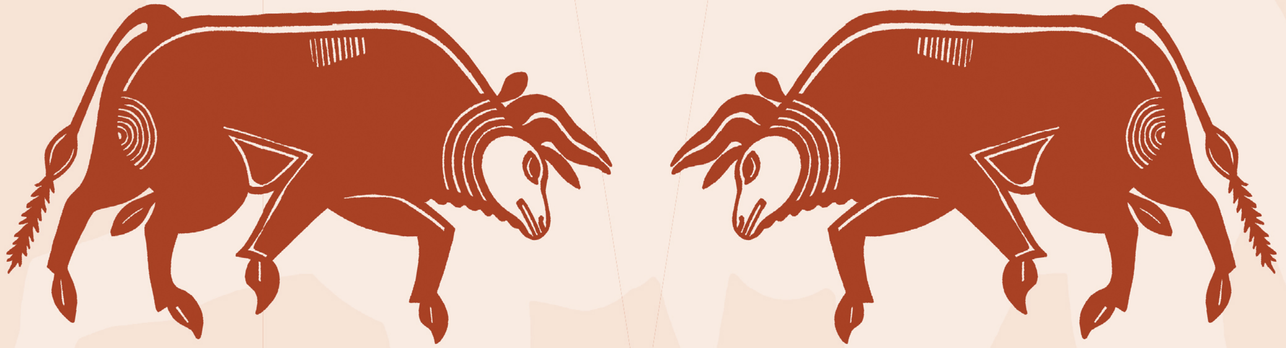
Archaeobiology 3

ARCHAEOZOOLOGY OF SOUTHWEST ASIA AND ADJACENT AREAS

XIII



Proceedings of the Thirteenth International Symposium,
University of Cyprus, Nicosia, Cyprus, June 7–10, 2017

edited by
Julie Daujat, Angelos Hadjikoumis, Rémi Berthon, Jwana Chahoud,
Vasiliki Kassianidou, and Jean-Denis Vigne

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Series Editors

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Group photo of the 13th ASWA[AA] meeting June 8th 2017
in the hall of the University-House Anastasios G. Leventis of the University of Cyprus.

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FOREWORD

The 13th ASWA conference was hosted by the University of Cyprus, one of the youngest of Europe's universities. In 2019, it was only thirty years since its foundation. Nevertheless, this is a thriving academic institution, which currently consists of eight faculties, twenty-two departments, and eleven research units.

In 1991, and just two years after the university's foundation, the Archaeological Research Unit (ARU) was founded by decree from the Government of the Republic of Cyprus, following the issuance of the dependent legislation by the House of Representatives. The decision to establish the ARU was based on the recommendation of the Interim Steering Committee of the University of Cyprus, which stated the following:

1. Cyprus is offered for primary research in the field of archaeology thanks to its distinctive cultural signature and history, as well as due to the fact that Cypriot archaeology and archaeological research on the island already has a distinguished tradition and international reputation;

2. The subsequent international recognition of the importance of archaeological research in Cyprus should comprise one of the first incentives for choosing the University of Cyprus as a center for postgraduate studies, and will pave the way for the exchange of students and academics between the University of Cyprus and academic institutions overseas.

The faculty members of the ARU, who are also part of the Department of History and Archaeology academic staff, have contributed immensely over the past 28 years to the achievement of the aforementioned objectives for the study and promotion of Cypriot cultural heritage through their research, their teaching, and the practical training they have been providing to students at undergraduate and postgraduate levels. The active study of other regions of the Mediterranean world have not been overlooked either, as members of the ARU academic staff have been carrying out excavations and research projects in Greece, Turkey, and France.

The members of the ARU are actively carrying out research in Pre- and Protohistoric Archaeology, Classical and Byzantine Archaeology but also Archaeometry and Environmental Archaeology, Maritime Archaeology, and Western Art. In the course of the past 28 years, the ARU has laid very stable foundations in all aforementioned specialisations of the archaeological discipline, none of which existed at academic level in Cyprus before the unit's establishment. Through their teaching at undergraduate and postgraduate levels, all members of the ARU academic staff have been contributing to the formation of a new generation of Cypriot archaeologists, equipped with all the necessary knowledge and practical experience needed to excel in this scientific field.

Over the years, the ARU has been very active in organizing international conferences and workshops. The ARU has organized over 50 international conferences, while members of the academic staff have published the proceedings of over 20 scientific meetings held at the ARU.

Thus, when Jean-Denis Vigne came to my office several years ago with the suggestion to co-organize the 13th Archaeozoology of Southwest Asia and Adjacent Areas conference I gladly accepted. The meeting in Nicosia brought together colleagues from all over the world and offered a venue where new results from the field or the laboratory could be presented and discussed. The publication of the conference proceedings enables colleagues who were unable to attend the conference to read about the latest developments in the archaeozoology of this culturally important region.

I would like to close by thanking all the members of the 13th ASWA organizing committee for all the work they have put into bringing so many scholars to Cyprus, many of them for the first time. I would also like to thank the co-editors of this volume for all the work they have put into the publication of the proceedings.

Professor Vasiliki Kassianidou
Director of the Archaeological Research Unit,
University of Cyprus
Nicosia, August 2019

EDITORS' PREFACE

Due to their location at the meeting point of the three Old World's continents—Africa, Asia, and Europe—Southwest Asia and its adjacent areas played a pivotal role in the history of humanity. They received successive waves of our species—*Homo sapiens*—out of Africa. Different processes in several areas of this large region brought about the transition to the Neolithic, and later on the urban revolution, the emergence of empires bringing with them important subsequent religious, cultural, social, and political consequences. Southwest Asia also played a major role in the interactions between East (Asia) and West (Europe) during the last two millennia. The unique importance of Southwest Asia in the history of humanity is strengthened by the, also related to its location, fact that this area is a hotspot of biodiversity, especially in mammals, which were—as everywhere in the world—tightly associated to the history of civilizations in a diversity of roles: game, providers of meat and milk, traded raw material, symbol of prestige and wealth, pets, etc.

Everywhere in the world, the biological and cultural interactions between humans and animals often remain under-evaluated in their heuristic value for understanding complex social and biological interactions and trajectories. This is why, almost half a century ago, archaeologists who were carrying out research and reflecting on such themes founded a very active nonprofit world organization named the International Council for Archaeozoology (ICAZ). This is also why the ICAZ working group "Archaeozoology of Southwest Asia and Adjacent Areas" (ASWA[AA]) was one of the first ones created within ICAZ, constituting one of the largest and most active of ICAZ's working groups.

The ASWA[AA] was formed during the 1990 ICAZ International Conference in Washington, D.C. Its purpose is to promote communication between researchers working on archaeological faunal remains from sites in western Asia and adjacent areas (e.g., Northeast Africa, Eastern Europe, Central Asia, and South Asia). It carries out its mandate mainly through the sponsoring of biennial international conferences. Since 1998, these meetings have alternated in being hosted in Europe or in Southwest Asia: Paris (1998), Amman (2000), London (2002), Ankara (2004), Lyon (2006), Al Ain (2008), Brussels (2011), Haifa (2013), Groningen (2015).

Ongoing armed conflicts and political tensions in several countries of Southwest Asia made it difficult to locate a safe and convenient place that would enable the organizing the 13th ASWA[AA] meeting in within that region. Although Cyprus is currently a member of the European Union, in (pre-)history Cyprus was embedded in the eastern Mediterranean "world." Because of its location, Cyprus was indeed at the confluence of African, Levantine, Anatolian, and Greek cultural streams and, as is common for islands, recombined them in different but always original ways all along its history. Archaeozoology recently provided one of the most convincing illustrations of the tight connection between Cyprus and Southwest Asia, demonstrating that the earliest domesticated mammals, especially cats, pigs, cattle, sheep, and goats, were introduced to the island very shortly after their first incipient domestication on the near continent, that is, during the ninth millennium BC. For all these reasons, Cyprus represented an ideal place to host the 13th ASWA[AA] conference.

Despite the illegal military occupation of part of its territory by a foreign country, the option of hosting the meeting in Cyprus was enthusiastically embraced by all members of the working group, especially because it is open to all nationalities and maintains good diplomatic relationships with a large majority of countries in Southwest Asia. These facts contributed towards the 13th ASWA[AA] meeting in Cyprus (June 7–9, 2017) becoming one of the best-attended ASWA[AA] meetings. It brought together 80 scientists coming from 25 different countries: from Southwest Asia (6 countries), Europe (14 countries), North America (2 countries), and Japan.

They presented their results in 36 oral and 32 poster presentations. They debated the long-term interactions between humans and biodiversity, about the beginning of animal domestication and husbandry, the strategies of animal exploitation from the Paleolithic to modern times, and the symbolic and funeral use of animals through time. They also greatly enjoyed the numerous social events organized, including a fantastic Cypriot mezze dinner, enhanced by a local folk-music band, and a nice excursion to the archaeological sites of Amathous, Kourion, and Khirokitia, and to the museums of Nicosia and Larnaca, which provided ample opportunities for scientific exchanges in a friendly atmosphere.

The hosting of the conference at the new campus of the University of Cyprus was another major reason to the meeting's success. This campus was a convenient and pleasant venue for such a conference, and the strong support of the University of Cyprus, as well as its valuable experience for the organization of such meetings were deeply appreciated by both the scientific organizers and the delegates. Several other partners contributed to the organization: the French archaeological mission "Neolithisation—Klimonas," which is itself strongly supported by the French School at Athens, the Cyprus Department of Antiquities, the French Institute of Cyprus, the French National Center for Scientific Research (Centre National de la Recherche Scientifique [CNRS]), and the French National Museum of Natural History (Muséum national d'Histoire naturelle [MNHN]).

The present volume brings together the texts of 18 of the 68 presentations of the meeting in Nicosia. The editorial board collected the papers and organized their review and editing. We are very grateful to Sarah Kansa (and Open Context), Justin Lev Tov, and Lockwood Press for their constant support in bringing this volume to fruition.

Julie Daujat
Angelos Hadjikoumis
Rémi Berthon, Jwana Chahoud
Vasiliki Kassianidou
Jean-Denis Vigne

1.4 | The Butchered Faunal Remains from Nahal Tillah, an Early Bronze Age I Egypto-Levantine Settlement in the Southern Levant

Jeremy A. Beller,[*] Haskel J. Greenfield,[†] and Thomas E. Levy[‡]

Abstract

The examination of butchering technology and patterns from archaeological sites provides insight into various socio-economic aspects of past societies, including diet, technology, and cultural identity. This study presents the analysis of 183 butchered animal bones recovered from the Early Bronze Age I site of Nahal Tillah, located on the northern fringe of the Negev Desert, Israel, in an effort to elucidate some of this information. The butchered assemblage is comprised primarily of domestic taxa, of varying ages, which exhibit a range of butchery-mark types that are the result of the full suite of butchering-related activities—from slaughter to toolmaking. As such, this report contributes to understanding the butchering practices and subsistence economy of early sedentary societies of the southern Levant.

Keywords

Early Bronze Age, butchering patterns, southern Levant, butchery marks, Nahal Tillah, filleting, disarticulation, toolmaking, ovicaprines, slice

Introduction

The recovery of faunal remains from archaeological contexts permits inquiry into the associated butchering patterns and technology. This inquiry has provided information on aspects of carcass processing, diet, ethnic identity, and technology of past communities (Binford 1981; Greenfield 2002; Lyman 1987a; Potts and Shipman 1981). However, such information is lacking from the Early Bronze Age (hereafter EB) I, 3400–3100 BC, of the southern Levant. During this period, agriculturalists and nomads of the southern Levant subsisted within the reaches of interaction with Predynastic Egypt (5300–3000 BC; Levy et al. 1995). As such, the butchering assemblages have the potential to offer insight into the nature of subsistence in early sedentary societies.

This report presents and discusses the faunal remains that exhibit evidence of butchering, comprised of 183 bones, from the EB I site of Nahal Tillah (Israel). In this manner, taphonomic aspects, age profiles, and the types and distribution of butchering are explored. The results indicate that the residents of EB I Nahal Tillah consumed both domestic and wild animals, and preferentially culled animals once they reached subadult/adult age.

Background on Nahal Tillah

The site of Nahal Tillah, near Kibbutz Lahav, is located on the border between the northern Negev Desert and the southern *Shephelah*—foothills in Hebrew—regions in modern Israel (Figure 1.4.1). The *nahal*—stream in Hebrew—is a small secondary seasonal drainage system that runs along the base of the terrace on which the nearby site of Tell Halif—Tell Khuweilifeh in Arabic—sits and ultimately empties into the larger Nahal Gerar before proceeding westward to the Mediterranean Sea (Levy et al. 2001). The *nahal* and surrounding environs served

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as a strategic intersection for north–south and east–west movement and exchange networks across the region during the EB (Levy et al. 1995).

During the EB I, a gradual Egyptian presence increased in the southern Levant, possibly through the involvement in various exchange networks—for example copper, olive oil, wine—(Genz 2003; Ketelaer and Hauptmann 2016; Levy et al. 2002). As a result, the residents of the Nahal Tillah region experienced socioeconomic interaction with Egypt (Levy et al. 1995, 2001). The focus of the Nahal Tillah Regional Archaeology Project (1994–1996), directed by Thomas Levy of the University of California–San Diego and late David Alon of the Israel Antiquities Authority, was to investigate the end of the Chalcolithic period and the role of early Egyptian civilization in the rise of urban communities in the southern Levant through the examination of a series of EB I sites situated on the Halif Terrace (Levy 2013; Levy et al. 2001). The Halif Terrace extends over an area of around 13 ha on the eastern side of Tel Halif (Levy et al. 1995). Here the excavations focused on a broad horizontal sounding—ca. 800 m^2—on the Halif Terrace and several nearby cave sites (Figure 1.4.2; Levy et al. 1997). These excavations uncovered a variety of remains, including public and residential architecture, grain silos, local and Egyptian pottery (Kansa and Levy 2002), and lithics from the EB I A—currently thought to be ca. 3600–3400, previously 3500–3300 BC, and from both early and late phases of the EB I B—currently thought to be ca. 3400–3200, previously 3300–3000 BC (Regev et al. 2012). It is from these contexts that the zooarchaeological remains for this study originate.

The following study focuses on the butchering patterns associated with a sample of the faunal assemblage from Nahal Tillah. An initial report on the faunal material was composed by Caroline Grigson and described 1,125 specimens (Levy et al. 1997). Later collective reports on all seasons reported a total of 37,000 specimens of which 7,523 could be identified to taxon and element (Kansa et al. 2006; Kansa in press). The assemblage is housed in the archaeozoological storage unit of the National Natural History Collections (Institute of Earth Sciences, Hebrew University, Givat Ram campus, Jerusalem) and was made available for this analysis.

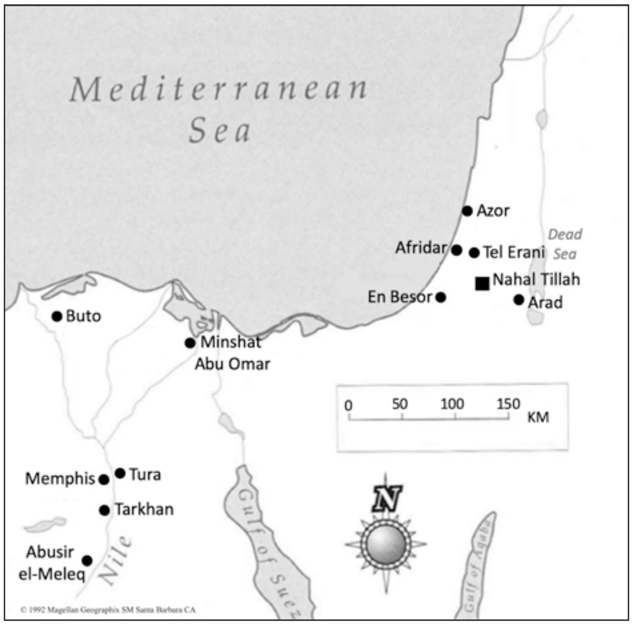

Figure 1.4.1. Map of Early Bronze Age southern Levant and Egypt with location of Nahal Tillah and Halif Terrace. (Modified after Levy et al. 1995:30.)

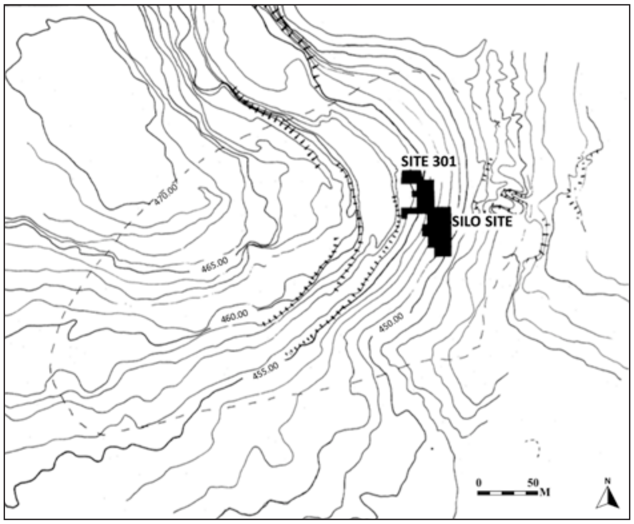

Figure 1.4.2. Topographic map of Halif Terrace and excavation areas. (Modified after Levy et al. 1997:5.)

A total of 183 bones exhibit evidence of butchering. Although this number is small in relation to the larger faunal assemblage, it is similar to that found in other nonmarine or waterlogged assemblages of contemporary and earlier periods (Allentuck and Greenfield 2010; Greenfield and Brown 2016; Greenfield and Horwitz 2012). These butchered bones can be divided among three successive time periods at the site (Table 1.4.1). The number of butchered bones per period mirrors that of the overall total of bones. In this respect, most bones (NISP=4,050) originate from EB I B–late levels overall (Kansa in press), as

Table 1.4.1. Distribution of butchered bones and butchering incidences by period. NISP = Number of Identified Specimens; NBI = Number of Butchery Incidences.

	NISP #	NISP %	NBI #	NBI %
EB I A	7	3.8%	10	3.0%
EB I B–early	11	6.0%	15	4.5%
EB I B–late	149	81.4%	287	85.4%
EB I, indeterminate	3	1.6%	4	1.2%
Topsoil	4	2.2%	7	2.1%
Unknown	9	4.9%	13	3.9%
TOTAL	**183**	**100.0%**	**336**	**100.0%**

do the vast majority of butchered bones (NISP=149), which account for 81.4% of the butchered assemblage. By total of bones, the EB I A and EB I B–early are similar in count, with a NISP of 471 and 415 respectively (Kansa in press). However, the number of butchered bones slightly differs, as more occur during the EB I B–early (NISP=11, 6.0% of the butchered assemblage) than the EB I A (NISP=7, 3.8% of the butchered assemblage). Several butchered bones originate from the EB I indeterminate (1.6%) and topsoil (2.2%), while others could not be assigned to a specific period (4.9%). This study largely focuses on interpretations from the EB I–late, as most of the butchered bones originate from it, but considers other subperiods as well in order to establish the nature of EB I butchering at the site. A parallel report on the butchering technology associated with the butchered assemblage from Nahal Tillah can be found in Greenfield et al. (2018).

Methods

This present study involved two components: (1) the identification of butchered bones and (2) the documentation of butchery marks and patterns. First, the bones exhibiting potential butchering marks were exported to the Near Eastern and Biblical Archaeological Laboratory (NEBAL) at the University of Manitoba. Using the comparative zooarchaeological collection, the butchered bones were identified to their element and taxon. Second, butchery and other damage were examined with a combination of the naked eye, hand-held illuminated magnifying glass, and binocular microscope (25×) observations. Several specimens were tested by submitting silicone molds for analysis within a scanning electron microscope to ensure their identification as butchering marks and to determine the raw material of the butchering implement used (Greenfield et al. 2018). For each bone, the type of butchery mark, number of marks, location, and activity represented were noted. Based on previous descriptions (Fisher 1995; Greenfield 1999, 2000; Lyman 1987b, 1994; Olsen 1988; Walker 1978; Walker and Long 1977), it is possible to discern several types of butchering damage in the Nahal Tillah assemblage: bashes, chops, gouges, nicks, notches, sawing, scrapes, and slices.

(1) Bashes are caused by heavy blows from a blunt object, such as a hammerstone, in an attempt to break open the bone. They manifest as irregularly shaped grooves with no evident striations.
(2) Chops are the result of heavy impact to a bone, typically with a sharper implement than those used for bashes, such as an axe, with the intention to dismember or break open a bone. They appear as short broad linear grooves with a V-shaped cross section. The edges are usually straight with the edge opposite the direction from which the blow was struck having a higher profile than the other. A relatively straight edge remains with no striations evident within the groove. The V-shaped cross-section shows micro-depression fractures oriented downward into the groove.
(3) Gouges result from a direct puncture—minute angular cavity—into the bone surface by a sharp implement. These are often incidental, as the intention was to separate tougher portions of flesh.
(4) Nicks are caused by light incidental contact between a sharp implement and the bone. As such, these are represented by extremely short grooves. These are isolated occurrences and typically shallow in nature, often going unnoticed.
(5) Notches are similar to nicks, but leave a broader groove, as more force is applied.
(6) Sawing results from repeated back-and-forth slicing action by a sharp implement. It leaves behind multiple striations in a single series within a wide groove. The groove also exhibits a V-shaped cross section.
(7) Scrapes result from the surficial removal of

flesh along the bone. They appear as a series of shallow parallel striations, typically elongated and orientated with the longitudinal axis of the bone.

(8) Slices result from the removal or cutting through soft tissues—e.g., muscles—using a sharp implement. A slice appears as a single elongated, relatively narrow, linear striation. Although the shapes seen in cross section exhibit some variation, they usually are V-shaped with flat regular sides and fine parallel striations oriented with the long axis of the main groove.

The data are reported by the Number of Identified Specimens (NISP) and the Number of Butchery Incidences (NBI). The NISP only counts a single specimen once. The NBI reflects the number of times that one type of butchering activity occurred on the same bone fragment. For instance, if there are separate butchering grooves on two different sides of the bone, then the NISP would be one, but the NBI would be two. This allows a more suitable analysis of butchering patterns and avoids double counting of elements and taxa (Greenfield and Brown 2016; Greenfield et al. 2016).

Assemblage Description

Taphonomy

An evaluation of the taphonomy of the assemblage is essential for understanding what might be missing or biased in assemblages (Lyman 1987b, 1994). Several variables are quantified in this respect (Greenfield 1986), as taphonomic and other relevant zooarchaeological data are presented.

Weathering. Overall, the butchered assemblage is in relatively good condition (Table 1.4.2). The majority is lightly weathered (79.7%). In contrast, medium (9.9%) and heavy (0.3%) weathering occur in much lower proportions. These patterns attest to the relatively high level of preservation and suggest that the bones were quickly discarded after meat consumption or use.

Fragmentation. Fragment size is often an indication of an assemblage's quality (Table 1.4.3). The butchering assemblage is heavily fragmented, as most (71.1%) bones represented by an estimated <25% of the original element. In addition, more than half (54.7%) of the bones represent <10% of the original element. It should be noted that this degree of fragmentation complicates taxonomic identification and can skew any kind of taxonomic quantification. The only complete bones (NISP=4) are two astragali, a cuboid, and a mandible. These compact elements are more resistant to fragmentation than most other elements in the skeleton.

Table 1.4.2. Weathering of butchered assemblage by period (N = 183).

	WEATHERING INTENSITY				
	Heavy	**Medium**	**Light**	**None**	**TOTAL**
EB I, indeterminate	0.0%	25.0%	75.0%	0.0%	100.0%
EB I A	0.0%	10.0%	90.0%	0.0%	100.0%
EB I B–early	0.0%	28.6%	64.3%	7.1%	100.0%
EB I B–late	0.3%	8.7%	79.4%	11.5%	100.0%
Topsoil	0.0%	14.3%	85.7%	0.0%	100.0%
Unknown	0.0%	7.7%	92.3%	0.0%	100.0%
TOTAL	**0.3%**	**9.9%**	**79.7%**	**10.1%**	**100.0%**

Heat Treatment. All bones were evaluated for thermal alteration using traditional zooarchaeological techniques based on color and texture (Greenfield and Beattie 2017; Shipman et al. 1984). Just over half (NISP = 95, 51.9%) of the butchered assemblage received some form of heat treatment (Table 1.4.4). Such alterations are a result of boiling (33.3%) and burning (18.6%). Burnt bones occur in the EB I indeterminate (33.3%), EB I B–late (18.1%), and EB I A (14.3%), but do not occur in the EB I B–early. Boiled bones are present in each period with the EB I B–late (35.6%) containing the highest proportion, followed by EB I indeterminate (33.3%), EB I B–early (18.2%), and EB I A (14.3%).

Gnaw Marks. Very few bones (4.4%) in the butchering assemblage exhibited any evidence of gnaw marks. This extremely low proportion demonstrates that canids and rodents were not a significant taphonomic factor affecting the visibility of butchery marks and condition of the assemblage.

Table 1.4.3. Condition and fragmentation of butchered assemblage by period (N = 183).

	ESTIMATED PERCENTAGE OF ELEMENT REMAINING								
	1%	**5%**	**10%**	**15–25%**	**30–50%**	**70–95%**	**100%**	**Unknown**	**TOTAL**
EB I A	0.0%	71.4%	14.3%	14.3%	0.0%	0.0%	0.0%	0.0%	100.0%
EB I B–early	0.0%	18.2%	45.4%	9.1%	18.2%	0.0%	0.0%	9.1%	100.0%
EB I B–late	1.3%	32.2%	17.4%	18.2%	13.5%	6.7%	2.6%	8.1%	100.0%
EB I, indeterminate	0.0%	33.3%	33.3%	0.0%	0.0%	0.0%	0.0%	33.3%	100.0%
Topsoil	0.0%	25.0%	25.0%	0.0%	25.0%	0.0%	0.0%	25.0%	100.0%
Unknown	0.0%	77.8%	0.0%	11.1%	0.0%	11.1%	0.0%	0.0%	100.0%
TOTAL	**1.0%**	**35.0%**	**18.6%**	**16.4%**	**12.6%**	**6.0%**	**2.2%**	**8.2%**	**100.0%**

Table 1.4.4. Heat treatment of butchered assemblage by period (N = 183).

	FORM OF HEAT TREATMENT							
	Boil		**Burn**		**None**		**TOTAL**	
	NISP #	**NISP %**	**NISP #**	**NISP %**	**NISP #**	**NISP %**	**NISP #**	**NISP %**
EB I A	1	14.3%	1	14.3%	5	71.4%	7	100.0%
EB I B–early	2	18.2%	0	0.0%	9	81.8%	11	100.0%
EB I B–late	53	35.6%	27	18.1%	69	46.3%	149	100.0%
EB I, indeterminate	1	33.3%	1	33.3%	1	33.3%	3	100.0%
Topsoil	2	50.0%	2	50.0%	0	0.0%	4	100.0%
Unknown	2	22.2%	3	33.3%	4	44.4%	9	100.0%
TOTAL	**61**	**33.3%**	**34**	**18.6%**	**88**	**48.1%**	**183**	**100.0%**

Worked Bone. As a strong, but elastic material, bone can be modified to serve as a variety of tool forms (Maeir et al. 2009). Repeated interaction between the bone and another material—for example, palm of the hand, polishing stone—can result in smoothing of the bone surface, loss of surface detail, and creation of bone surface polish (Shipman and Rose 1988). Surface polish is scaled by the intensity of light reflected off the bone. As such, it is a common taphonomic variable with the capacity to reduce the visibility or completely erase shallow butchery marks.

Overall, a very high proportion (73.2%) of the bones with butchery marks exhibit surface polish. This modification was ranked according to intensity. Light polish (36.6%) was the most common, followed by medium (25.1%), and high (11.5%). These data indicate that a high proportion of bones with butchery marks were modified for use as tools.

Six identifiable tools were discovered among the butchering assemblage, as shovels (NISP = 3), points (NISP = 2), and what is likely a handle (NISP = 1). It should be noted that most of the polished long bones may also represent handles, but they are too fragmented to confirm with certainty. In addition, two complete astragali were discovered with light-medium polish, which were possibly used as game pieces (Gilmour 1997) or tokens (Sasson 2007). These bone tools and game pieces all originate from the EB I B–late assemblage.

Table 1.4.5. Taxonomic representation within butchered assemblage by period (N = 183).

	EBI, indeterminate	**EB I A**	**EB I B –early**	**EB I B –late**	**Topsoil**	**Unknown**	**Grand Total**
Bos taurus		2		20		1	23
Canis familiaris				3			3
Capra hircus	1	2		15		1	19
Cervidae–medium				1			1
Equus asinus			2	6			8
Equus sp.				1			1
Gazella gazella				4			4
Leporidae				1			1
Mammal–large				1			1
Mammal–medium	2	1	2	30	3	2	40
Ovis aries			1	7			8
Ovis/Capra		2	6	59	1	4	72
Sus domesticus				1			1
Unknown						1	1
Grand Total	**3**	**7**	**11**	**149**	**4**	**9**	**183**

Taxonomic Representation

The taxa present in the butchered assemblage are almost entirely domestic species (N = 177, 96.7% of NISP, Table 1.4.5). The most common taxa are *Ovis/Capra* (N = 72, 39.3%), *Capra hircus* (N = 19, 10.4%), and *Bos taurus* (N = 23, 12.6%). Other present domestic taxa include *Ovis aries* (N = 8, 4.4%), *Equus asinus* (N = 8, 4.9%), *Canis familiaris* (N = 3, 1.6%), and *Sus domesticus* (N = 1, 0.6%). The few wild taxa are represented by *Gazella gazella* (N = 4, 2.2%), Cervidae (N = 1, 0.5%), and Leporidae (N = 1, 0.5%).

The EB I B–late contains both domestic and wild taxa. In fact, the entire range of species is present during this period, including dog, pig, and donkey in their previously stated small proportions. Additionally, *Ovis/Capra* (altogether 54.1%, n = 99) and medium mammals (N = 40, 21.8%) dominate the assemblage with *Bos taurus* (N = 23, 12.5%) as next highest. A similar pattern of domestic taxa frequency is seen among the EB I indeterminate, EB I A, and EB I B–early where goats, sheep, and medium mammals—likely *Ovis/Capra*—are prevalent.

It should be noted that if the vast majority of medium mammals are considered to be *Ovis/Capra*, then the total frequencies of sheep and goats combined throughout the three periods become EB I A (71.4%), EB I B–early (81.8%), and EB I B–late (60.7%). These frequencies are fairly similar to those observed in the overall assemblage—that is, EB I A = 66.2%, EB I–early = 75.4%, and EB I B–late = 74.6% (Kansa in press). Similar frequencies between the EB I B–late butchered assemblage and the larger EB I B–late assemblage are also apparent with the following species—frequencies listed respectively (Kansa in press): *Gazella gazella* (2.7%, 3.6%), *Bos taurus* (13.4%, 11.9%), *Canis familiaris* (2.0%, 2.2%), *Equus asinus* (4.0%, 4.1%), and *Sus* (0.7%, 1.4%). Consequently, the taxonomic frequencies in the butchered assemblage and the larger faunal assemblage align well.

Element Representation

Several observations can be made regarding the proportions of elements in the butchered assemblage (Appendix 1.4.1). Overall, the NISP distribution by body section is as follows:

(1) Trunk: hyoid, axis, vertebrae, scapulae, ribs, and innominate = 58
(2) Forelimb: humeri, radii, ulnae, and metacarpals = 46
(3) Hindlimb: femora, tibiae, cuboids, calcanei, metatarsals, and astragali = 31
(4) Cranial: cranium and mandibles = 12
(5) Indeterminate fragments: long bones, flat bones, and unknown = 36

More specifically, ribs (NISP = 33) are the most common followed by indeterminate long bones (NISP = 27) and various vertebrae (NISP = 18). Identifiable long bones appear in moderate frequencies, such as humeri (NISP = 17), radii (NISP = 13), femora (NISP = 8), and tibiae (NISP = 8). It should be noted that if these are combined with the indeterminate long bones, then long bones—in general—are the most abundant category (NISP = 73).

In relation to various taxa, several observations can be made regarding the frequency of elements. For example, the majority of ribs (73%) and various long bone elements (84%) originate from the collective group of medium mammals, *Ovis aries* and *Capra hircus*. Even though most of the ribs and long-bone fragments cannot be directly attributed to a specific taxon, for example sheep versus goat, it is clear that such animals typically constitute the bulk of meat consumed at the site and are likely the dominant herding livestock. Scapulae also appear in moderate frequencies (NISP = 11) and most (55%) originate from *Bos taurus*. Similarly, smaller elements, for example, astragali, cuboids, and calcanei, mainly originate from larger mammals, such as *Bos taurus* and *Equus asinus*, but still appear in minute amounts (NISP < 5). Lastly, the portions of cranial bones (NISP = 12) are mostly too fragmented to fully identify. However, based on their thickness and limited morphology, they are likely *Ovis*/*Capra* or medium mammal remains.

Age Profiles

Age distribution of butchered taxa exhibits several distinct patterns that are noted below (Appendix 1.4.2). The overall emphasis in each taxon on subadult/adult specimens is clearly taphonomically induced: older animals are more likely to survive the various attritional forces since their bones are denser and more durable (Binford 1981; Lyman 1994). If we reduce the influence of the indeterminate age classes—such as subadult/adult—and focus instead on the more clearly age-definable specimens—namely, juvenile, subadult, and adult—several interesting patterns begin to emerge that cannot be simply attributed to bone attrition. The age classes are fairly similar among the large mammalian taxa. In both cases, subadults are dominant, while the juvenile and adult frequencies are much smaller. For *Bos taurus*, most specimens are from the subadult/adult (N = 9, 39.1%) and subadult (N = 8, 34.8%) age classes, with far fewer adults (N = 5, 21.7%) and even fewer juveniles (N = 1, 4.3%). For *Equus asinus*, the specimens are subadults (N = 2) and subadult/adult (N = 4), while juveniles and adults are represented by one specimen each. These differences suggest that taphonomy may be the overriding variable in bone distributions.

The age distribution for medium mammals varies depending on whether they are common food animals. For example, dogs are rarely present and are equally divided between juvenile, subadult/adult, and adult. In contrast, the distributions for *Capra hircus* and *Ovis aries* are quite similar. Across both taxa, juveniles are the most common (*Capra* = 6, 31.6%; *Ovis* = 4, 50%). There is a small proportion of subadults among *Capra* (N = 2, 10.5%) and none among *Ovis*, though subadult/adults are present in high proportions (*Capra* = 6, 31.6%; *Ovis* = 2, 25%). The adults are present in roughly equal frequencies for each (*Capra* = 5, 26.3%; *Ovis* = 2, 25%). These frequencies suggest a greater selection for younger animals–juveniles, almost no subadults, and some adults. They are further reminiscent of culling ages for meat-providing taxa. The missing subadults (N = 17, 23.6%) appear among the indeterminate *Ovis*/*Capra*. Also, the younger individuals—fetal (N = 1) and infant (N = 2)—are present among this group, albeit in extremely small proportions. These distributions illustrate the difficulty of identifying age class preference with sheep and goats since so many elements are difficult to assign to a taxon, especially those from young individuals.

Cervidae, Leporidae, *Sus domesticus*, and *Equus* sp.—probably *E. asinus*—specimens are from subadults/adults. Lastly, *Gazella gazella* remains are equally distributed among subadults/adults and adults, while *Canis familiaris* specimens range from juvenile to adult in equal proportions.

Table 1.4.6. Distribution of element–butchery marks by number of butchery incidences.

	TYPE OF BUTCHERY MARKS								
	Bash	**Chop**	**Gouge**	**Nick**	**Notch**	**Saw**	**Scrape**	**Slice**	**TOTAL**
Astragalus								4	4
Axis								2	2
Calcaneus							1	8	9
Cervical vertebra								5	5
Cranium		1						6	7
Cuboid								6	6
Femur							2	26	28
Flat bone							1	11	12
Humerus	2	1		2	1		2	33	41
Hyoid								1	1
Innominate								6	6
Long bone	1						11	36	48
Mandible								7	7
Metacarpal								6	6
Metatarsal	1	1						5	7
Radius			2				9	19	30
Rib		2		2			4	37	45
Scapula							1	21	22
Thoracic vertebra	1							4	5
Tibia		1	1			1	4	18	25
Ulna								3	3
Unknown								2	2
Vertebra								15	15
TOTAL	**5**	**6**	**3**	**4**	**1**	**1**	**35**	**281**	**336**

In small samples sizes, such as at Nahal Tillah, it is important to consider the indeterminate mammal size categories since they often contain the elements and age distributions absent from the more identifiable part of the assemblage. Large mammals are represented by a single subadult/adult specimen, while medium mammals retain a proportion of subadult/adult and subadult, with no adults.

Butchery Marks

Butchery marks are present in a variety of forms and on various locations of the skeletal elements. Additional documentation can be found in Greenfield et al. (2018), as well as in the extensive fauna catalogue that cannot be compressed into this volume (available on request), but portions of it have been summarized in Tables 1.4.6–1.4.7. Several observations can be made regarding the distribution of the 336 butchering incidences within the assemblage.

Slices are by far the most common type of butchery mark (84%). These appear as narrow elongated grooves with a V-shaped cross section (Figures 1.4.3–1.4.4). Slices are found on every type of element in the butchered assemblage, often in higher quantities on long bones, ribs, and vertebrae. They occur in

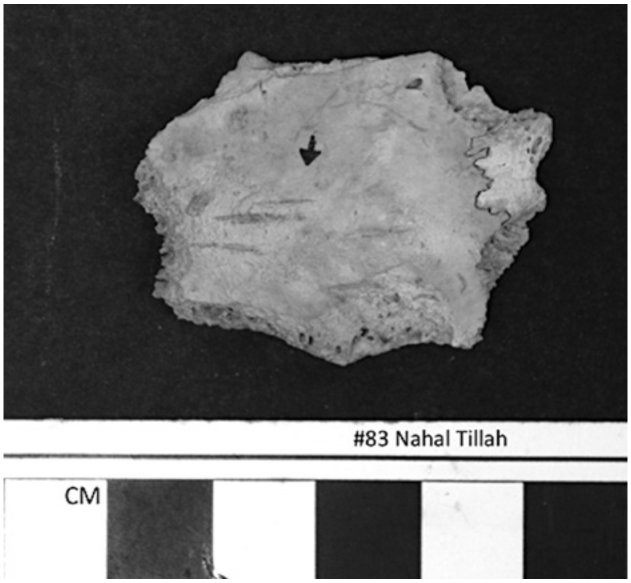

Figure 1.4.3. Slice incidence #83 on *Ovis/Capra* cranial fragment (EB I B–late). (Photograph by H. Greenfield.)

Figure 1.4.4. Slice incidence #273 on *Ovis/Capra* vertebrae (EB I B–late). (Photograph by H. Greenfield.)

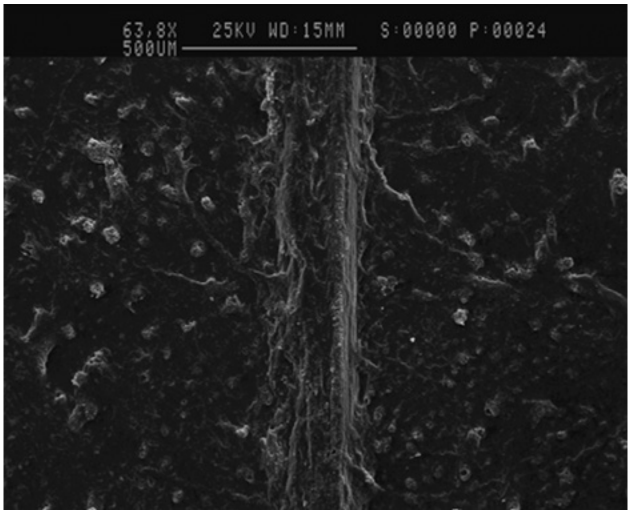

Figure 1.4.5. Scanning electron microscope images of slice marks. Note the asymmetrical nature of the groove, which is indicative of stone. (Photograph by H. Greenfield.)

highest frequencies on the shaft of long bones and across the spinous and transverse processes of vertebrae. Results from the scanning electron microscopy analysis demonstrate that stone was the raw material used to make the butchering tools that caused the slice marks (Figure 1.4.5; Greenfield 2006; Greenfield et al. 2018).

The second most common type of butchery mark is scrapes (10%). These often accompany slices and appear in highest quantities on long bone shafts. The heavy impacts of chops and bashes are also evident. For the former, they are present on a cranium, the shafts of a humerus, metatarsus, tibia, and on two ribs. Bashes occur on the shafts of two humeri, a metatarsus, and an indeterminate long bone, as well as on a thoracic vertebra.

A gouge appears on the shaft of a tibia, while two others are located on the proximal half of two separate radii. Two nicks are found on a distal rib and the other two on two separate humeri. Lastly, a single saw mark is located on a tibia and a notch on a humerus.

Butchering Patterns

Butchering activities can be present in a variety of forms. Traditionally, they are interpreted from the type of butchery mark (see Methods) and its location on the body (Binford 1981). The most common activities are listed below.

(1) Slaughter: incision, strike, or blow intended to kill animal, typically around the neck or head
(2) Skinning: removal of hides and skin, mainly on distal extremities or cranium.
(3) Dismemberment: division of body with heavy implements, typically a separation of a limb from the trunk.
(4) Disarticulation: calculated division of one bone from another, typically division of the limb into smaller units.
(5) Filleting: removal of meat around and along bones.
(6) Marrow extraction: destruction of the long bone to retrieve the marrow from the shaft.

(7) Toolmaking: further removal of residual flesh to completely expose the bone (such marks are indistinguishable from routine filleting, and the two activities are grouped together for bones that were tools).

The butchering activities associated with the butchered faunal assemblage appear in a variety of forms (Figure 1.4.6), but some are more prevalent than others. For example, filleting (particularly when associated with defleshing for tool production; both together represent NBI = 65%) is the most common occurrence, followed by disarticulation and dismemberment. All other forms of butchering appear in extremely low proportions. These patterns are interpreted from the extensive data summarized in Tables 1.4.7–1.4.8. These data are used to augment the discussions in the following sections with regard to the distribution of butchery marks and their implications for butchering activities associated with each taxon. The taxa are described in alphabetical order, with ovicaprines described separately and together as a whole.

Bos taurus

Skinning and removal of the hides occurs in the form of butchering incidences located on cranium fragments. Disarticulation is found as a series of slice incidences and a chop incidence on several limb bones—metatarsalus, cuboids, calcaneus, and astragalus—that were performed in attempts to divide up the lower limb. Further indications of disarticulation are discovered on several scapulae, where attempts to separate the scapulae from the trunk—ribs—were made. Extensive filleting and toolmaking activities, in the form of slice and scrape incidences, occur on the midshafts of several humeri, ribs, and a scapula. Two scapulae were fashioned into shovels. Isolated filleting is also found on the midshafts of other elements—humerus, radius, rib, scapula—and on a vertebra. The majority of bovine bone tools were either boiled or burnt.

Canis familiaris

Dismemberment of the forelimb occurs as two slice incidences and a chop on the proximal half of the humerus. Filleting activity is present in the form of a nick on a humerus and three slice incidences on a metacarpus.

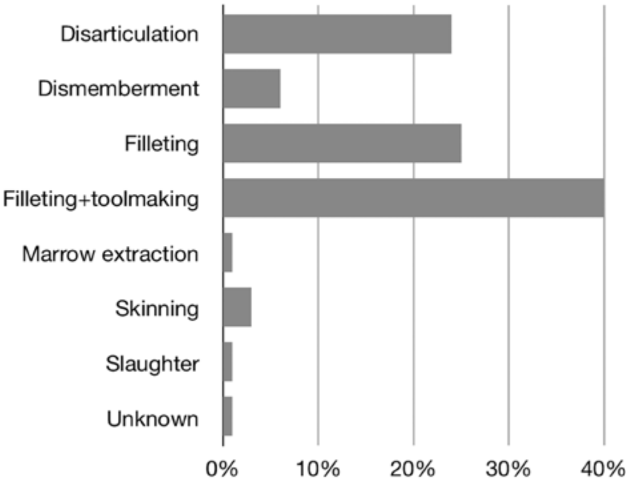

Figure 1.4.6. Proportions of butchery activities.

Cervidae

Disarticulation, specifically that of the scapula from trunk, is observed in a slice incidence found on a scapula. The bone was also boiled.

Equus asinus

A slice incidence on the axis is a tentative indication of slaughter, given its position at the forefront of the neck. Similarly, the slice incidence on the hyoid may be due to slaughter or possibly filleting. In the case of the latter activity, the hyoid may be removed for access to the tongue. The slice incidence on the calcaneus is likely the result of disarticulation. Lastly, filleting and toolmaking activity occurs as a series of slice and scrape incidences on the humerus, radius, ribs, and metacarpus.

Gazella gazella

Slice incidences on a left innominate and proximal end of one femur are likely the result of disarticulation of the hindlimb from the trunk. Further evidence of disarticulation of the limbs occurs on two femora, where slice incidences are present on the distal ends of both femora and on an astragalus. Additional slice incidences on the shaft of one femur are indicative of filleting and toolmaking. The astragalus was likely utilized as a game piece or token, as it exhibits considerable polish.

Table 1.4.7. Distribution of taxa–butchering activity by Number of Butchery Incidences.

	BUTCHERING ACTIVITY								
TAXON	**Slaughter**	**Skinning**	**Dismember-ment**	**Disarticu-lation**	**Filleting**	**Filleting and toolmaking**	**Marrow extraction**	**Unknown**	**TOTAL**
Bos taurus		2	4	19	10	10			45
Canis familiaris			3			4			7
Capra hircus	1	1	2	13	5	14	1		37
Cervidae				1					1
Equus asinus	1			2	7	12			22
Gazella gazella			6	5	1	5			17
Leporidae					1				1
Mammal–large						3			3
Mammal–medium		2		3	19	38	1	1	64
Ovis aries		1	2	14					17
Ovis/*Capra*		3	4	25	38	49			119
Sus domesticus					2				2
Unknown								1	1
TOTAL	**2**	**9**	**21**	**82**	**83**	**135**	**2**	**2**	**336**
%	**0.6%**	**2.7%**	**6.3%**	**24.4%**	**24.7%**	**40.2%**	**0.6%**	**0.6%**	**100.0%**

Table 1.4.8. Distribution of butchering activity by butchery mark, first presented by count followed by percentage.

Activity	**Bash**	**Chop**	**Gouge**	**Nick**	**Notch**	**Saw**	**Scrape**	**Slice**	**Grand Total**
Disarticulation	4	3		1		1	1	72	82
Dismemberment		1						20	21
Filleting			2	2			7	72	83
Filleting and toolmaking			1	1	1		27	105	135
Marrow extraction	1	1							2
Skinning		1						8	9
Slaughter								2	2
Unknown								2	2
Grand Total #	**5, 1.5%**	**6, 1.8%**	**3, 0.9%**	**4, 1.2%**	**1, 0.3%**	**1, 0.3%**	**35, 10.4%**	**281, 83.6%**	**336, 100%**

Leporidae

Two slice incidences on a rib fragment possibly represent filleting activity to remove meat. They are located on the lateral face of the rib. The bone was also boiled.

Mammal–large

A long bone fragment exhibits three slice incidences that are likely the result of filleting and toolmaking, as the shaft is moderately polished.

Mammal–medium

The heavy fragmentation of this group of bones impedes the secure identification of butchering activities by taxon. Two slice incidences found on subadult and juvenile cranium bones are likely the result of skinning activity. Disarticulation occurs in the form of several slice incidences located on the medial and cranial face of the scapula. Dismemberment is present a chop on the proximal end of a rib. The tools range in polish intensity from light to high. Most are long bone shafts, but others are points made from flat bones. As such, any bone fragment with incidences associated with filleting also has toolmaking as a secondary activity. This is evident with the large quantity of slice and scrape incidences that occur on various shafts of long bones and ribs, as well as flat bones. Isolated filleting activity is found on a similar distribution of bone elements, though in lower proportions. Finally, the long bone shaft of a juvenile exhibits a bash that is probably the result of marrow extraction as the bash breaks open the bone and exposes the interior cavity. Nearly every bone, especially all the tools, has been boiled or burnt.

Ovicaprines

First, each taxon will be separately described. Then the patterns for all combined ovicaprines will be discussed to illustrate differences between and within the various taxa.

CAPRA HIRCUS. There is a wide range of butchering activities associated with *Capra hircus* remains. Slaughter possibly occurs as a slice incidence upon the axis vertebra, though it is possible that these marks appeared postmortem. The cranium fragment retains a slice incidence that may indicate skinning activity. Disarticulation and filleting are the two major activities. The former is represented by a series of slice incidences, as well as a nick on various limb bones—cuboids, astragalus, metatarsus, and radius—and a mandible. Similarly, filleting, and toolmaking, occurs as multiple slice incidences on several limb bones, two mandibles, and a vertebra. A slight gouge on a humerus is associated with filleting, rather than a failed attempt at marrow extraction as the mark does not fully penetrate through the cortical bone. Lastly, a chop mark on the shaft of a metatarsal bone indicates dismemberment and marrow extraction as it severed the bone, exposing the interior cavity. A tibia, a metatarsus, and three humeri were boiled, while a fourth humerus was burnt.

OVIS ARIES. The juvenile mandible retains a slice incidence that may indicate skinning activity. The slice incidences on the two innominates represent attempts to disarticulate the hindlimb from the trunk. Disarticulation is the predominant activity found on sheep remains. This is evident from the series of slice incidences found on the calcaneus, scapula, metatarsus, and humerus.

COMBINED OVICAPRINES. In this section, the *Ovis aries*, *Capra hircus*, and *Ovis/Capra* data are summarized. In this regard, filleting—combined with toolmaking—is the most frequent butchering activity, constituting over half of the incidences. Several slice, scrape, and gouge incidences are the result of filleting. These occur mostly upon ribs, scapulae, long bones, and vertebrae. The majority of long bones retain evidence of filleting that is also associated with toolmaking, as most are tools. Two infant bones and the lone fetal specimen retain small slice incidences, which are likely due to filleting. Disarticulation appears as the next frequent butchering activity, albeit in a considerably lower frequency than filleting. This pattern stands in contrast to that exhibited by the species separately, where filleting is not present on *Ovis aries* remains and occurs in nearly similar frequencies to disarticulation on *Capra hircus* remains. Several disarticulation marks occur at the distal and proximal portions of long bones and ribs as well as on the dorsal body of a vertebra. The separation of the hindlimb from the trunk, occurs as several slice incidences on the proximal end of three femora and on several innominates. Lastly, three cranial fragments and two juvenile mandibles exhibit slice incidences that are likely the result of skinning. Dismemberment is evident from bash, chop, and saw incidences.

Sus domesticus

Two slice incidences on a rib fragment represent filleting to remove portions of meat. Access was through the upper left side of the trunk.

Discussion

Given the small size of the sample, it is difficult to establish statistically significant patterns. But, some tentative general observations can be made. In total, 183 bones exhibit 336 butchering incidences on them. The majority of bones demonstrated multiple incidences and most incidences are those of slices (NBI = 280). These are followed by scrapes (NBI = 35), while all others—bashes, chops, gouges, nicks, notches, sawing—are comparatively rare (NBI < 10).

While the assemblage has undergone heavy fragmentation, it is not considerably weathered, nor have canids significantly affected the condition. However, bone fragmentation has likely caused some of the smaller taxa and younger individuals to be minimally present or entirely absent. Similarly, it is evident that compact bones, such as calcanei, are more likely to survive intact. The causes of fragmentation in the majority of bones are not always clear. However, it is clear that only a few can be confidently associated with butchering (such as chops and bashes) and toolmaking (such as smoothed edges).

Several taxa are underrepresented in the Nahal Tillah butchering assemblage when compared to the larger assemblage. This is likely a function of sample size. Yet some observations can be made. The butchered taxa reflect the proportions in the greater faunal assemblage (see larger assemblage data in Kansa et al. 2006; Kansa in press). As in the larger assemblage, *Ovis*/*Capra*, medium mammals (probably *Ovis* and *Capra*), *Bos taurus*, and *Capra hircus* are followed by the most common taxa by NISP in the butchered assemblage. These are also the most common domestic taxa regularly exploited during the EB by pastoral nomads and early sedentary societies for their primary and secondary products. However, it is apparent that the residents of Nahal Tillah were not limited to domestic animals and acquired a few wild animals—like *Gazella*, Cervidae, and Leporidae—for their diet and other uses as well.

In general, the age distribution of the butchered assemblage extends from fetal to adult. However, it should be noted that there is only one fetal and two infantile remains. Hence, these very young age classes are not common. As suggested above, there was not heavy differential attrition of the younger age classes, then they were likely not a routine part of the culling pattern or diet. As shown above with respect to the culling patterns of the major medium mammal food taxa—for example, all ovicaprines—the age distribution for both sheep and goat are remarkably similar. In this respect, most individuals are of juvenile and subadult age. These frequencies differ from those of the large mammals where subadult and adult are the predominant age classes, suggesting that taxonomic body size may be a mediating variable here. It should be emphasized that the butchered assemblage is a small subsample of the entire faunal assemblage. Consequently, these conclusions are tentative and subject to modification. It is more than likely that the majority of bones in the entire assemblage represent consumption for subsistence.

All stages of butchering activities are represented at Nahal Tillah, albeit in varied frequencies. The data are based upon the number of incidences as more than one activity is often present on the same bone. Our interpretations regarding the relationship between types of butchering marks and activities are based on notable butchering studies, such as Binford (1978, 1981) and Lyman (1994), and personal observation of modern slaughterers and butchers. These allow us to relate marks at particular locations to specific activities.

Butchering activities range from slaughtering to toolmaking (Table 1.4.8). Filleting—and filleting combined with toolmaking—is by far the most frequent (65%). These activities typically produce slices and scrapes, as the intention is meat removal. The slicing marks found at the proximal and distal ends of bones are most closely associated with joint disarticulation (24%). Heavier blows—such as bashes and chops—were primarily utilized for dismemberment (6%). Although the activities associated with slice incidences are quite variable, ranging from slaughter to toolmaking, the majority (63%) were applied for filleting (and toolmaking) and disarticulation (24.4%). Skinning (2.7%) is largely manifested upon cranial and mandibular bones. None of the slicing marks on the lower limbs could be securely identified as skinning marks. Most (if not all) seem to be disarticulation marks. Slice marks that are possible indications of slaughtering (0.7%) are found on the ventral faces of two axis vertebra—from a *Capra hircus* and *Equus asinus*—and possibly a hyoid. However, they may also be a function of disarticulation. Slaughtering is one of the most difficult processes to identify given that animals could have been slaughtered without damaging any of the bones. Lastly, there are some indications of marrow extraction (0.6%), as demonstrated by heavier blows to fracture the long bones.

If all the butchered taxa are considered together, then the entire suit of butchering activities is present at Nahal Tillah. However, only filleting (and toolmaking) and disarticulation are present for most taxa. For many bones, toolmaking occurred after boiling and consumption. Consequently, it is mainly secondary and tertiary stages of the butchering process that are represented by the Nahal Tillah assemblage, where the carcass undergoes division into smaller portions and cuts of meat and later bone working (Rixson 1989).

Conclusion

In this study, we have tried to cope with the complexity of data that exists on butchering patterns, carcass processing, and technology at the site of EB I Nahal Tillah, Israel. Unfortunately, no other assemblage from this region or time period has been investigated to such an extent for these variables to provide suitable comparisons. As such, this report contributes to elucidating the butchering patterns and carcass processing at a southern Levantine settlement situated within the interaction sphere of Egypt. Consequently, this study is an initial step toward understanding the butchering practices and subsistence economy of early sedentary societies of the southern Levant.

The taxonomic profile of the butchered assemblage from Nahal Tillah reflects the most common species in the region. Sheep and goat make up the majority of butchered animals. The age-at-death for butchered specimens varies by taxon, with younger individuals being preferred for ovicaprines and slightly older individuals for larger mammals. All stages of butchering are present at Nahal Tillah, with filleting as the dominant butchering activity.

Finally, it should be added that all butchery marks were made by stone implements. Metal tools had not yet been integrated into such quotidian activities (Greenfield et al. 2018). Evidence for metal technology for butchering activities is absent throughout the southern Levant during the EB I–III, and only begins to make its appearance at the end of the third millennium BC. Even then, it is present in minimal quantities (Greenfield 2013).

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Appendix 1.4.1. Element representation within butchered assemblage by taxon—proportion by taxon.

		TAXON													
ELEMENT		***Bos taurus***	***Canis familiaris***	***Capra hircus***	**Cervidae**	***Equus asinus***	***Gazella gazella***	**Leporidae**	***Ovis aries***	***Ovis/ Capra***	***Sus domesticus***	**Mammal –large**	**Mammal –medium**	**Unknown**	**TOTAL**
Astragalus	NISP #	1		1			1								3
	%	33.3%	0.0%	33.3%	0.0%	0.0%	33.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%
Calcaneus	NISP #	2				1			1						4
	%	50.0%	0.0%	0.0%	0.0%	25.0%	0.0%	0.0%	25.0%	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%
Cranium	NISP #	1		1						2			2		6
	%	16.7%	0.0%	16.7%	0.0%	0.0%	0.0%	0.0%	0.0%	33.3%	0.0%	0.0%	33.3%	0.0%	100.0%
Cuboid	NISP #	1		2											3
	%	33.3%	0.0%	66.7%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%
Femur	NISP #						2			6					8
	%	0.0%	0.0%	0.0%	0.0%	0.0%	25.0%	0.0%	0.0%	75.0%	0.0%	0.0%	0.0%	0.0%	100.0%
Humerus	NISP #	4	2	4		1			2	4					17
	%	23.5%	11.8%	23.5%	0.0%	5.9%	0.0%	0.0%	11.8%	23.5%	0.0%	0.0%	0.0%	0.0%	100.0%
Hyoid	NISP #					1									1
	%	0.0%	0.0%	0.0%	0.0%	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%
Innominate	NISP #			2			1		2	1					6
	%	0.0%	0.0%	33.3%	0.0%	0.0%	16.7%	0.0%	33.3%	16.7%	0.0%	0.0%	0.0%	0.0%	100.0%
Mandible	NISP #			3					1	2					6
	%	0.0%	0.0%	50.0%	0.0%	0.0%	0.0%	0.0%	16.7%	33.3%	0.0%	0.0%	0.0%	0.0%	100.0%
Metacarpal	NISP #		1			2				1					4
	%	0.0%	25.0%	0.0%	0.0%	50.0%	0.0%	0.0%	0.0%	25.0%	0.0%	0.0%	0.0%	0.0%	100.0%
Metatarsal	NISP #	1		2					1	1					5
	%	20.0%	0.0%	40.0%	0.0%	0.0%	0.0%	0.0%	20.0%	20.0%	0.0%	0.0%	0.0%	0.0%	100.0%
Radius	NISP #	1		1		1				10					13
	%	7.7%	0.0%	7.7%	0.0%	7.7%	0.0%	0.0%	0.0%	76.9%	0.0%	0.0%	0.0%	0.0%	100.0%

		TAXON													
ELEMENT		***Bos taurus***	***Canis familiaris***	***Capra hircus***	**Cervidae**	***Equus asinus***	***Gazella gazella***	**Leporidae**	***Ovis aries***	***Ovis/ Capra***	***Sus domesticus***	**Mammal –large**	**Mammal –medium**	**Unknown**	**TOTAL**
Rib	NISP #	5				2		1		17	1		7		33
	%	15.2%	0.0%	0.0%	0.0%	6.0%	0.0%	3.0%	0.0%	51.5%	3.0%	0.0%	21.2%	0.0%	100.0%
Scapula	NISP #	6			1				1	2			1		11
	%	54.5%	0.0%	0.0%	9.1%	0.0%	0.0%	0.0%	9.1%	18.2%	0.0%	0.0%	9.1%	0.0%	100.0%
Tibia	NISP #			1						7					8
	%	0.0%	0.0%	12.5%	0.0%	0.0%	0.0%	0.0%	0.0%	87.5%	0.0%	0.0%	0.0%	0.0%	100.0%
Ulna	NISP #									1					1
	%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%	0.0%	0.0%	0.0%	0.0%	100.0%
Vertebra	NISP #	1		1						9					11
	%	9.1%	0.0%	9.1%	0.0%	0.0%	0.0%	0.0%	0.0%	81.8%	0.0%	0.0%	0.0%	0.0%	100.0%
Axis vertebra	NISP #			1		1									2
	%	0.0%	0.0%	50.0%	0.0%	50.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%
Cervical vertebra	NISP #									3					3
	%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%	0.0%	0.0%	0.0%	0.0%	100.0%
Thoracic vertebra	NISP #									2					2
	%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%	0.0%	0.0%	0.0%	0.0%	100.0%
Flat bone	NISP #												7		7
	%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%	0.0%	100.0%
Long bone	NISP #									4		1	22		27
	%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	14.8%	0.0%	3.7%	81.5%	0.0%	100.0%
Unknown	NISP #												1	1	2
	%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	50.0%	50.0%	100.0%
TOTAL	NISP #	23	3	19	1	9	4	1	8	72	1	1	40	1	183
	%	12.6%	1.6%	10.4%	0.5%	4.9%	2.2%	0.5%	4.4%	39.3%	0.5%	0.5%	21.9%	0.5%	100.0%

Appendix 1.4.2. Age profiles per taxon. Total 1: all specimens. Total 2: only specimens from well-defined age classes. * Unknown taxa and age classes are excluded.

	AGE CLASS*												
	Foetus		**Infant**		**Juvenile**		**Subadult**		**Subadult/ adult**	**Adult**		**Total 1**	**Total 2**
TAXON	**#**	**%**	**#**	**%**	**#**	**%**	**#**	**%**	**#**	**#**	**%**	**#**	**#**
Bos taurus					1	7.1	8	57.1	9	5	35.7	23	14
Equus asinus					1	25.0	2	50.0	5	1	25.0	9	4
Canis familiaris					1	50.0			1	1	50.0	3	2
Capra hircus					6	46.2	2	15.4	6	5	38.5	19	13
Ovis aries					4	66.7			2	2	33.3	8	6
Ovis/Capra	1	2.6	2	5.1	11	28.2	17	43.6	33	8	20.5	72	39
Ovicaprines combined	1	1.7	2	3.4	21	36.2	19	32.8	41	15	25.9	99	58
Cervidae–medium									1			1	0
Gazella gazella									2	2	100.0	4	2
Leporidae									1			1	0
Sus domesticus									1			1	0