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Up in Arms: Slingstone Assemblages from the Late Prehistoric Sites of 'En Ẓippori and 'En Esur

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This paper presents the slingstone assemblages recovered from two large-scale excavations at the Late Pottery Neolithic/Early Chalcolithic (c. 5800–4500 cal BCE) sites of 'En Ẓippori and 'En Esur. Based on contextual, morphometric and other archaeological data, we suggest that during this time, the slings and slingstones were used as weapons. The high number of slingstones found within the settlements, and the traits of systematic production they reflect (formalization, standardization and time-consuming manufacturing), point to an organized production of weapons, interpreted as an escalation in the preparations for war, alluding to the possible existence of local power centers in the region.

Keywords: Late Pottery Neolithic, Early Chalcolithic, Southern Levant, 'En Ẓippori, 'En Esur, slingstones, warfare

Introduction

The Late Pottery Neolithic/Early Chalcolithic period (c. 5800–4500 cal BCE) marks the earliest unequivocal archaeological evidence for the use of slings in the Southern Levant. The use of slings became archaeologically visible with the formalized and systematic production of slingstones. These early formalized sling missiles are primarily recognized by their biconical form, which has been used in different times and places worldwide (Korfmann 1973; York and York 2011). In the Northern Levant, biconical clay projectiles first appeared in the second half of the seventh millennium BCE and became frequent in the Halaf culture (Gaulon 2013; Streit 2020). Biconical stone projectiles, however, were first systematically produced around 5800 cal BCE, as part of the Southern Levantine Wadi Rabah culture (Kaplan 1969; Korfmann 1972; Garfinkel and Matskevich 2002; Rosenberg 2009; Gopher 2012), when they were used for about a millennium, until they abruptly disappeared. In subsequent periods, for thousands

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of years, natural water-worn pebbles were probably used as sling projectiles in the region (Paz 2011; Ashkenazi 2020). In fact, save for slingstones from Iron Age Lakhish (Sass and Ussishkin 2004), described as flint spheroids weighing 250 g or more (Ussishkin 2014:83), formalized slingstones reappeared in the archaeological record of the Southern Levant only in the Hellenistic period, in the form of biconical slingstones of rather similar dimensions and form (e.g., Ilan 2019: Fig. 20.5), alongside biconical lead sling projectiles (Dothan 1976).

This paper presents two large Late Pottery Neolithic/Early Chalcolithic (Early Chalcolithic, herein) slingstone assemblages from ‘En Ẓippori in the Lower Galilee and ‘En Esur in the northern Sharon plain (Fig. 1). As the assemblages were retrieved in large-scale excavations, they contribute important information concerning chronological, contextual and morphometric issues. Based on the archaeological data, we suggest that during this time, the slings and slingstones were used as weapons. The large quantities of slingstones that comprise these assemblages exhibit traits of systematic production reflected in the formalization, standardization and investment in the manufacturing of these items, providing insights regarding their geographic distribution. Southern Levantine Early Chalcolithic slingstone assemblages are found from the Rift Valley in the east to the Mediterranean coast in the west, and from the Jezreel Valley and the northern Sharon plain in the south to the Ḥula Valley and Western Galilee in the north, excluding Upper Galilee. South of ‘En Esur, slingstones have rarely been found: two from Tell el-Far‘ah (N), one from Ha-Bashan Street site, Tel Aviv; one from Jericho (Rosenberg 2009); and two from Moẓa (Ianir Milevski, personal observation). Thus, as of yet, it seems that ‘En Esur marks the southern border of the region in which slingstones were systematically used.

‘En Ẓippori

The site of ‘En Ẓippori is located in Lower Galilee, between the Naḥal Ẓippori stream and Giv‘at Rabi (Jebel el-Ayn). Several superimposed strata dating to the Pre-Pottery Neolithic B and later were uncovered in salvage excavations conducted mainly between 2011 and 2016 (Milevski and Getzov 2014; Yaroshevich 2016;[2] Getzov and Milevski 2017). The Early Chalcolithic occupation at the site includes public buildings and intramural burials. The primary strata date to Early Chalcolithic (EC) I, II and III (see below) and EB IB. During EC I, these remains covered an area of 30 hectares, decreasing to 20 hectares in EC II, and drastically shrinking to one hectare in EC III.

‘En Esur

‘En Esur is a large site in the northern Sharon Plain, at the outlet of Naḥal ‘Iron. Remains of settlements and artifacts were exposed at the site, dating from the Pre-Pottery Neolithic to the Roman periods, of which the main strata date to EC II, Late Chalcolithic, EB IA and EB IB. Excavations in 1993 (Yannai 2006), and large-scale excavations exposing four hectares of the site during 2017–2019, revealed remains of an extensive c. 50 hectare EC II

[2] The authors are greatly indebted to Alla Yaroshevich for allowing them to include the slingstones uncovered in her excavation at ‘En Ẓippori in this publication.

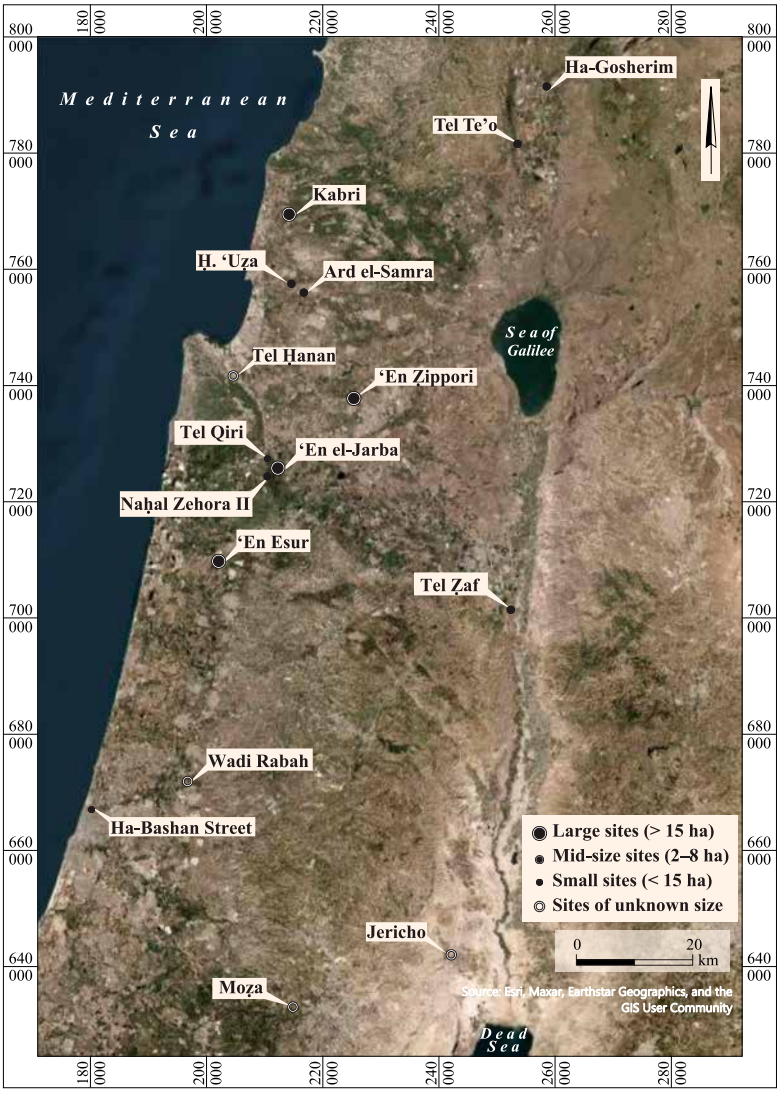

Fig. 1. Location map of sites mentioned in the text.

settlement (Elad, Paz and Shalem 2020, and see further references therein). The exposed remains include domestic, public and monumental structures, intramural burials of adults and infants, evidence for ritual activities and anthropomorphic and zoomorphic figurines. The preceding and subsequent occupation layers are somewhat scant. Scattered EC I finds indicate the presence of a settlement, although its exact location is unknown. Later finds are related to a very small occupation during EC III.

The Slingstone Assemblages

The assemblages comprise 424 objects: 187 items from ‘En Ẓippori and 237 items from ‘En Esur. Of these, 357 (84%) were complete or slightly damaged specimens, enabling the measurement of both length and width (max. diameter). Only the width diameter of 57 broken objects could be measured, while ten fragments were poorly preserved and therefore not measured. The weight of 338 items was recorded (Table 1).

Raw Material

Hard limestone/dolomite was the most common raw material (362 objects, 85.4%; Table 2), while the remainder were made of chalk (33 objects, 7.8%) and basalt (28 objects, 6.6%). A single item from ‘En Ẓippori was made of sandstone. Basalt slingstones are particularly rare at ‘En Esur (only three items), while chalk slingstones are rare at ‘En Ẓippori (only six items). Two clay biconical projectiles from ‘En Ẓippori, and one from ‘En Esur, are similar to those known from the Northern Levant (these will be discussed elsewhere; see Streit 2020).

Technology

Technological aspects of the *chaîne opératoire* of the slingstones have much in common with the production of groundstone tools (Wright 1992) and other stone objects produced using a reduction sequence (e.g., Milevski 2022). Typically, the blank size did not exceed twice the size of the finished product. The more polygonal forms and surface markings

Table 1. Slingstones State of Preservation

State of Preservation	N	%	No. of Measured Items		
			Length	Width	Weight
Complete	357	84	357	357	338
Broken	57	13		57	
Fragment	10	3			
Total	*424*	*100*	*357*	*414*	*338*

Table 2. Raw Material of Slingstones according to Site

Raw Material	‘En Ẓippori		‘En Esur		Total	
	N	%	N	%	N	%
Limestone/ Dolomite	155	82.8	207	87.3	362	85.4
Chalk	6	3.2	27	11.5	33	7.8
Basalt	25	13.4	3	1.3	28	6.6
Sandstone	1	0.5			1	0.2
Total	*187*		*237*		*424*	

(scars) that characterize some of the less-finished items in the assemblages suggest that the production of a biconical slingstone began with flaking, whilst the final form was achieved through grinding (see also Rosenberg 2009:106).

Form

The slingstones are smooth-surfaced objects characterized by a circular or an oval cross-section and a biconvex longitudinal section (Fig. 2; Table 3). Roughly 61% (260 items) of the objects feature the 'classic' double-pointed biconical form (Fig. 3:a–f), while the remaining are less pointed and their forms can be described as ellipsoid, elongated ovoid, egg-shaped and other forms (Fig. 3:g–l).

Table 3. Slingstone Forms

Form	N	%
Pointed ends (classic biconical)	260	61
Blunt ends (ellipsoid, elongated ovoid, egg shaped)	149	35
Other forms (teardrop, parallelepiped) and fragments	15	4

0 5 cm

Fig. 2. Slingstones from 'En Ẓippori.

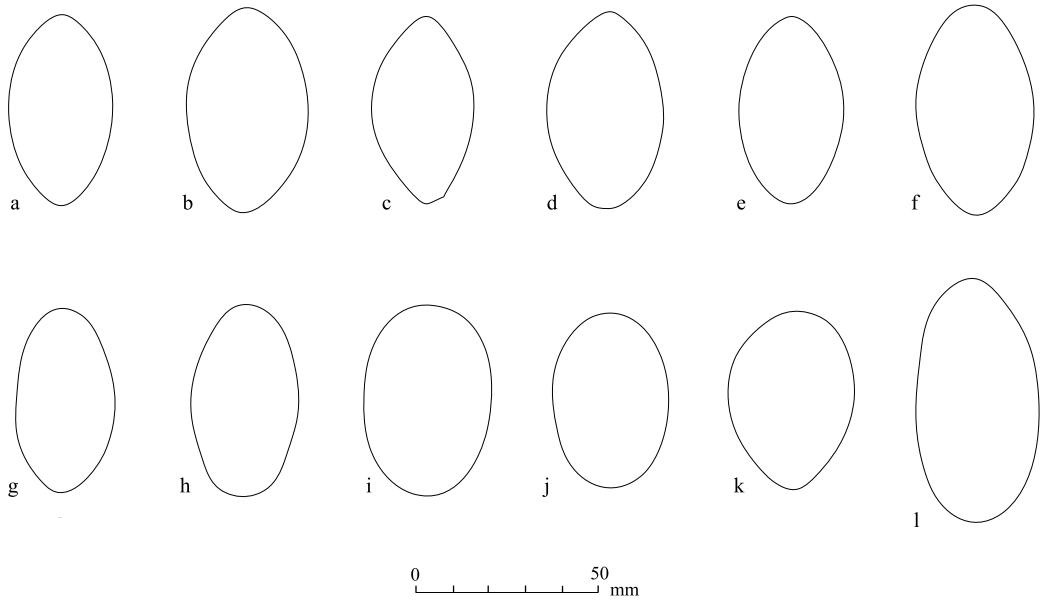

Fig. 3. Profiles of slingstones from ‘En Esur: biconical (a–f) and other (g–l) forms.

Metrics

Length.— The length of the slingstones varies between 34 and 71 mm (Fig. 4), although approximately 80% of the measured lengths range between 46 and 58 mm. The average length of slingstones is 52 mm at ‘En Esur and 53 mm at ‘En Ẓippori.

Width.— The maximum diameter of the slingstone width varies between 19 and 46 mm (Fig. 5), with roughly 80% of the measured widths ranging between 27 and 35 mm. The average width at ‘En Esur is 31 mm, and at ‘En Ẓippori, 32 mm.

Weight.— The weight of the slingstones varies between 24 and 134 g (Fig. 6), although approximately 80% of the measured weights range between 40 and 80 g, and roughly 25% range between 56 and 64 g. The average weight is 60 g: 56 g at ‘En Esur and 64 g at ‘En Ẓippori.

The average slingstone dimensions in the assemblage are about 52 mm long and 31 mm wide (Table 4). Of the 357 complete items, 236 (c. 66%) are characterized by dimensions that fall within ±6 mm in length range and ±4 mm in width range (Fig. 7). While the average width of the slingstones (31 mm) remains constant regardless of the raw material, the average length slightly varies between 51 and 53 mm (Table 5). The average weights of limestone and basalt objects are equal (59–60 g), but the average weight of chalk items is slightly lower (53 g).

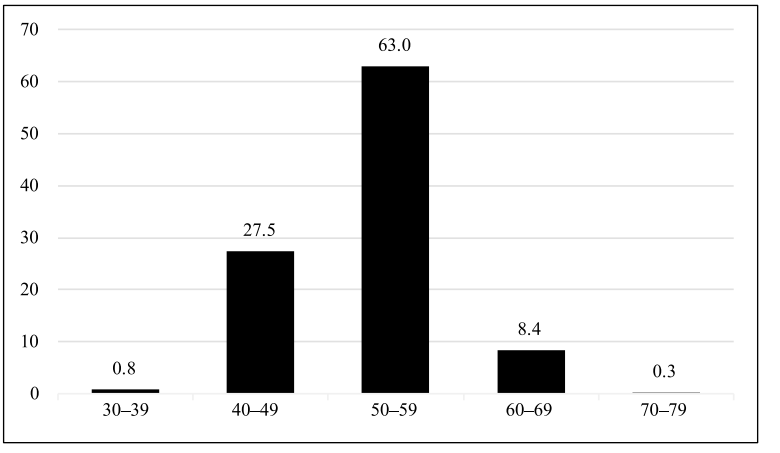

Fig. 4. Distribution of lengths (mm/%).

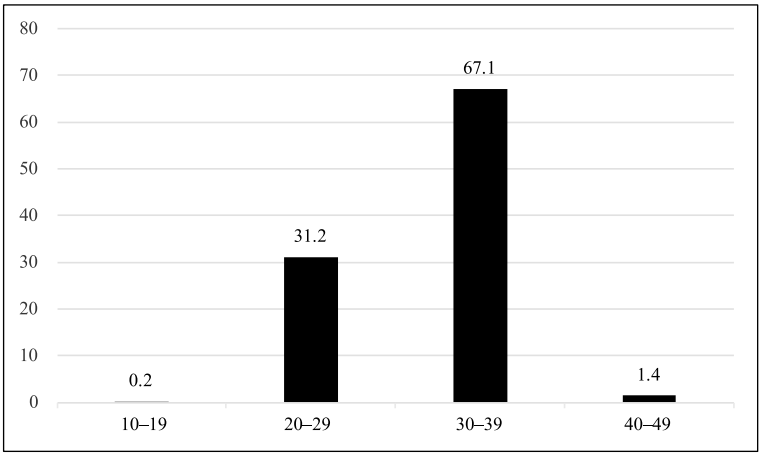

Fig. 5. Distribution of widths (maximum diameter) (mm/%).

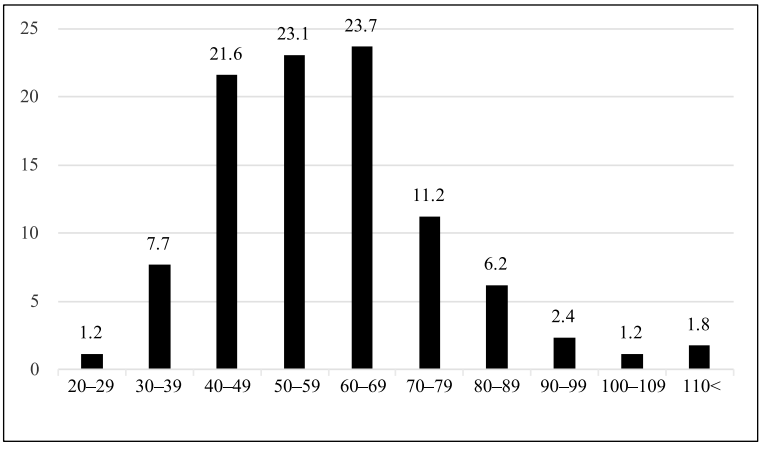

Fig. 6. Distribution of weights (g/%).

Table 4. Average Dimensions of the Slingstones

Sites Measurements	‘En Ẓippori	‘En Esur	Total
Average length (mm)	52.6	51.8	52.2
Average width (max. diameter) (mm)	32.0	30.5	31.2
Average weight (g)	63.86	56.1	59.6

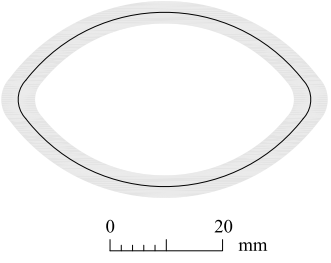

Fig. 7. PA profile of a typical biconical slingstone of the average dimensions (52 mm long, 31 mm wide) and the ranges (±6 mm in length, ±4 mm in diameter, in gray). Both the length and diameter of ~66% of all complete items fall within these ranges.

Table 5. Raw Material by Average Dimensions and Weights

Raw Material	N	Average Measurements		
		Length (mm)	Width (mm)	Weight (g)
Limestone/ Dolomite	362	52	31	60
Chalk	33	53	31	53
Basalt	28	51	31	59
Sandstone	1	34	30	50

Chronology

The dating of the slingstones is discussed using the chronological framework in which the Early Chalcolithic period (c. 5800–4500 cal BCE) postdates the Pottery Neolithic Lodian culture and Naḥal Zippori PN horizon (Getzov et al. 2019) and predates the Late Chalcolithic Ghassulian culture. This time span may be subdivided into three phases (EC I–III; Getzov 2015; Gopher 2012: Fig. 41.1). About 46% of the objects were found in loci belonging to this time frame (Table 6), with the remaining items originating in loci that could not be dated

Table 6. Chronological Frame of the Slingstones

Context	‘En Ẓippori		‘En Esur		Total	
	N	%	N	%	N	%
Early Chalcolithic (5800-4500 cal BCE)	97	51.9	97	40.9	194	45.8
Other contexts/mixed/ unknown	90	48.1	140	59.1	230	54.2

Table 7. Chronology of Slingstones from Early Chalcolithic Contexts

Context	Date (cal. BCE)	‘En Ẓippori		‘En Esur		Total	
		N	%	N	%	N	%
Early Chalcolithic I	5800–5200	23	23.7			23	11.9
Early Chalcolithic II	5200–4800	40	41.2	97	100	137	70.6
Early Chalcolithic III	4800–4500	3	3.1			3	1.5
Early Chalcolithic, General	5800–4500	31	32.0			31	16.0
Total		*97*	*100.0*	*97*	*100*	*194*	*100.0*

(c. 24%) or belonging to later periods (c. 30%). The latter, mostly attributed to the Early Bronze Age, seem to be residual. The slingstones found in Early Chalcolithic contexts are often found in clusters (see below), providing a secure dating for these objects.

At ‘En Ẓippori, most items (42 of 97 found in Early Chalcolithic contexts) were retrieved from loci dated to EC II (Table 7), while a smaller group of items (23 out of 97) was retrieved from loci dated to the EC I. Only three items were retrieved from loci assigned to the EC III, and the remaining 31 items could not be assigned with certainty to one of the three phases. At ‘En Esur, where only the EC II and EC III periods are represented, all slingstones were retrieved from loci assigned to EC II.

Context and Spatial Distribution

At both ‘En Ẓippori and ‘En Esur, slingstones were found in nearly all excavated areas (Figs. 8–11). Most of the 194 items retrieved from Early Chalcolithic contexts were found in archaeological accumulations: 22 were found on living floors and stone surfaces, 5 within pits and in association with installations, and 2 within a wall.

At ‘En Esur, 97 slingstones were found in Early Chalcolithic contexts. Approximately 70% (68 objects) were found in Areas M7, O6 and N9, in which Early Chalcolithic remains were extensively uncovered (Fig. 10). In Area M7, 17 out of 18 slingstones were concentrated in the southern part of the excavated area, on either side of the wall of a large public building. The density of slingstones there is one item per 3.3 sq m; a similar density was recorded in Area N9 (Table 8), where 31 slingstones were found (Fig. 12), mostly within thick layers

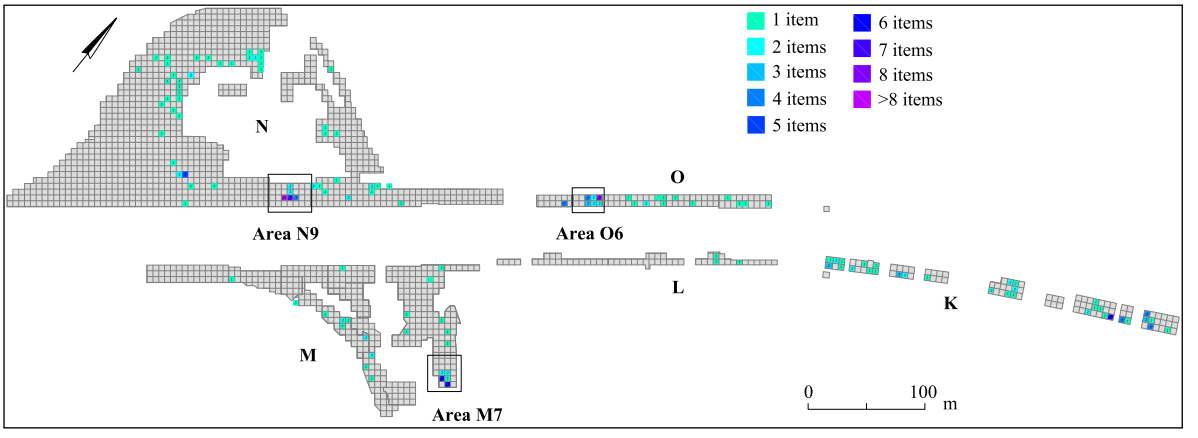

Fig. 8. Spatial distribution of slingstones at ‘En Ẓippori.

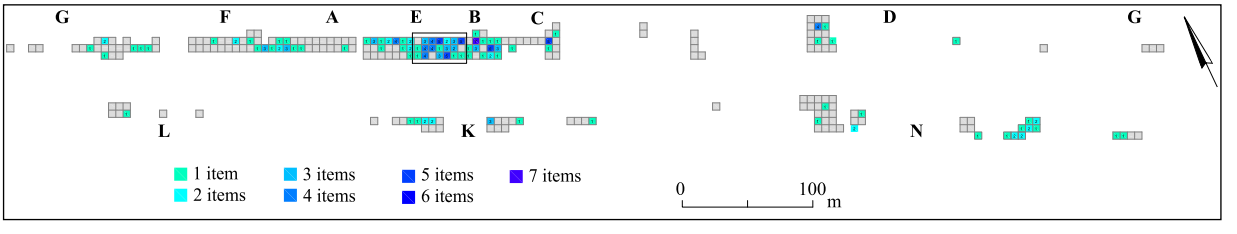

Fig. 9. Concentrations of slingstones from Early Chalcolithic contexts at ‘En Esur, Areas N9, M7 and O6.

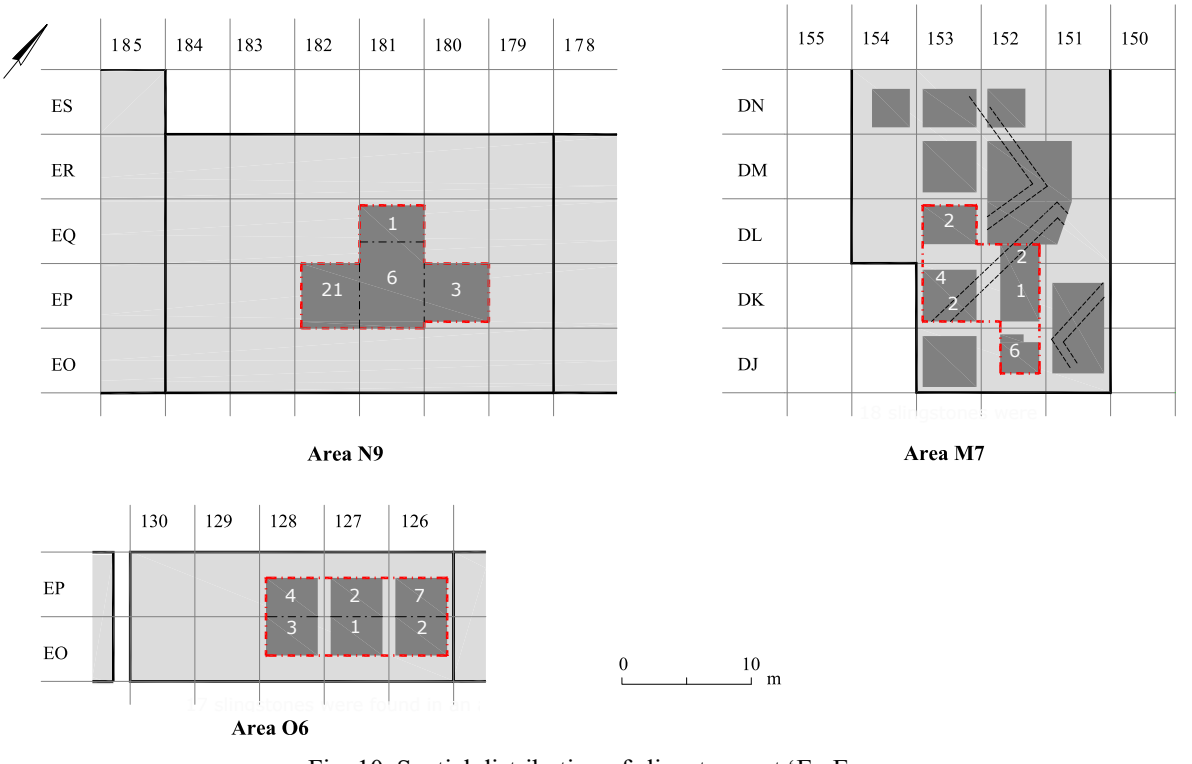

Fig. 10. Spatial distribution of slingstones at ‘En Esur.

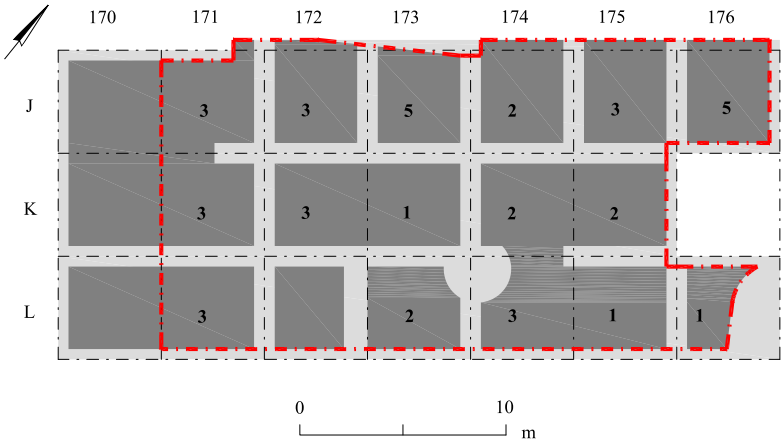

Fig. 11. Distribution of slingstones from Early Chalcolithic contexts at ‘En Ẓippori, Area B.

Table 8. Density of Slingstones in Early Chalcolithic Contexts

Site	Area	Excavated Area (sq m)	No. of Items	Density (items/sq m)	1/Density (sq m/items)
‘En Ẓippori	B	302	42	0.14	7.2
‘En Esur	M7	56	17	0.30	3.3
	O6	72	19	0.26	3.8
	N9	92.5	31	0.33	3.0

of floor-makeup comprising small stones. These features contained pottery sherds which indicate that some of the construction material was brought from other parts of the site. However, the high density of slingstones (up to 21 objects in a single locus) suggests that this was the location of an arsenal. In Area O6, 19 slingstones were found within an area of 72 sq m, in which a sequence of floors and installations was uncovered. The density in this area was calculated to be one object per 3.8 sq m.

At ‘En Ẓippori, 42 of the 97 slingstones recovered from Early Chalcolithic contexts were found in Area B, where 302 sq m of Early Chalcolithic deposits were excavated (Fig. 11). The density of the slingstones here is one object per 7.2 sq m. Of the 97 slingstones, 52 (c. 54%) were recovered from Early Chalcolithic contexts in loci that yielded at least two slingstones, further indicating the clustering of these objects. At ‘En Esur, 69 of the 97 items (c. 71%) from Early Chalcolithic contexts were retrieved from loci, in which at least two slingstones were found. It is not unusual to find multiple groundstone items of the same type in a single locus, but in the case of slingstones (which were mostly found in a complete state of preservation), this phenomenon at both sites is highly pronounced, suggesting that this fact may be directly related to the way the slingstones were used and stored.

Fig. 12. Slingstones from ‘En Esur, Area N9.

Discussion

The identification of the artifacts in this assemblage as slingstones is strongly supported by their aerodynamic form, comparable to similar biconical sling projectiles archaeologically known from later periods, and from historic and ethnographic accounts worldwide, including Oceania and North America West Coast (York and York 2011; Skov 2013). Biconical sling projectiles from several Halaf-culture sites predate the Southern Levantine examples (Clare et al. 2008:77; Streit 2020:93). At Tell Sabi Abyad, they appear as early as c. 6400 cal BCE (Akkermans et al. 2006:141, 144). From the Halaf-culture region they spread westward to western Anatolia in the late seventh millennium BCE (Clare et al. 2008:77), and to the Southern Levant, in the early sixth millennium BCE (Streit 2020:228–229). The sixth-millennium BCE interactions between the Southern and Northern Levant and Mesopotamia are evident in various finds: pottery (Kaplan 1958); anthropomorphic and zoomorphic imagery (Garfinkel 2003; Streit and Garfinkel 2015; Milevski et al. 2016); imported obsidian and chlorite vessels (Rosenberg, Getzov and Assaf 2010; Schechter et al. 2016); and the design of the sling projectiles.

Throughout history, the sling was used for different purposes, most commonly as a weapon, as well as a hunting and herding tool. The sling may have acquired different symbolic meanings by different peoples at different times. For example, slingers were

highly respected warriors in pre-European Oceania (York and York 2011:46), but possibly less honorable in ancient Egypt, where the sling may have been associated with lower-class shepherds (Wernick 2014). The focus of interest here is the function of the sling and biconical slingstones in the Early Chalcolithic Southern Levant. Below is a discussion of the various possible functions of the objects in question.

Hunting

The appearance of fashioned slingstones and the almost complete disappearance of arrowheads occurred simultaneously in the Late Pottery Neolithic in arable lands throughout Northern and Southern Levant (Kaplan 1969; Korfmann 1972; Schwartz and Weiss 1992:230; Özdoĝan 2002). Korfmann (1972) and Özdoĝan (2002) suggested that slings and slingstones may have replaced the bow and arrows during this time. Yet, the Pottery Neolithic was the time when the Neolithization process—the transformation from hunting and gathering to food production that culminated in the establishment of a full-fledged farming economy (Özdoĝan 2002)—resulted in a significant decrease in hunting (Gopher and Gophna 1993). In the desert regions, for instance, in the eastern Jordan Badia region (Rollefson, Rowan and Wasse 2014:289; Rowan 2016:50–52), where hunting continued during this period, arrowheads remained in use (Rollefson, Rowan and Wasse et al. 2014), whereas slingstones were not found (Streit 2020).

These observations are well-reflected in the faunal and flint assemblages from both ʻEn Ẓippori and ʻEn Esur. For example, at ʻEn Esur, wild animals comprise only 7% of the faunal assemblage, and small game animals (including birds) are rare (M. Pines-Amir, pers. comm.). Likewise, the frequency of flint arrowheads at ʻEn Esur drops significantly in comparison to earlier periods (L. Brailovsky-Rokser, pers. comm.; for a similar comparison from other sites, see Rosen 1996).

Interestingly, York and York (2011) noted the lack of arrowheads also in the islands of Oceania, where biconical slingstones were used for centuries, going back to 1100 CE. There, the sling was mostly a combat weapon, but also often used in bird hunting (attesting to the accuracy achieved using slings). In the Southern Levant, the sling and biconical slingstones were not primary hunting tools, as hunting became occasional. Nevertheless, it is still possible that the sling and slingstones replaced the bow and arrows if the latter were not used exclusively for hunting during the Early Pottery Neolithic period.

Herding

The use of slings by herders (to guide and protect the herd) less likely attests to their primary use in the Southern Levant. Perlès (2001) suggested that Neolithic biconical clay projectiles from Greece were used as shepherds' implements, based on the choice of raw material which, according to her, would not be suitable as a combat weapon (for a different opinion, see Clare et al. 2008). According to Perlès, the herders could have used available pebbles, but chose to use softer clay projectiles, aimed to hit but not harm, and could have easily been produced at any location. Rosenberg (2009) suggested a similar function for the Southern

Levantine slingstones, in relation to an increased dependence on herding during the time of their appearance. There are in fact, historic and ethnographic examples for slings used by herders worldwide (e.g., Bjerregaard 2014; see also Dohrenwend 2002 and references therein). Yet, to the best of our knowledge, such slingstones were not formalized, but rather natural pebbles that seem to have been sufficient for this function (e.g., Vega and Craig 2009; Bowen 1940:53–54). The effort of modifying, formalizing and standardizing these stone objects, which involved laborious work, alongside the large number of these items found within settlements, seem to negate this explanation.

Ritual Duals

Recently, it was suggested that slings were used in ritual duals, rather than a weapon meant to kill (Shimelmitz and Rosenberg 2013). However, Arkush and Stanish (2005) argued that ceremony and defense should not be mutually exclusive, and festive combats probably took place in the context of state institutions that could control the violence that arose during these fights. Moreover, the suggestion that slinging was exclusively performed in ritual combats does not account for the large quantities of slingstones found at ʻEn Ẓippori and ʻEn Esur.

Combat

The possibility that the primary use of late prehistoric biconical slingstones was for combat is not new. At the Wadi Rabah site of ʻEin el Jarba, Kaplan uncovered a "hoard of weapons" including 17 slingstones and two mace-heads (Kaplan 1969:25). Experimental studies have yet to successfully calculate the range and impact of slinging by skilled users (Skov 2011). Ethnographic studies have shown that as a skill developed for years, slinging can be quite accurate, whether in bird hunting or combat, which may result in critical head wounds (York and York 2011). Furthermore, textual sources depicting Hellenistic- and Roman-period battles include descriptions of the importance of the slinger unit, the high skills required of its members and the critical wounds caused by the slings (Yuzofovsky 2008). We agree with previous suggestions recognizing the prehistoric sling and slingstones as a weapon and further suggest, based on the findings from ʻEn Ẓippori and ʻEn Esur, that rather than replacing the bow and arrows as a hunting tool, the introduction and formalization of slingstones in the Southern Levant reflects the practice of warfare in the region during the Early Chalcolithic.

Warfare

The debate regarding ancient warfare goes back to Hobbs and Rousseau, and their views on the nature of humankind and human condition in the distant past (Keeley 1996; Gat 2015). According to Clausewitz, from a socio-political perspective, "…war is merely the continuation of policy by other means…" (Clausewitz 1943: Book 1, Chapter 1). While interpersonal combat and other types of violence appeared alongside the rise of human societies, there is no consensus among researchers regarding the existence of warfare

among hunter-gatherers and in prehistoric pre-state societies, as there is no prevailing definition of the term that goes beyond "intergroup violence." Definitions of warfare (e.g., Kissel and Kim 2019: Table 1) are primarily concerned with three main characteristics: the relationship between the opposing groups, the use of weapons, and the organization of violence. The aspect of organization includes strategies employed during battle, as well as the preparations leading to it, including equipping and training. The scale of the conflict is not usually mentioned in definitions of warfare, as the opposing groups of population may be tribes, communities, states and social classes (Johnson 1950), as long as they perceive each other as 'others' (Kissel and Kim 2019). Keeley, however, distinguished between violent activities of small groups, which would not be defined as war, explaining that a "large scale is implied by our normal definition of warfare" (Keeley 1996:29). Use of the term warfare is *sensu lato*, defined by occurrences of significant organized armed conflicts.

The possibility of warfare in the late prehistoric period in the Near East is weighed against theories and understandings of the crucial transformations of the period. While Cauvin (2000) envisioned a PPNB culture that spread across the Levant through proactive invasions and conquests, the introduction of warfare is mostly viewed as a response or adaptation to changing conditions. The potential for war may have increased as a result of sedentism that led to the accumulation and storing of surplus/wealth (Grossman 2010; Müller-Neuhof 2010), and due to 'scalar stress' related to population growth accompanied by food shortage (known as the Malthusian approach), possibly caused by worsening climatic conditions (Clare et al. 2008; Bar-Yosef 2010). LeBlanc (2010) suggested that the introduction of warfare was associated with farming economy and its lifestyle, while Otterbein (2010) proposed that the domestication of plants and animals (in the Northern Levant) required a warless society. Clare et al. (2008) state that the Late Neolithic/Early Chalcolithic period in southwestern Anatolia was characterized by episodes of warfare attested by the construction of small fortified settlements, major conflagrations, identification of distinct site clusters and a large numbers of clay sling projectiles found at the sites. In contrast, Clare (2010) argued that there is not enough archaeological evidence of significant conflicts in the PN Southern Levant, and that the picture beginning to emerge is of "harmonious times." Clare notes that the slingstones only appear during the Wadi Rabah culture (EC I), concluding that "Significantly, however, even in the Wadi Rabah culture numbers are still exceedingly low" (Clare 2010:20).

Following the excavations of 'En Ẓippori and 'En Esur, in which 424 slingstones have been recovered, it may be argued that in large Early Chalcolithic settlement sites, slingstones are, in fact, present in large numbers. The density of slingstones in the areas where they were found is one item per 3–7 sq m, making the slingstones one of the most frequent Early Chalcolithic groundstone objects at both sites. Considering the absence of such slingstones in the earlier and later periods, they should be regarded as a significant phenomenon of their time. The emergence of a systematic production of weapons suggests a step up in the preparation for battle. Warfare during the Early Chalcolithic of the Southern Levant is also

plausible in light of increased settlement size, remains of monumental public buildings and several distinctive built burials present in both in ‘En Ẓippori and ‘En Esur (for an example from Moẓa, see ‘Ad and Eirikh-Rose 2021: Figs. 5, 6), suggesting a stratified society, involved in interregional or international exchange (Milevski and Barzilai 2017:32–33; Streit 2020) and prone to conflicts.

Two other large Early Chalcolithic sites, ‘Ein el-Jarba and adjacent Kabri, yielded large quantities of slingstones. At ‘Ein el-Jarba, at least 143 slingstones were recovered in excavations and field surveys since the 1960s (Kaplan 1969; Meyerhof 1962: No. 13; Raban 1999: Sites 31, 40, 45; Streit 2015: Area A). Streit (2015: Fig. 1) considers ‘Ein el-Jarba and Abu Zureiq to be a single site, over 15 hectares in size (see Rosenberg 2009, though, who considers them a cluster of sites). At Kabri, where 165 slingstones were collected from the surface surrounding the site (Rosenberg 2009), the Early Chalcolithic settlement was estimated to cover over 20 hectares (Getzov 2013: Fig. 1). Each of these four large sites was inhabited by thousands of people. Considering the small number or often complete absence of slingstones in midsize and small Early Chalcolithic sites, e.g., Tel Ḥanan (Khalaily and Nagorsky 2013) and Wadi Rabah (Gopher and Eyal 2017), we suggest that the widespread formalized production and use of slingstones mostly pertained to the larger settlements of over 15 hectares, indicating their status as local centers of power (Table 9).

The proliferation of formalized slingstones in the Southern Levant may plausibly be regarded as evidence of warfare in the region. Non-formal slingstones (i.e., natural pebbles) may have been used as sling projectiles before (Gebel 2014), during (Rowan 2006) and

Table 9. Number of Slingstones according to Sites and Their Size[i]

Site	No. of Items	Site Size	Source
‘En Esur	253	A	This study; Rosenberg 2009
‘En Ẓippori	187	A	This study
Kabri	165	A	Rosenberg 2009
‘Ein el-Jarba	143	A	Rosenberg 2009; Streit 2015
Ha-Gosherim	23	B	Rosenberg 2009
Naḥal Zehora II	21	B	Gopher 2012
Ḥorbat ‘Uẓa	3	B	Getzov 2009
Ard el-Samra	3	B	Getzov, Vardi and Marom, forthcoming
Tel Te’o	1	B	Rosenberg 2009
Tel Ẓaf	1	B	Bekker 2020
Tel Qiri	5	C	Rosenberg 2009
Ha-Bashan Street	1	C	Kaplan 1958
Jericho	1	?	Rosenberg 2009
Moẓa	At least 2	?	Milevski (personal observation)

[i] A = larger than 15 ha, B = between 2–8 ha, C = smaller than 2 ha.

after (Paz 2011) the Early Chalcolithic period for various purposes. Ethnographic studies show how unworked stones were hurled, with or without slings, for different purposes (e.g., Isaac 1987). Yet, the novel effort of formalizing slingstones to increase accuracy, range and speed (Korfmann 1973:38–39; Skov 2013), which involved considerable labor investment, indicates the important role of these implements and a certain level of organization in their production. York and York (2011:147) noted that the biconical design (subsequently used by the Greeks and the Romans) has been accepted as optimum for sling projectiles. Skov (2013:100) suggested that the use of slings in warfare led to this design evolution in every case that biconical sling projectiles occur. The overall uniformity of weight, form and size of slingstones in the discussed assemblage suggests that the slingstones were systematically manufactured for use by standard users (warriors), equipped with standard slings, allowing them effective training. The large assemblage of standardized slingstones may suggest that the slingstones were not produced by their users but manufactured in a more organized process, possibly as a community effort.

Standardization is also reflected in their regional similarities (Table 10), suggesting the possibility that slingstones were not produced at site level but manufactured elsewhere, possibly in central workshops and distributed to different sites as commodities. Nevertheless, the slight preference of basalt as raw material at ‘En Ẓippori reflects the geographic difference between the two sites discussed here, supporting a scenario of local production.

Finally, the clustering of slingstones found at ‘En Ẓippori, ‘En Esur, ‘Ein el-Jarba and Abu Zureiq may be directly related to the way that they were stored and used, suggesting group activity. A slingstone cluster may represent ammunition of a barrage to be launched by a group of slingers. In warfare, this may cause the breakage of formation in the opposite rank.

Table 10. Average Measurements of Slingstones in Different Assemblages

Site	No.	Length (mm)	Width (mm)	Weight (g)	Source
Multiple Sites	366	54	31	69	Rosenberg 2009
Ḥorbat ‘Uẓa	3	56 (one of three items)	28 (one of three items)		Getzov 2009
Ard el-Samra	3	57	35	62	Getzov et al., in press
Abu Zureiq	9	50	29	47	Garfinkel and Matskevich 2002
‘Ein el-Jarba	17	55 (range midpoint)			Kaplan 1969
Naḥal Zehora II	21	52 (range midpoint)			Gopher 2012
‘En Esur	12	50	30	55	Yannai 2016
‘En Esur	237	52	31	56	This study
‘En Ẓippori	187	53	32	64	This study

Conclusions

Formalized biconical slingstones first appeared in the Southern Levant with the onset of EC I (c. 5800 cal BCE), in the Wadi Rabah culture. Slingstones were abundant in excavations of large EC II settlements of the Mediterranean zones and abruptly disappeared from assemblages at the end of this period (c. 4800 cal BCE). The biconical slingstones, systematically produced and standardized, tend to be found in clusters. Many feature very smooth surfaces and are characterized by a high level of symmetry. The average metric attributes of slingstones assemblages recovered from different excavations narrowly range between 50–57 mm in length, 29–35 mm in width and 47–69 g in weight. The proliferation, formalization, standardization and labor-intensive manufacturing, all point toward an organized production of weapons, interpreted as an escalation in the preparations for war, attesting to the probable existence of local power centers in the region. Subsequent to the Early Chalcolithic period, slings remained part of the arsenal of warfare weapons in the Levant until recent history, although formalized slingstones largely disappeared from the archaeological record for almost five millennia.

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