(C_i\) is the contributingof visible area of the \(i\) burial site viewshed \(V_{bi}\) to the \(i\) habitation site. Note that the raw contributing area (the numerator of equation number 2) is divided by the raw area of the habitation site, which normalizes \(C\) to percentage units. The same procedures were attributed to the matched control group datasets. The overlapping visible areas and the contribution visible areas of the two groups were compared by means of t-test analyses (for additional information on overlapping viewshed or co-visibility see Llobera, 2007, 2010). Our analysis is based on viewshed area relations between a single burial site and a single habitation site (its nearest neighbor). This minimizes confounding variables, and enables to examine the phenomenon significance. Further research should include testing viewshed area relations between several sites and each burial site (one-to-many relationship) to test the likelihood of other assumption that these burial sites may have served more than the nearest site. All viewshed analyses were generated using the ModelBuilder Iteration processing tool of ArcGIS 9.3.

**Results**

Statistical analyses (Table 1) indicate significant negative correlation between kernel density maps of the burial sites and kernel density maps of the non-burial sites. Results indicate that the size of the grid cell has relatively little effect on the correlation results. Using different search radius, however, shows that the greater the search radius distance is the stronger the correlation it will have. The important outcome is that in all cases correlation are negative, indicating that non-burial site clusters locations are correlated with decline in burial sites density estimation. In other words, the location of burial sites tends to stay away from areas with non-burial sites (Fig. 6).

Fig. 7 shows a descriptive graph of the mean and standard error of the visibility area size from the study group datasets. Within a maximum radius distance of 5 km the average size of visible area observed from burial sites (11.4 km²) is clearly larger than the average size of visible area observed from habitation sites (7.5 km²). The two dataset areas were compared using a student t-test analysis and has resulted in \(p < 0.04\), indicating a significant difference. This result indicates that the community burial sites had larger areas of visible control.

Fig. 8 shows that the contributing visible area within the study group is substantially larger (92%) than the contributing visible area within the matched control group (46%). A comparison of the two contributing areas using student t-test analysis has resulted in \(p = 0.004\) indicating the areas are significantly different. This result indicates that within a radius of 5 km from the habitation site an average of 92% contribution of visible area from the nearest burial site is added to the habitation site visible area (for examples see Fig. 10a and b).

Fig. 9 shows that an average of 37% overlapping visible areas are produced within the study group datasets and 25% overlapping visible areas are produced within the matched control group dataset. These overlapping areas were compared by means of student t-test analysis, resulting in \(p < 0.18\). This indicates that overlapping areas measured within the study group datasets and the matched control group datasets are similar, while their contributing areas are significantly different.

**Discussion**

Given the locations of secondary burial sites and their relation to habitation sites, our study shows a pattern of visibility control over the landscape. This pattern probably reflects attempts to socially constitute and mediate ownership overlap areas of the landscape as part of a land tenure system.

Correlation analyses between the locations of the relatively dense clusters of non-burial sites and burial sites have produced significant negative correlations. These results indicate that the
location of burial sites tends to avoid the location of non-burial sites, i.e., clusters of burial sites will most likely be placed away from habitation sites. This substantiates our assertion that Chalcolithic secondary burial grounds are off-site cemeteries, located away from habitation sites. This represents a phenomenon that differs considerably from the secondary burials of pre-Chalcolithic times, when burials were within the habitation sites (but see above the claims of Goring-Morris concerning Kfar HaHoresh).

The relationship between the habitation sites and the burial caves is apparent when analyzing the spatial pattern. Our results show that the size of the terrain seen from burial sites (field of visibility), is significantly larger than the size of the terrain seen from habitation sites (Fig. 7). Furthermore, we found that these larger viewed areas that are seen from the burial sites are located mostly adjacent to the habitation sites. When examining the percentage of the visible contributing area (Fig. 4) from the burial sites our results show it almost doubles the size of visible area surrounding the habitation site, in contrast to the match control group (Fig. 8). This indicates that the larger viewed area, seen from the burial sites, primarily affected the contributing visible area and not the overlapping visible areas (Fig. 9). Burial caves have been located in areas which are visible from a significantly larger part of the landscape than their nearest settlements, thus enlarging the size of the terrain that can be viewed. We suggest that this pattern indicates that Chalcolithic cemeteries played a role in claiming land tenure, similar to what have been described in the ethnographical record.

Ethnographic and archaeological studies that follow Hertz's (1960) view argue that the role of secondary burial rites is to affirm the social identity and establish community cohesion (Hertz, 1960; Kidd, 1953, pp. 372–375; Kuijt, 2008, p. 186; Robb, 2007, pp. 290–291; Thwaites, 1898, pp. 279–305; Trigger, 1976, pp. 88–91). However, it is difficult to explain the establishment of off-site cemeteries during the Chalcolithic period solely as a mean to reaffirm social identity. As demonstrated above, secondary burial rituals as a mean of social integration were performed during the Neolithic period within the habitation sites. Moreover, there are ethnographic indications that mortuary practices signify important economic and political aspects beyond social integration (Chénier, 2009; Metcalf, 1981; Metcalf and Huntington, 1991; Miles, 1965; Poyil, 2009). As Goldstein (2008, p. 189) notes: “... in contrast to primary burial, secondary burial may have little to do with death per se. The rite may come a year or even several years later, and it is triggered not by the death of the individual being afforded the treatment but by some other event.”

There are archaeological records of secondary burials in the southern Levant both before and after the Chalcolithic period. Mortuary practices of the PPNB period, for example, indicate that to reaffirm social identity secondary burials, and probably the rites involved, were carried out inside habitation sites (e.g. Kuijt, 1996, 2001, 2008; Kuijt and Goring-Morris, 2002). The spatial aspect of Chalcolithic period secondary burials cannot be overemphasized. It is practically the first time in the archaeology of the southern Levant that cemeteries shift in a systemic manner from within settlements to off-site locations that are exclusively dedicated to burial.

Secondary burial in ossuaries within burial caves was practices in this region during the Roman period (Hachlili, 2005, p. 522). Most of the ossuaries have been found within Jerusalem and its surroundings, especially during the period of city prosperity until its destruction in 70 BC (Rahmani, 1978, p. 110). The burial caves were quarried into limestone hills or arable lands. A cave with ossuaries usually represent burials of a family (Regev, 2002, pp. 59–60) in communities of farmers or other sedentary settlers. In such communities the collective identification is primarily with the ancestors and their land property (Regev, 2002, p. 50; Rubin, 1994, p. 258).

During the Chalcolithic period an increased demand for arable land due to population growth and reliance on agriculture may have stimulate a need to signal claims over arable lands. Arable lands were undoubtedly claimed also in later periods, but such claims were made in different ways (Adler, 1996; Earle, 1991, 2000). Territorial behavior, in regard to exploitation of resources, is an aspect that was first introduced to archaeological prehistoric research by Vita-Finzi and Higgs (Bintliff, 1999, p. 505). Accordingly, territorial behavior is assumed to have existed in all prehistoric and historic periods. Some scholars argue that humans are territorial by nature (Ardney, 1966; Cohen, 1976) or that some patterns of territorial control are apparent even among bands of hunter-gatherers (Cashdan, 1983, 1989; Dayson-Hudson and Smith, 1978; King, 1975; Peterson, 1975; Wilson, 1975).

The idea of territorial control is also significant in Saxe's hypothesis 8 (1970, p. 119) which is based on a hypothesis set forth by Meggitt (1965a, p. 279). Goldstein's (1981, p. 61) restatement of Saxe's hypothesis 8 suggests that burial grounds represent corporate groups that control crucial resources. "This corporate control is most likely to be attained and or legitimized by means of lineal decent from the dead...of the critical resources passing from parent to offspring." Goldstein notes that Saxe changed Meggitt's concepts of "'land' to 'vital resources' and 'agnation' to 'lineal descent'" (Goldstein, 1981, p. 60). Meaning that the nature of the crucial or vital but restricted resources has been generalized in order to make the hypothesis cross-culturally applicable. In the archaeological research 'crucial but restricted resources' refers...
mostly to land or agricultural land (Bintliff, 1999; Earle, 2000; Gerritsen, 2003).

The Ghassulian way of claiming rights over the land was probably based also on gatherings of the community during secondary burials ceremonies, when land rights may have been negotiated, defined and asserted. The specific part of the terrain that was chosen for the burial cave, be it a particular kurkar ridge or limestone hill, turned into a landmark which was understood by the local communities. The burial caves locations created “spiritscapes” (David et al., 2008; McNiven, 2004), landmarks which are identified with a spiritual and political power, similar to the way Grosman (2003, p. 577) interprets the role of the Natufian Hilazon Tachtit cave. Changing recurrently the landscape with burial caves defined patterns of group relationship and rules of inheritance that related to land use and/or access rights.

The pronounced variability of the caves as well as the nature of the social units that used them is still poorly understood. Although it has been argued that meanings and ideas behind burial practices may differ from those of the living community (e.g. Bloch, 1971; Hodder, 1982; Ucko, 1969), it is possible that each cave and its receptacles represent the social persona of the group that its members are buried in it. An example of a recent attempt to identify social entities is the study of Nativ and Gopher (2011) who suggest that there were two regional ‘cemetery groups’ a southern and a northern one.

We wish to emphasis that the territorial behavior of the community was primarily aimed toward regulating intra-community affairs rather than reaction to foreign intruders as is the case of the Megalithic monuments of Europe (e.g. Renfrew, 1976). This is based on indications that most, if not all community members participated in the mortuary ceremonies. A good example for the number of the participants in secondary burial ceremony may be found with the description of Jean de Brébeuf (1593–1649) who participate in the Huron’s secondary burial ceremony known as the “Feast of the Dead” in 1636: “…the old men and notables of the country assemble, to deliberate in a definite way on the time at which the feast shall be held to the satisfaction of the whole country and of the foreign nations that may be invited to it” (Thwaites, 1898, p. 279). Moreover, the archaeological evidence indicates that the number of individuals buried within each cave during the Chalcolithic has reached well into the hundreds in several cases. Thus, it is highly probable that the location of the burial caves was known to the entire community. In addition, there are no indications that a foreigner population penetrated this region.

One of the archaeological primary interests in the study of mortuary remains is due to the fact that mortuary behavior relates closely to the organization of society (Binford, 1971; Goldstein, 1976; O’Shea, 1984; Saxe, 1970; Ucko, 1969). There are researchers who view the Chalcolithic burial grounds as reflecting “elite lineages, extended families and kin groups that emerged at the top of a nascent social hierarchy” (Golden, 2009, p. 70), or “…reflect social hierarchy…individuals buried in the Peqi’in cave were of higher social status among members of the Chalcolithic community/communities.” (Gal et al., 2011, p. 205), Levy (1986, 1995), citing Saxe/Goldstein hypothesis, argues that the formal burial ground signifies a “hereditary chiefdom society” (Levy, 1995, p. 235). His assertion is based on the anthropological models of Service (1962) and Fried (1967) and on their archaeological correlates listed by Renfrew (1973a). However, the archaeological evidence from cemeteries supporting the idea of a socially ranked society hardly exists (see introduction; Gilead, 1988a, 1988b; Perrot and Ladiray, 1980, p. 131). Furthermore, Ghassulian settlement patterns and house shapes and sizes, cast doubts on Levy’s chiefdom model (Bourke, 2001, p. 151; Gopher and Tsuk, 1990, p. 15). Golden’s
and Gal et al. propositions that the burial caves were only for elite lineages/higher status members, implies the untenable proposition of "too many chiefs – no Indians". Moreover, state societies were preceded by societies that were not egalitarian, yet the chiefdom default model and its ubiquitous use should not be used mechanically to define them (Bawden, 1989; Crumley, 1995; Hole, 1983, pp. 322–328; Yoffee, 1993). In any case, corporate lineal descent groups are not necessarily equivalents to the chiefdom stage of Service (Knight, 1990, p. 4). Based on ethnographic data, it is more likely that corporate groups (clans or lineages), who own or control lands, which are often marked by special boundary ceremonies and/or cemeteries, represent local groups (tribes), rather than chiefdoms, that depend on agriculture, and settled "permanently or seasonally close to fields or other prime subsistence resources" (Earle, 2000, p. 46; Johnson and Earle, 1987).

O'Shea and Milner (2002, p. 200) state that tribal social organization "is a means of predictably organizing people within a defined territory", and that "...the flexibility inherent to tribal organization can be seen as both a major adaptive benefit ... and as a potential seedbed for evolutionary change". Kinship and ideology provide the "...floor plan that describes the cosmological origin and interrelationships among the people and their land" (O'Shea and Milner, 2002, p. 201). Natural features and built structures, such as burial mounds, provide the active representation of "intentioned and conventionalized use of material markers to designate identity, boundaries and ownership." (O'Shea and Milner, 2002, p. 207). Based on the present evidence it seems that Chalcolithic burial grounds represent local corporate groups (similar to tribal systems) rather than chiefdoms. These local corporate groups practiced secondary burial which maintained their social identity and group cohesion alongside asserting and defining rights over land use by means of linear ties to ancestors. This was marked by the location of a nearby hill where burial caves were quarried. These linear ties were socially articulated and symbolized by the secondary burial of the deceased relatives in formal cemeteries. The location of burial caves on hill sides suggests a signaling mechanism of visibility, from the areas near the habitation sites. The above mentioned Rumu from Papua New Guinea is a good example of demonstrating the close link between secondary burial in caves and land tenure. The landscape in this particular case is even defined as "spiritscape". We therefore suggest that the location of the Chalcolithic secondary burial grounds reflects both the affirmation of the corporate group's social identity and the link of this identity to a particular area within the surrounding landscape that is the source of vital subsistence resources.

Conclusions

The distribution of secondary burial caves in the landscape may reflect an element of land tenure system. The burial caves were visible from larger areas than the locations that are visible from the habitation sites and their location completes rather than overlaps the area visible from the habitation sites. This may suggest a need to enlarge the size of the terrain controlled by a community, the source of vital subsistence resources, mainly arable lands. Secondary burial was adopted by the Ghassulian communities during a time of demographic growth and intensification of crop growing and animal husbandry, activities that required large areas of arable land. Thus, it is likely that secondary burials have been used not only to enhance social cohesion but also to socially mediate and assert land use responsibilities and rights of access.

During the last two decades the archaeological research concerning the burial practices of the Chalcolithic period have focused on social, cultural and symbolic aspects. Most of the research has been devoted to the study of ossuaries and other funerary objects, paying little attention to patterns of burial caves locations and their relationship to the habitation sites and the landscape. It is not argued that the spatial aspects of the burial sites are more important than other aspects of mortuary behavior. It is rather suggested that they are important for a better understanding of the Ghassulian secondary burials.

The link between secondary burial caves and land tenure has never been previously considered. Our study, however, is by no means exhaustive. We have chosen to concentrate only on the spatial distribution of burial caves, and its relation with neighboring habitation sites, excluding several sites such as – Teleilat Ghassul. This may raise the question whether or not this model of land tenure system can be applied to all the Ghassulian cemeteries that are not burial caves. Unfortunately there are only four Ghassulian above ground cemeteries: Shiqmim (Levy, 1987), Palmahim North (Gorzalczy, 2006), Kissufim Road (Goren and Fabian, 2002) and perhaps Adeimeh (Neuville, 1930), near the type-site Teleilat Ghassul. Currently, the comparison between these two burial forms is problematic mainly because burial caves are frequent while above ground cemeteries are very rare.

To conclude, in this study we have tried to analyze the spatial inter-relationships between secondary burial caves and the neighboring habitation sites. We found that the cemeteries and their neighboring habitation sites are distributed in a pattern which significantly increases the area that can be monitored. This distribution may reflect a system of landmarks associated with negotiating land tenure. During the Neolithic period secondary burials were means to enhance social cohesion. During the Chalcolithic period another function was added: to define and regulate the rights to use and access land and its resources.

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