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Excavations at Tell Fadous-Kfarabida: Preliminary Report on the 2009 Season of Excavations

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The excavations conducted at Tell Fadous-Kfarabida in 2009 were restricted to Area II in the central part of the site. We continued to expose Buildings 1 and 2, dating to the Early Bronze Age II. A third building could be assigned to the Early Bronze Age III, a period not previously recognized at the site. The Early Bronze Age IV and the Middle Bronze Age were only represented by pits. As in previous years, no evidence for any activities postdating the Middle Bronze Age was found.

In addition, a number of special reports dealing with botanical and zoological remains, bone and ground stone artifacts, as well as the results of a geomagnetic survey conducted for one week in 2009 are provided.

I- Report on the Season of 2009 (H. G.)

Introduction

The American University of Beirut archaeological team, in collaboration with the Lebanese Directorate General of Antiquities (DGA) undertook a third season of excavations on the site of Tell Fadous-Kfarabida located 2 km south of the modern town of Batroun from June 22nd to July 18th 2009, to continue the investigation of the areas opened during the 2007 (Genz and Sader 2007) and 2008 (Genz and Sader, 2008) seasons of excavation. The DGA granted us permission to conduct the fieldwork (Cahier de Charges No 2331) and we would like to take this opportunity to express our gratitude to the Director General, Mr. Frédéric Husseini and his staff, especially Mrs. Tania Zaven, for their constant support and interest in the project.

The AUB team was directed by Professor Hermann Genz and included AUB students, Riva Daniel (Graduate AROL), Nathalie Kallas (Graduate AROL), Rafael Sequeira (Graduate AROL), Marshall Woodworth (Graduate AROL), as well as Dr. Bettina Genz (German Archaeological Institute,

Berlin), Kamal Badreshany (Ph.D. student, University of Chicago), Alison Damick (British Institute in Amman), Chris Beckman (Graduate student, UCL), Julia Bertsch (University of Tübingen, Germany), Michaela Frick (University of Tübingen, Germany) and Metoda Peršin (University of Ljubljana, Slowenia). Various specialists joined the team for shorter periods of time: Ann Donkin (Geophysicist, University of Akron, USA), assisted by Chelsea Jalbrzikowski (University of Akron, USA) and Janka Verhey (Conservator, Germany). Dr. Canan Çakırlar (Archaeozoologist, University of Tübingen, Germany) continued the analysis of the faunal material at AUB for two weeks in July.

Three AUB students from the Department of Geology (Nicolas Hawie, Rena Karanouh and Abed Yassine) assisted during the geophysical survey.

May Haider cleaned and conserved the metal finds from the 2009 season.

The excavations were funded by the Faculty of Arts and Sciences of the AUB. The Gerda Henkel Foundation generously supported the work by financing the participation of the various specialists as well as by providing funds for radiocarbon dating, the conservation and the geophysical survey.

We would like to express our gratitude to architect Rémi Feghali (Kfarabida) for his constant support during the field season.

This year's work was restricted to area II on top of the mound, where we continued excavation in squares 285/295, 285/300, 285/305 and 290/295, which already were opened in 2007 and 2008 (**Fig. 1**). In addition, three new squares, 290/300, 290/305 and 295/295, were totally or partially opened in order to complete the excavation of structures encountered in previous years (Genz and Sader 2007; Genz and Sader 2008).

Two buildings of the main architectural phase (Phase III) belonging to the Early Bronze Age II, termed Buildings 1 and 2, were partially uncovered. In addition a building of the Early Bronze Age III was encountered (**Fig. 2**).

The discovery of two new architectural phases in 2009, which were not recognized in the previous seasons, required the creation of a new stratigraphic terminology, which is provided in **Table 1**.

New Terminology	Old Terminology	Period
Phase VI	Phase 4	Middle Bronze Age
Phase V	Phase 3	Early Bronze Age IV
Phase IV	-	Early Bronze Age III
Phase III	Phase 2	Early Bronze Age II
Phase II	-	Early Bronze Age II
Phase I	Phase 1	Early Bronze Age I/ Chalcolithic

Table 1 - Stratigraphic terminology for Tell Fadous-Kfarabida.

Building 1

Work continued in room 1 of Building 1 (square 285/295), which was already started in 2007 (Genz and Sader 2007). This year the entire room was excavated down to virgin soil. The collapsed roof uncovered last year in a limited area in the east of the room was fully exposed this year. Contrary to last year's observations (Genz and Sader 2008) it continues under wall 207 to the north, thus it represents an earlier architectural phase (now termed Phase II) and not only the earliest phase of Building 1. The excellent preservation of the roof collapse with many charred beams *in situ* (context 249) allows detailed studies of the roof construction techniques (**Fig. 3**). The burnt and collapsed roof rested directly on a floor (context 236), which unfortunately was devoid of any *in situ* finds. Only one wall (context 221) in the western part of the excavation area belongs to this phase, which also runs under Wall 207 and continues farther north into unexcavated parts. Remarkable is the rather massive foundation of the pillar base (context 228) of Phase III, which cut through all earlier layers and reached virgin soil. This certainly indicates that the pillars must have carried a considerable weight, which provides additional evidence for the existence of multi-storied buildings in that phase at least. No evidence for any remains of Phase I was found in this area, as the Phase II remains were situated directly on virgin soil.

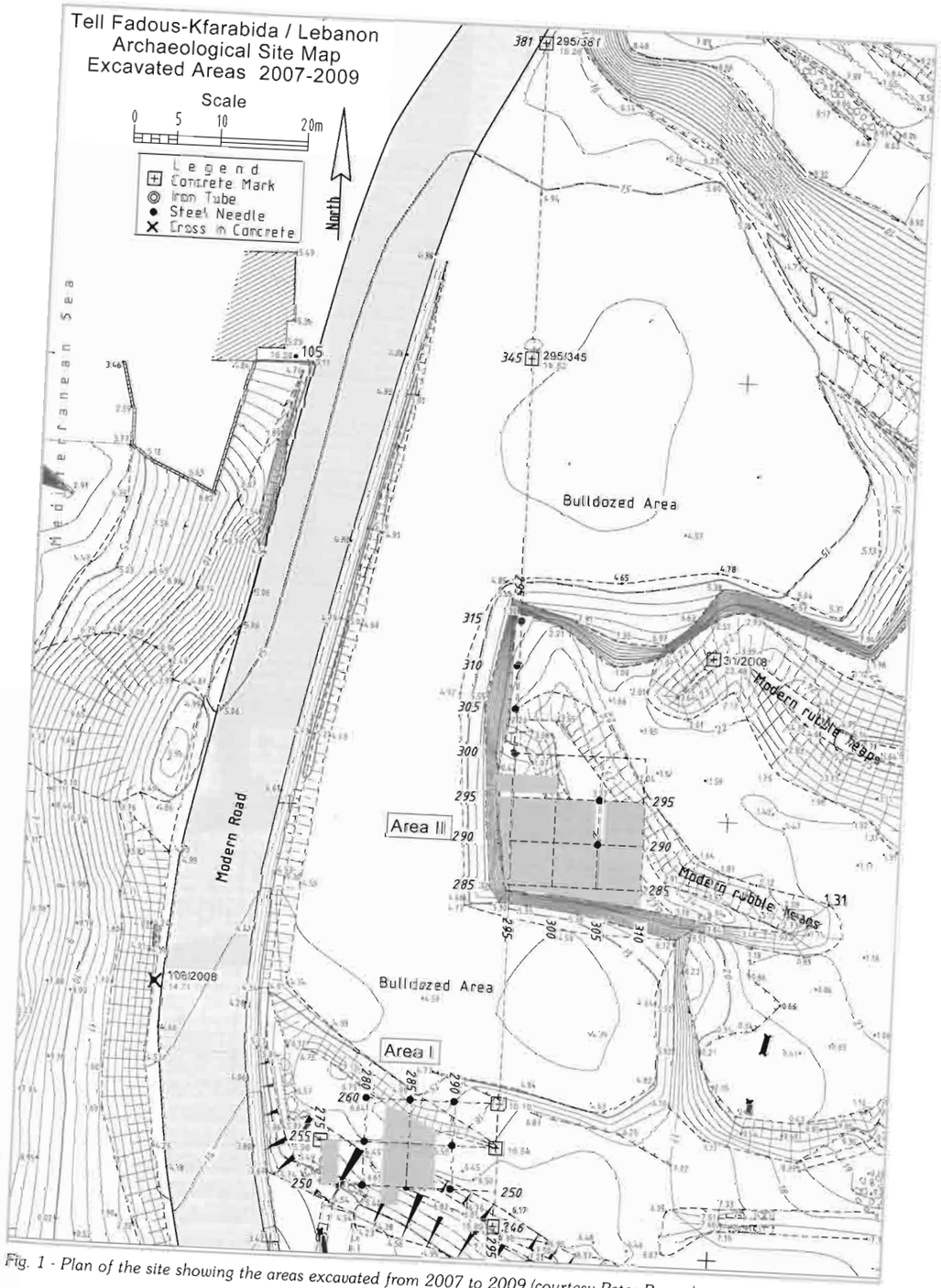


Fig. 1 - Plan of the site showing the areas excavated from 2007 to 2009 (courtesy Peter Breuer).

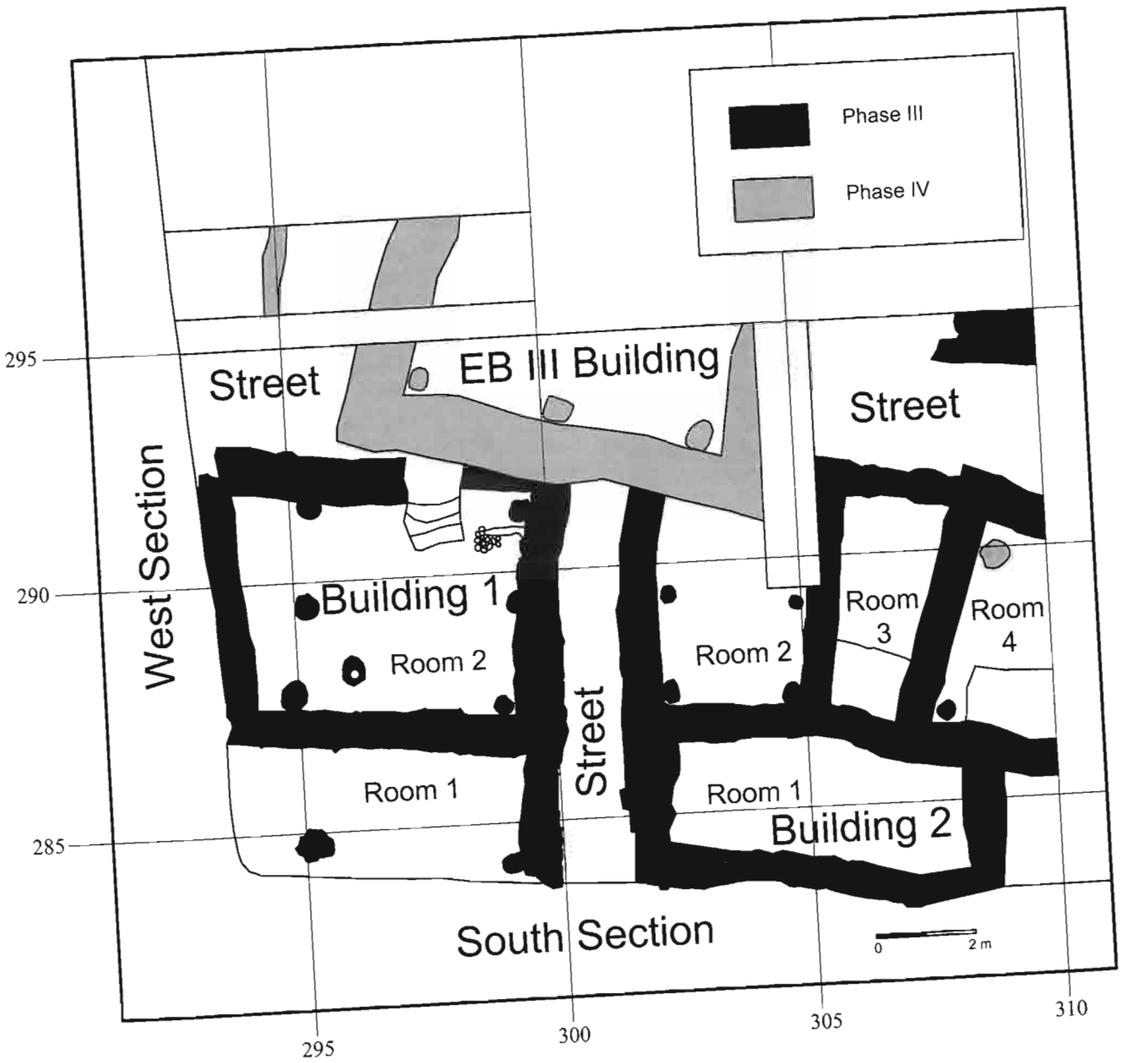


Fig. 2 - Schematic plan of the Phase III and Phase IV architecture in Area II.

Fig. 3 - Burned roof beams (context 249) of Phase II in square 285/295.

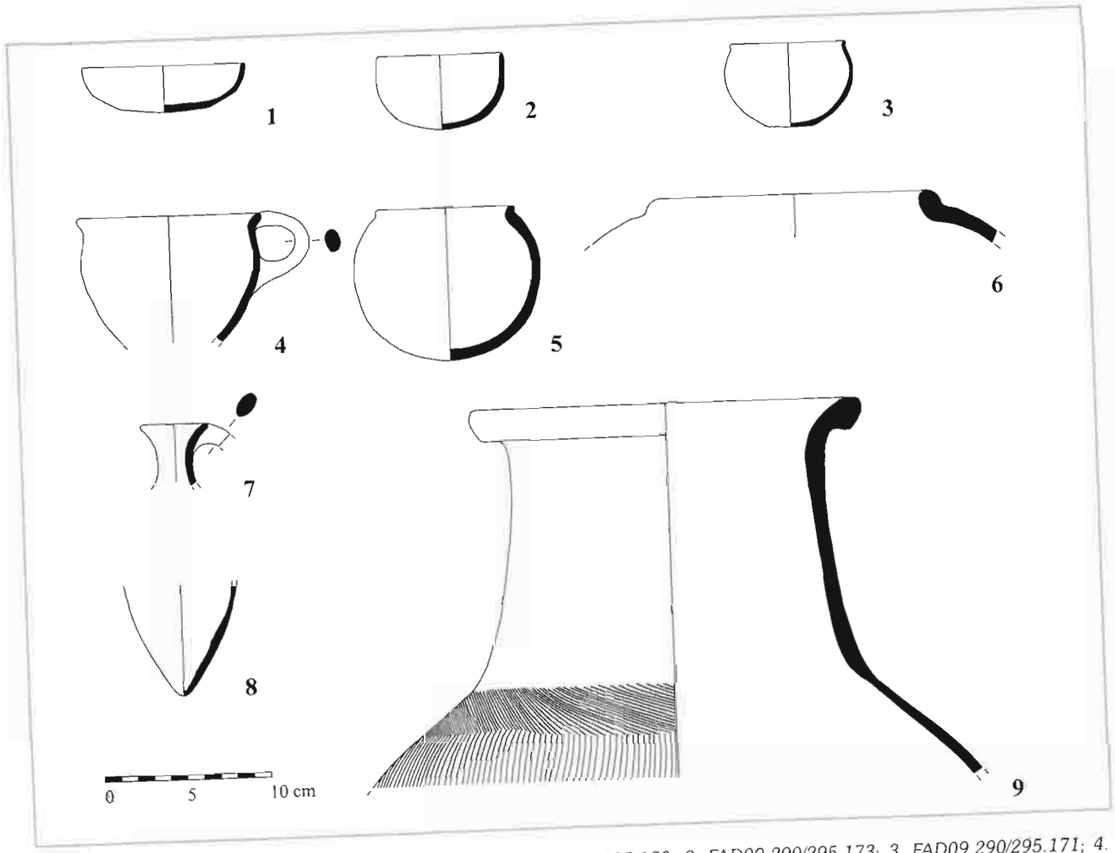
Fig. 4 - Room 2 of Building 1, looking to the east (Phase III).

Fig. 5 - Assemblage of restorable pottery on floor context 522 in Room 2 of Building 1 (Phase III).

In Room 2 of the same Building (Squares 285/295 and 290/295) the floor of Phase III, which was already partly uncovered in 2008, was fully exposed. Along the east wall of the room a stone bench was discovered, on which three pillar bases and the oven already exposed last year rested (**Fig. 4**). A number of *in-situ* finds were encountered on the floor, among them a group of three complete bowls and one small cooking pot in the northwestern corner of the room (**Fig. 5 and Pl. 1: 1-3, 5**) and the neck of a large storage jar in a pit along the south wall (**Pl. 1: 9**). In comparison to the inventory of other rooms from this phase the number of drinking vessels such as small bowls and one-handled cups is rather high, possibly indicating a special function of the room. This idea is supported by the observation that this room is the only one excavated so far which is accessible directly from the street to the north. All other completely excavated rooms lack doors and seem to have been accessible only through trapdoors from an upper storey.

Building 2

The original plan to excavate Rooms 1 and 2 of Building 2 down to virgin soil had to be abandoned for safety reasons. The walls of these rooms are preserved to a height of more than 3.5 m, and a full exposure of these walls would have endangered students working in these areas and may have led to the collapse of the well-preserved architecture. Operations in these rooms were therefore limited to smaller soundings. Squares 290/300 and 290/305 were opened this season to investigate the northern extension of Building 2. The northern walls of



Pl. 1 - Pottery from Building 1, Room 2 (Phase III): 1. FAD09.290/295.180; 2. FAD09.290/295.173; 3. FAD09.290/295.171; 4. FAD09.290/295.208.2; 5. FAD09.290/295.172; 6. FAD09.290/295.194.3; 7. FAD09.290/295.200.5; 8. FAD09.290/295.208.1; 9. FAD09.290/295.166.

Rooms 3 and 4 were uncovered in square 290/305 **(Fig. 2)**. As expected, north of Rooms 3 and 4 a street running in an east-west direction was found, which is the eastern continuation of the street situated north of Building 1.

As already established in 2007, Room 1 of Building 2 had at least three successive floor levels (Genz and Sader 2007: 10). This season the southern wall was exposed and documented, and in the western part of this room an installation already exposed in 2007 (Genz and Sader 2007: 10-11) was further investigated **(Fig. 6)**. The detailed investigation proved that this installation was a domed oven[8]. Interestingly, this room contained no pillar bases, suggesting that it may have been an unroofed courtyard. As no doors are attested, it remains unclear how it was accessed. Yet the presence of the oven on the earliest floor in Phase III definitely shows that it was used for daily activities.

Room 2 also contained at least 3 successive floor levels. Despite its rather small size, pillar bases were found embedded in at least the upper and middle floor. The northern extension of this room could not be exposed due to a later building (see below).

Room 3 was completely exposed. On its uppermost floor a substantial collection of restorable pottery was encountered *in situ* **(Fig. 7)**.

Room 4 could not be excavated, as directly above it a massive column base dating to a later phase is situated **(Fig. 8)**.

Fig. 6 - Oven context 342 in Room 1 of Building 2 (Phase III).

Fig. 7 - In situ pottery on floor context 715 in Room 3 of Building 2 (Phase III).

In the northeastern corner of square 290/305, north of the street, a podium made of massive, partly dressed limestone blocks was uncovered **(Fig. 9)**. Its function and date are unclear, but this structure was partly destroyed by a pit (context 716) containing Early Bronze Age IV pottery, therefore it definitely belongs to the third millennium BC.

A New Architectural Phase

Already in the season of 2008 in the northern part of square 290/295 a wall (Context 511) was uncovered, which according to the pottery associated with it seemed to date to the Middle Bronze Age (Genz and Sader 2008). This season the northern part of this square was opened to better

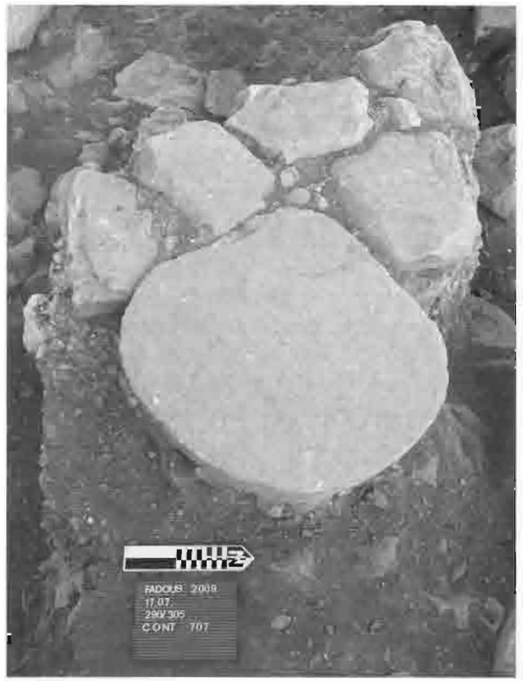


Fig. 8 - Pillar base context 707 above Room 4 of Building 2.

Fig. 9 - Square 290/305, looking north, with podium context 710, cut by pit context 716.

understand this new building. Again we encountered massive quantities of Middle Bronze Age pottery, but these were restricted to a large pit (context 531) partly destroying wall 511 of the new building. To our surprise wall 511 turned out to belong to a massive building extending into the neighboring square 290/300. So far the southern wall has been

completely exposed, as well as parts of the western and eastern walls. The east-west extension of this room is 6 m. Along the southern wall three massive column bases were found **(Figs 2 and 10)**. Unfortunately no restorable *in situ* pottery was found, but the sherds collected on the floor suggest a dating to the Early Bronze Age III **(Pl. 2)**. This period (Phase IV according to the new terminology) was hitherto elusive at the site. This new building clearly cuts into the underlying Buildings 1 and 2 of Phase III dating to the Early Bronze Age II.

In order to establish the size of this new building, a 2 m wide trench was opened in square 295/295. Indeed the northern continuation of its western wall was found, but the northwestern corner is still farther to the north.

The Early Bronze Age IV (Phase V)

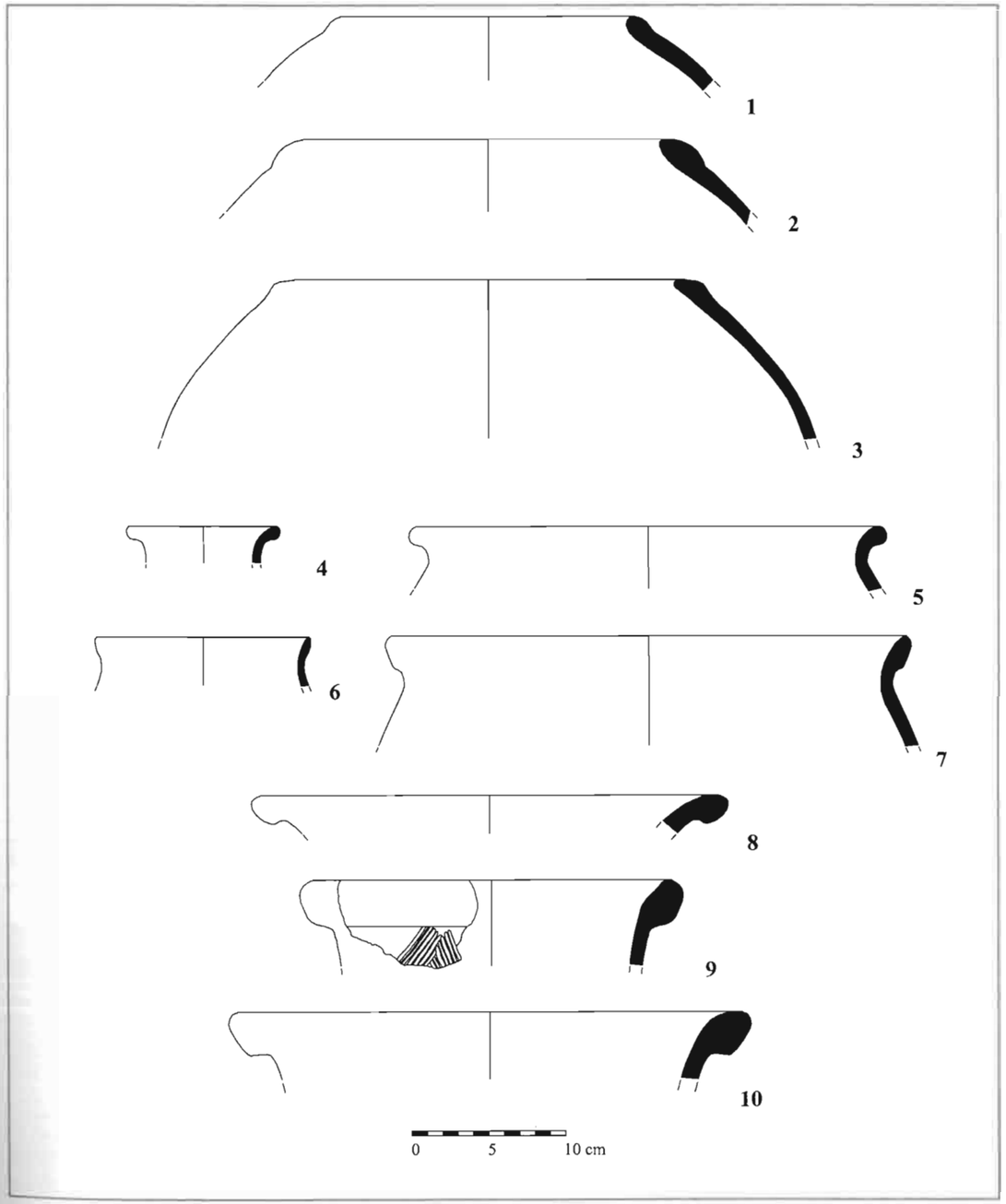
As in the previous seasons, no architectural features belonging to Phase V were encountered. Only a few pits were assigned to this phase, such as pits 604 in square 290/300 and 716 in 290/305. Despite the lack of architectural features, the pottery from this phase generally shows a remarkably high quality, as attested by the cup from pit 716, which is red-slipped and carefully burnished **(Pl. 3: 2)**. Comparisons for this type are found at Tell Arqa in Phase P (Thalmann 2006: Pl. 57: 2-3).

The Middle Bronze Age (Phase VI)

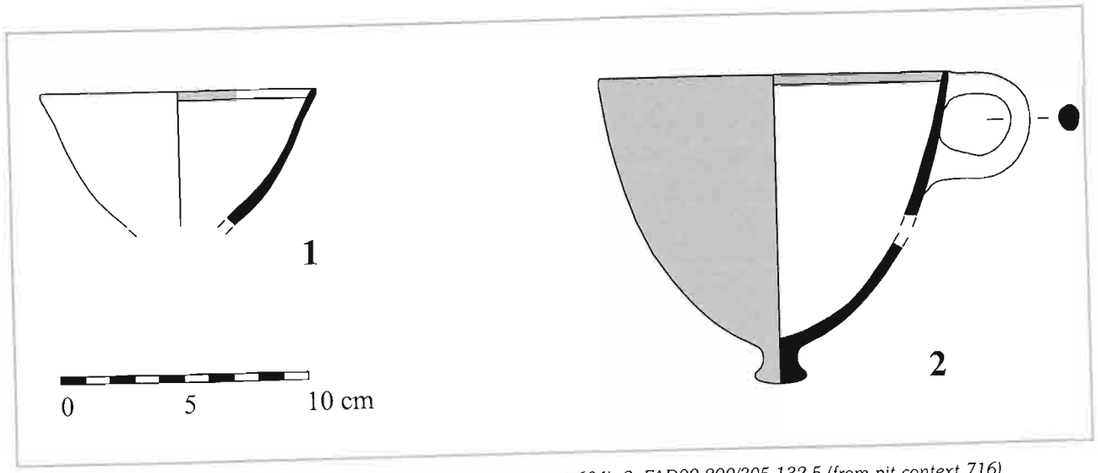
Also Phase VI is only attested by pits. As mentioned above, pit 531 in square 290/295 cut into the wall of the Phase IV building. This pit contained a large quantity of pottery vessels. Among these are globular cooking pots, craters, jugs and jars **(Pl. 4)**. Remarkable is again the presence of straight-walled cooking bowls **(Pl. 4: 1)**, for which Tell Fadous-Kfarabida remains for the time being the only place along the Lebanese Coast where these are attested[9]. Pit 704 in square 290/305 is stone-lined **(Fig. 11)** and has been assigned to Phase VI due to the presence of some Middle Bronze Age sherds in the pit fill. The nature of these pits remains unclear, but the presence of complete vessels in context 531 cautions against designating them as mere refuse pits.

Fig.10 - Squares 290/295 and 290/300 with Phase IV building, looking east.

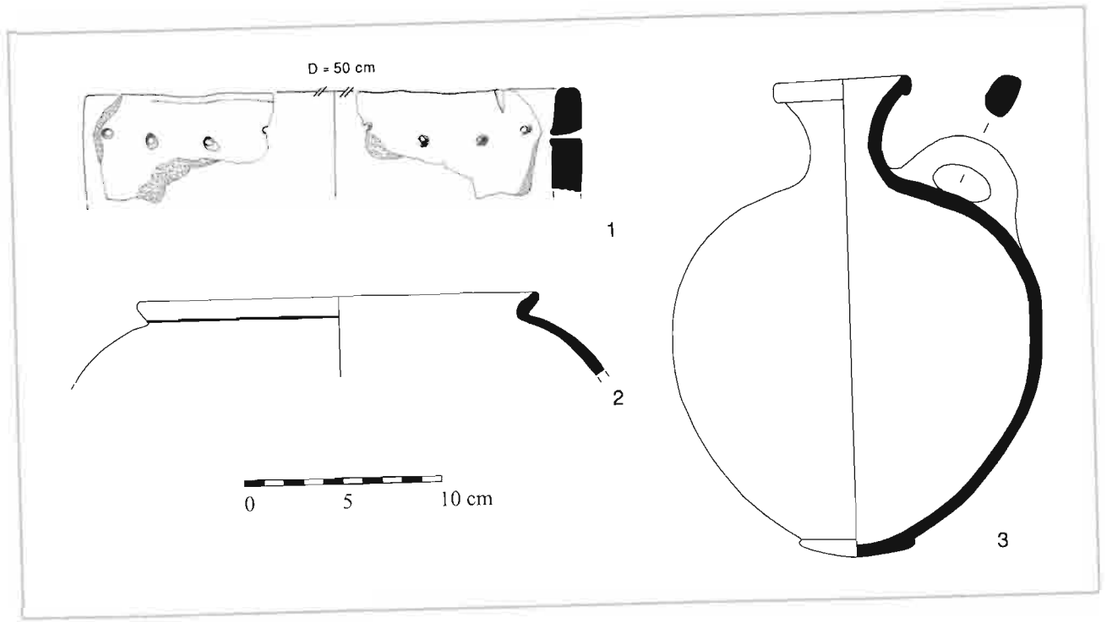
Fig. 11: Stone-lined pit context 704 (Phase VI).



Pl. 2 - Pottery from Phase IV: 1. FAD09.290/300.79.2; 2. FAD09.290/295.286.2; 3. FAD09.290/295.270.2; 4. FAD09.290/295.270.1; 5. FAD09.290/300.52.1; 6. FAD09.290/295.286.1; 7. FAD09.290/300.52.2; 8. FAD09.290/300.93.1; 9. FAD09.290/295.274.1; 10. FAD09.290/295.293.1.



Pl. 3 - Pottery from Phase V: 1. FAD09.290/300.8.1 (from pit context 604); 2. FAD09.290/305.132.5 (from pit context 716).



Pl. 4 - Pottery from Phase VI (pit context 531): 1. FAD09.290/295.228; 2. FAD09.290/295. 240.7; 3. FAD09.290/295.247.1.

Finds

A total of 25384 sherds, weighing 487.72 kg were retrieved during this season. Squares 290/295 and 290/305 produced a number of restorable vessels from Early Bronze Age II floor contexts. The discovery of the new architectural phase in squares 290/295 and 290/300 will allow a better definition for the hitherto unclear Early Bronze Age III phase at the site. Early Bronze Age IV and Middle Bronze Age pottery was retrieved from topsoil contexts and pits in squares 290/295, 290/300 and 290/305.

A number of noteworthy small finds were retrieved. Among these a bronze roll-headed pin **(Fig. 12)** from square 295/295 represents a common type for the Levant during the later third millennium BC (Klein 1992: 121-125 and Pls. 123-125). A large number of bone tools are attested (see contribution by E. Jastrzębska in this volume). Most remarkable is a beam of a beam scale made out of bone that was discovered in the collapse above floor 715 in Room 3 of Building 2 **(Fig. 13)**. This is the first attestation of a beam scale in the third millennium Levant, but contemporary objects are known from Anatolia and the Aegean (Rahmstorf 2006, 72 and Fig. 10: 23-27, Genz, in press).

Two new sherds with cylinder seal impressions, showing a fine net pattern **(Figs 14 and 15)** were found, this time in good stratigraphic contexts dating to the Early Bronze Age II (Phases II and III respectively), as well as another rams head application on a sherd **(Fig. 16)** from a large storage jar.

Fig. 12 - Roll headed pin FAD09.295/295.32 (context 802).

Fig. 13 - Scale beam FAD09.290/305. 124 (context 714, Phase III).

Radiocarbon Dating

Six new radiocarbon dates from Tell Fadous-Kfarabida are now available **(Table 2)**, augmenting the first set of dates taken during the 2004 season (Badreshany *et al.* 2005, 80-84). All of them are AMS dates, taken from short-lived samples. The results were calibrated using «CALIB rev 5.01».

Fig. 14 - Cylinder seal impression on sherd FAD09.285/295.313 (context 243, Phase II).

Fig. 15 - Cylinder seal impression on sherd FAD09.290/295.192 (context 522, Phase III).

Fig. 16 - Rams head application on sherd FAD09.290/295.224 (context 501).

Excavation No. and context	Lab No.	Bp date	BC date (2σ)	Material	Period
FAD09.290/300.85 (Context 614)	KIA 40115	3955 ± 25	2567 – 2522 2498 – 2436 2421 – 2403 2379 – 2349	Olive pit	Phase IV (EB III)
FAD09.290/295.296 (Context 537)	KIA 40113	4065 ± 25	2839 – 2814 2677 – 2557 2555 – 2550 2537 – 2491	Olive pit	Phase IV (EB III)
FAD08.285/295.175 (Context 222)	KIA 37205	4101 ± 23	2858 – 2810 2750 – 2723 2700 – 2576	Olive pit	Phase III (EB II)
FAD09.290/300.76 (Context 618)	KIA 40114	4120 ± 25	2864 – 2806 2760 – 2580	Olive pit	Phase III (EB II)
FAD07.285/295.126 (Context 218)	KIA 37204	4154 ± 28	2876 – 2832 2820 – 2632	Olive pit	Phase III (EB II)
FAD05.20 (Context 67)	KIA 37203	5039 ± 31	3951 – 3762 3724 – 3715	Olive pit	Phase I (EB I/ Chalcolithic)

Table 2 - Radiocarbon dates from Tell Fadous-Kfarabida

The earliest sample was taken from the Phase I jar burial context 67 in 2005 and has provided a surprisingly early date in the first half of the fourth millennium BC. Further material and radiocarbon dates are needed to clarify the transition from the Chalcolithic to the Early Bronze Age, which is still rather enigmatic in Lebanon. Two of the samples (FAD07.285/295.126; FAD08.285/295.175) originate from restorable vessels from the floor of Phase III in Room 1 of Building 1. They place this phase in the 29th to 27th centuries BC, confirming the results of the samples from 2004[10]. The third sample from Phase III (FAD09.290/300.76) was collected on the uppermost floor of that Phase in Building 2, Room 2 and falls into the same time range. Two samples (FAD09.290/295.296 and FAD09.290/300.85) come from the floor of the Early Bronze Age III building (Phase IV) and date to the 27th to 24th centuries BC.

After Tell Arqa (Thalmann 2006: 230), Tell Fadous-Kfarabida is the second site in Lebanon to have yielded a set of high precision radiocarbon dates from a well-defined stratigraphic sequence, and thus will considerably help to solve controversial problems concerning the chronology of the 4th and 3rd millennia in the Northern Levant.

Conservation of Architecture and Backfilling

In order to preserve and protect the architectural features, Rooms 1 and 2 of Building 1 as well as Room 1 of Building 2 were backfilled at the end of the excavation season **(Figs 17 and 18)**.

During the last week of the excavation Janka Verhey, a stone conservator from Germany, secured the exposed parts of the walls of buildings 1 and 2 by closing gaps and covering the tops of walls with lime mortar to prevent rainwater from penetrating and thus destabilizing the walls **(Fig. 19)**. Only the tops of the walls are left exposed **(Fig. 20)**.

Conclusions

The third season of excavations at Tell Fadous-Kfarabida greatly enhanced our understanding of the layout of the early urban settlement established at the site during the Early Bronze Age II and III. The excellent state of preservation of the architecture and the inventory of the rooms allow a detailed study of the function and use of individual rooms and entire houses. Comparisons with neighboring sites such as

Fig. 17 - View of the South Section during the backfilling process.

Fig. 18 - The South Section after completion of the backfilling.

Tell Arqa (Thalmann 2006) and Byblos (Lauffray 2008) will help to understand the planning and layout of early urban settlements on the Lebanese Coast.

The newly discovered Early Bronze Age III phase does not only close a gap in the occupational sequence, but furthermore enables a diachronic study of the development of the material culture of this region through the entire third millennium BC. Interestingly, the layout of the settlement changed remarkably from Phase III to Phase IV. The Phase IV building is located in the place of a former street intersection and cuts across previously existing boundaries of individual buildings. The nature of this change needs to be investigated further.

The Early Bronze Age IV (Phase V) and the Middle Bronze Age (Phase VI) so far are only represented by pits and one Middle Bronze Age burial (Genz *et al.*, in press), and thus seem to indicate a decline of the settlement during these periods. No activities postdating the Middle Bronze Age are attested up to now, and the site was deserted until the 20th century AD.

Fig. 19 - Janka Verhey working on the consolidation of the walls.

Fig. 20 - Room 2 of Building 1 after completion of the backfilling.

The excellent preservation of faunal and botanical remains enables building up a solid chronology based on radiocarbon dates, and furthermore allows a thorough study of the use of natural resources by the inhabitants and the interaction with their environment.

II- Faunal Remains from the 2007-2009 Seasons (C. Ç.)

Introduction

Tell Fadous-Kfarabida provides us with one of the few systematically sampled faunal assemblages from the northern coast of the Levant, which older excavations at important type sites such as Byblos or Ugarit have failed to present, creating an enormous gap in our understanding of human-animal interactions in Holocene coastal Lebanon. At this point in research, Tell Fadous-Kfarabida represents a small Early Bronze Age island (or a half-island, since half of the site has been bulldozed prior to its discovery in 2004!) in an archaeozoological *terra incognita* that is the Lebanese coast. Considering the burden of old excavations and the scarcity of new archaeological initiatives, it is unlikely that we will be able to construct good working hypotheses about a general, anthropological picture of life as it were on the Lebanese coast during the Middle Holocene in any near future. This is why any information on animal exploitation at Tell Fadous-Kfarabida represents a significant window of exploration into the poorly investigated aspects of Lebanon's archaeological past.

Covering the entire Early Bronze Age in its stratigraphic sequence, reaching up the Middle Bronze Age and down to the Chalcolithic Period, Tell Fadous-Kfarabida is excavated with state-of-the-art methodology, involving detailed recording of individual contexts (as opposed to phases only) and systematic sorting of wet-sieved heavy fraction from selected excavation units. Such an excavation methodology not only allows for accurate observations of diachronical changes in animal exploitation strategies through the occupational history of the site, but also makes it easier to detect evidence for animal-related behavior beyond subsistence, such as ritual feasts, tool making and long-distance exchange. Systematic sampling including heavy fraction sorting creates a more complete faunal assemblage thereby enabling more accurate reconstructions of human-animal interactions.

The first report on the faunal remains from Tell Fadous-Kfarabida discussed the small but promising faunal assemblage from the sections documented in 2004 and 2005 (Çakırlar in Badreshany *et al*. 2005). The small sample already signaled the importance of goat husbandry and a foraging strategy oriented towards the resources of the rocky coastline involving fishing, shellfish gathering and capturing marine turtles. A second discussion on yet another small but significant portion of faunal assemblage associated with a Middle Bronze Age burial on the mound can be found in a forthcoming report (Genz *et al*., in press). This paper contributes to the discussions concerning the wide-spread use of animals in Middle Bronze Age funerary customs in the Levant (Horwitz 2001; Vila 2006). The analytical results presented here exclude both of these assemblages and focus on the settlement deposits recovered during the 2007-2009 excavations. The material uncovered during the last two weeks of 2009 excavations, which has not yet been studied at the time of writing, is left out. The material was studied at different facilities, during the excavation seasons in Kfarabida, the premises of the American University of Beirut, and the archaeozoological collection units of Tübingen University. The fish remains were studied in the archaeozoological laboratory of Royal Belgian Institute of Natural Sciences (Brussels). Species determination of bird and small mammal remains still needs to be done at a later date.

There are two types of samples dealt with in this report: The bulk of the assemblage, which comes from hand-collected archaeological units and a smaller part of the assemblage coming from the wet-sieved soil samples. Out of 162 archaeological contexts studied so far, 39 were partially sieved (8 liter samples per context; 2 mm mesh size). The hand-collected assemblage consists of 3404 vertebrate and 589 invertebrate remains, while the sieved portion includes 224 vertebrate and 293 invertebrate remains **(Table 3)**. The bulk of the studied material comes from secure EBA contexts (ca. 73 %) and very few from the MBA layer (ca. 0.6 %). The stratigraphic position of the rest of the studied material is still somewhat ambiguous and no material from the Chalcolithic/EBA I (Phase I) period has been studied so far. The distribution of material between Areas I and II is just as uneven. Excavations have been concentrating on Area II where the domestic structures have been found and where most of the faunal material also comes from (ca. 94 %). Thus, although the studied total is large enough to draw a general picture of the subsistence economy and environment of the site as a whole and especially for the EBA, at this point of research, an attempt to understand archaeozoological changes between the different phases and/or different sectors of the settlement would be futile. An example can demonstrate this point: As of January 2010, excluding the specimens associated with the MBA grave mentioned earlier, only 158 faunal specimens come from the studied contexts of the MBA layer. While no marine turtle (Cheloniidae) remains have been identified among these specimens, the MBA sample size is simply too small to argue for a trend of discontinuation of a thriving EBA marine turtle exploitation. Thus, in this report, the material will be handled as a whole, undivided into smaller spatial or chronological units.

Mollusks

Mollusks make up a large (15% in Number of Identified Specimens – NIS – in the hand-collected assemblage and 55.5% of the sieved assemblage) component of the faunal assemblage from Tell Fadous-Kfarabida **(Table 3)**. The mollusk assemblage is rich with at least 11 species of marine gastropods, 4 species of marine bivalves and 4 species of terrestrial gastropods are represented **(Table 4)**. Added to this species list should be a freshwater bivalve (*Unio* sp.) that was found during section cleaning in 2004 (Badreshany *et al*. 2005, Table 11) and a *Conus*-like fossil gastropod, common to the Lebanese limestone ridges.

The quantity, taphonomic features and context of the mollusk remains are all helpful in determining their differential contribution to the subsistence economy of the settlement. Accordingly, it seems that only limpets (*Patella* spp.), topshells (*Monodonta* spp.) and *Helix* spp., a common edible land snail, were exploited for subsistence purposes (including their possible use as fishing bait). It is only these species that were found in clusters large enough to represent meals (as high as 59 limpet specimens in a single context, i.e. in context 502, in the fill layer of Building 1, Room 2; and an average of 6 specimens per each context they were encountered). Topshells, although less common (as high as 12

Method of retrieval	Hand sampling		Wet sieving	
Taxa	NIS	NIS %	NIS	NIS %
Invertebrate remains				
Mollusca (Mollusks)	585	14.7%	287	55.5%
Crustacaens (in this archaeological context =crab remains)	4	0.1%	6	1.2%
Vertebrate remains				
Pisces (Fish)	184	4.6%	75	14.5%
Cheloniidae (Marine turtles)	89	2.2%		0.0%
Aves (Birds)	15	0.4%	1	0.2%
Wild mammals	51	1.3%		0.0%
Domestic mammals	1965	49.2%	28	5.4%
Unidentified mammals	1100	27.5%	120	23.2%
Total	**3993**	**100.0%**	**517**	**100.0%**

Table 3 - Overview of the archaeofaunal assemblage from 2007-2009 excavations at Tell Fadous-Kfarabida.

specimens in a single context), were usually uncovered along with limpet clusters. This is only expected, since the two taxa share a common habitat in the splash zones of rocky shorelines where they were gathered. Besides their contextual situation and amount within the archaeological matrix, indicative of the role of these species in the settlement's diet is their well-preserved state. Limpet shells can start abrading through wave action already during their ontogenic life and abrasion continues in the soil once their shells are disposed of. But the lack of any sign of encrustation on the inner side of the shells found in the mound indicates that they were collected alive. Topshells, on the other hand, are better protected by their thin organic coating (periostracum) during lifetime, which starts decomposing only after the animal is dead. Topshells found on the mound were more or less intact, showing no sign of abrasion during life time or post-mortem human modification.

Limpet and topshell accumulations are frequently accompanied by *Helix* shells. In one occasion (context 443; Building 2, Room 1) as many as 26 *Helix* specimens were found together with smaller numbers of limpets and topshells. Although one could argue that *Helix* shells could represent accidental intrusions to the archaeological deposits, their proportion and context strongly suggest that they too were part of the diet. Studies on land snail remains from earlier archaeological contexts in the Mediterranean have already demonstrated their food value for prehistoric occupants of the region (Lubell 2004). No attempt was made to identify other land snails found in the assemblage. Most of them have been recovered through wet-sieving and consist of individuals of miniature sizes that occur naturally in the archaeological matrix. It is significant that no freshwater snails have been recorded (especially when considered in contrast to some other Bronze Age sites in the Levant, e.g. Tell el-Burak, 90 km south of Tell Fadous-Kfarabida on the Lebanese coast, and Tell Atchana in the Amuq Valley. Personal observation).

Among the rest of mollusk shells represented at Tell Fadous-Kfarabida, three species occur more frequently than others: *Charonia* spp. (triton or trumpet snails), *Stramonita haemastoma* (a large whelk), and *Glycymeris* spp. (dog cockles). All 79 specimens representing these three species **(Table 4)** have been exposed to varying levels of physical and biological abrasion, losing their sculpture to some degree. Most of the triton shells displayed pittings and a few of the dog cockles bore umbonal holes created by sand action. None of the triton snails were recovered intact; when they were found as near complete specimens, they displayed irregular holes of varying sizes resulting almost certainly from bioabrasion. One occasion (context 500, unfortunately topsoil), where three almost complete triton shells bearing such holes were found in a cluster, may be indicating the use of these large and heavy shells as net weights. The evidence for the secondary use of whelks as items to hang (also possibly net weights) is more concrete. A more or less complete specimen from context 317 (street fill) was perforated/cut from the inner side of the shell's wall near the lip **(Fig. 21)**. All other marine gastropods, represented in small quantities, display some sort of pre-depositional abrasion: Cypraeidae (cowries) occur either only as toothed lips or bear holes, whereas small snails such as the *Buccinulum, Nassarius, Columbella,* and *Conus* almost always appear with holed apices. Bivalves other than the *Glycymeris* are extremely rare. The single *Spondylus* (spiny oyster) shell is fragmented and pitted, representing an individual collected as an empty shell; the *Acanthocardia* (spiny cockle) is a tiny, juvenile individual; and the *Venus* specimen is all but a margin fragment.

Fig. 21 - Perforated, abraded and sand-encrusted Stramonita haemastoma (context 317, specimen 3087).

Method of retrieval	Hand sampling				Wet-sieving			
Taxon	NIS	NIS %	WIS (gr)	WIS %	NIS	NIS %	WIS (gr)	WIS %
Marine gastropods								
Patella spp.	261	44.6%	398.7	7.9%	137	47.7%	99.7	57.8%
Monodonta spp.	67	11.5%	281.5	5.6%	49	17.1%	32.4	18.8%
Cypraeidae	4	0.7%	6.1	0.1%	1	0.3%	2.0	1.2%
Phalium granulatum	2	0.3%	5.1	0.1%				
Charonia spp.	52	8.9%	2600.0	51.3%	1	0.3%	11.6	6.7%
Hexaplex trunculus					1	0.3%	0.5	0.3%
Stramonita haemastoma	7	1.2%	356.5	7.0%				
Buccinulum corneum	1	0.2%	3.5	0.1%				
Nassarius spp.					1	0.3%	0.5	0.3%
Columbella rustica					2	0.7%	1.5	0.9%
Conus mediterraneus	4	0.7%	8.5	0.2%	1	0.3%	1.0	0.6%
Unidentified marine gastropod	8	1.4%	481.1	9.5%	4	1.4%	1.2	0.7%
Bivalvia								
Glycymeris spp.	19	3.2%	152.7	3.0%				
Spondylus gaederopus	1	0.2%	7.7	0.2%				
Acanthocardia spp.					1	0.3%	0.1	0.1%
Venus verrucosa	1	0.2%	0.3					
Terrestrial gastropods								
Helix sp.	127	21.7%	716.2	14.1%	61	21.3%	16.7	9.7%
Unidentified terrestrial gastropod	30	5.1%	35.3	0.7%	28	9.8%	5.2	3.0%
Fossil gastropod	1	0.2%	10.1	0.2%				
Total	**585**	**100.0%**	**5063.3**	**100.0%**	**287**	**100.0%**	**172.4**	**100.0%**

Table 4 - Overview of the mollusk assemblage (WIS = Weight of identified specimens).

Fishes

Fish remains make up ca. 5.4% of the hand-collected and ca. 33.4% of the wet-sieved vertebrate remains **(Table 3)**. Both of these proportions are remarkably high, demonstrating – once again – that fish exploitation was a much more significant foraging activity in the ancient Eastern Mediterranean than previously shown by inadequately sampled archaeofaunal assemblages (Van Neer *et al.* 2005). While the relatively high proportion of fish remains, especially in the wet-sieved samples, do not necessarily result in a higher diversity of represented species **(Table 5)**, they do provide us with more accurate data about frequently exploited size classes of fish **(Fig. 22)**.

Cartilaginous fish, occurring with 12 specimens, is relatively frequent in the assemblage, indicating deliberate attempts to catch sharks and rays rather than chance yields. Requiem sharks, large migratory species, are represented by their calcified vertebrae. Three of the five Carcharchinid vertebrae could be measured and they represent large individuals (diameters: 17.1, 23.5, and 25.3 mm each) that are more likely to have been caught in the open sea rather than in inshore waters. One of the two rays in the hand-collected assemblage represents a partial skeleton with two vertebra

Method of retrieval	Hand sampling		Wet-sieving	
Taxon	NIS	%	NIS	%
Cartilaginous fish				
Carcharchinidae indet. (unidentified requiem shark)	5	2.7%		
Pteromylaeus bovinus (bullray)	3	1.6%		
Rajidae indet. (unidentified ray)	2	1.1%	2	2.7%
Bony fish -marine				
Serranidae indet. (unidentified grouper, bass or perch)	2	1.1%		
Epinephelus spp. (unidentified grouper)	48	26.1%	4	5.3%
Carangidae indet. (unidentified jack)	3	1.6%		
Seriola dumerili (greater amberjack)	1	0.5%		
Sparidae indet. (unidentified sea bream)	13	7.1%	7	9.3%
Sparus aurata (gilthead sea bream)	3	1.6%	1	1.3%
Sparus pagrus (common sea bream)	4	2.2%		
Dentex cf. dentex (dentex)	1	0.5%	1	1.3%
Diplodus sp. (other seabreams)			2	2.7%
Sarpa salpa (salema porgy)	2	1.1%		
Mugil cephalus (flathead grey mullet)	1	0.5%		
Sparisoma cretense (parrot fish)	1	0.5%		
Balistes carolienensis (grey trigger fish)	11	6%		
Bony fish -freshwater				
Tilapia zillii (redbelly tilapia)	1	0.5%		
Pisces indet.	83	45.1%	58	77.3%
Total	**184**	**100.0%**	**75**	**100.0%**

Table 5 - Overview of fish remains found in Tell Fadous-Kfarabida.

centra, each measuring 15.3 mm in diameter. Rays are benthic animals (i.e. they live on the seabottom) preferring sandy environments. In the sieved part of the assemblage rays are represented by their teeth also. Bullray identifications in the hand-collected portion of the assemblage are based on the occurrence of morphologically diagnostic hard tissue such as the caudal spine (two specimens) and a tooth plate, each stemming from distinct contexts. Bullrays are versatile species that move between coastal and deeper offshore waters. They can be benthic, but they can also dwell the surface waters, sometimes even leaping out of the water. Some degree of offshore fishing activity is further attested by the occurrence of very large Carangids (individuals ranging between 80 and 120 cm in SL). But the absence of other fast swimming pelagic and schooling fish (such as Scrombidae –mackerels and tunas) indicates that fishing activity in offshore waters was carried out only to a limited degree.

Species that occur most frequently in the archaeological deposits of the Eastern Mediterranean (Van Neer *et al.* 2005), namely Serranidae (groupers) and Sparidae (seabreams) dominate the assemblage from Tell Fadous-Kfarabida as well **(Table 5)**. Their frequent occurrence is both a representation of the dominance of rudimentary fishing targeting inshore demersal (i. e. bottom-dwelling, just above the benthic species in the water column) fish and a reflection of the robust structure of their skeletal

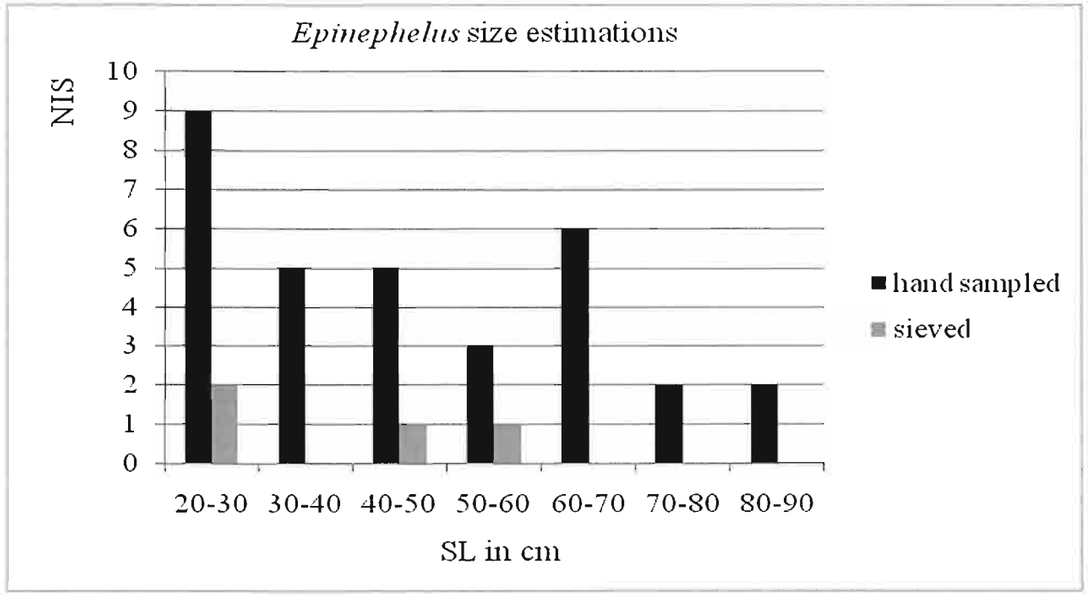


Fig. 22 - Estimated size range of Epinephelus from Tell Fadous-Kfarabida.

parts. The body size of *Epinephelus* sp. was reconstructed by direct comparison with modern specimens of known length **(Fig. 22)**. Accordingly, *Epinephelus* individuals vary between 20 and 90 cm in SL (Standard Length = length between snout and beginning of the tail). Individuals smaller than 60 cm SL occur more frequently; both in the hand-collected and sieved assemblages. The high representation of individuals below 30 cm SL, whose presence is well-attested with specimens in the sieved assemblage, indicates heavy exploitation pressure on coastal fisheries. The majority of the Sparid specimens in the hand-collected assemblage belong to individuals of 30-45 cm in SL. The Sparids in the sieved assemblage are also somewhat smaller than the ones in the hand-collected sample, mainly belonging to individuals ranging between 15 and 25 cm SL. Size estimations of Sparid individuals are also based on direct comparison with modern specimens of known size. The fact that no truly large Sparid individuals are present in the assemblage supports the idea of significant human impact on the coastal ecology at Tell Fadous-Kfarabida. The relatively high occurrence of grey triggerfish (*Balistes carolinensis*) and the presence of a single specimen of parrot fish (*Sparisoma cretense*) are affirmative of the importance given to the exploitation of demersal coastal fisheries at the site. The occurrence of a single flathead grey mullet (*Mugil cephalus*) specimen can be considered an outlier from this general picture: The species is known with its tolerance to freshwater and abundance in river mouths, but it can also occur in tranquil inshore waters. It is possible that this Mugilid was caught at a distance from the settlement at the mouth of Wadi Madfoun to the south or Wadi Edde to the north.

There is only one specimen that most likely represents continental (freshwater) fishing at Tell Fadous-Kfarabida: a precaudal vertebra centrum of a *Tilapia zillii* comparing well with a 15 cm SL modern specimen. The modern northernmost occurrence of *Tilapia zillii* populations is the Litani River Basin (Arndt *et al.* 2003). Although *T. zillii* prefers shallow vegetated freshwater habitats, often inhabiting brackish waters, it has also been reported from marine waters. The absence of imported freshwater fish such as the Nile perch (*Lates niloticus*), remains of which are commonly

encountered in the archaeological deposits of the coastal and inland Levant starting from the Middle Bronze Age onwards, verifies the previous evidence dating the beginning of trade in Nile fish from Egypt to the Middle Bronze Age (Van Neer *et al.* 2005; Van Neer 2006; personal observation in Tell el Burak).

Marine turtles

Marine turtles (Cheloniidae) are represented with 89 specimens adding up to 1832.1 grams. They all come from the EBA layers of the settlement, with half of the specimens coming from various contexts of Building 1. All specimens, but one (an unidentified vertebral fragment), come from Area II. Although there has been no systematic attempt to identify the marine turtle remains to the species level so far, the occurrence of both *Chelonia mydas* (green turtle) and *Caretta caretta* (loggerhead turtle) and the absence of *Trionyx triunguis* (Nile softshelled turtle) has been verified.

All anatomical elements of Cheloniidae, both exoskeletal (i.e. the shell) and skeletal parts, are present in the assemblage. They do not, however, appear to occur in equilibrium with the elemental distribution of an intact Chelonid skeleton. In an intact marine turtle skeleton, the carapace and the plastron make up about 75% of the total skeletal weight (Uerpmann and Uerpmann 1997). Exoskeletal fragments make up only about 42.9% of the total weight of turtle specimens in Tell Fadous-Kfarabida. At the same time, elements of the forearm (scapula, humerus, radius and ulna) are clearly overrepresented with relatively high numbers. In aquatic turtles, the forearm is stronger and more massive than the hind limb, therefore yielding more and high quality meat. It seems like a certain degree of schlep effect was at play in the creation of the Tell Fadous-Kfarabida assemblage, which resulted in the transportation of high quality parts of the turtle carcass to the settlement more frequently than the heavy but nutritionally useless parts such as the shell. There is, at present, no negative or positive evidence as to whether the turtles were captured off-shore in their aquatic habitat or whether only females were captured while nesting onshore. A large and curved pollex phalanx from a male individual, which could attest to the capturing of male individuals offshore, is missing from the assemblage. To understand the nature of turtle exploitation at the site, a larger sample and further study are necessary.

Element	NIS	NIS %	WIS (gr)	WIS %
Skull	2	2.2%	44.5	2.4%
Maxilla	1	1.1%	19.2	1.1%
Vertebra indet.	1	1.1%	9.9	0.5%
Rib	5	5.6%	50.4	2.8%
Scapula	10	11.2%	143	7.8%
Humerus	13	14.6%	564.2	30.8%
Radius	2	2.2%	29.2	1.6%
Ulna	3	3.4%	27.3	1.5%
Pelvis	1	1.1%	22	1.2%
Femur	4	4.5%	60.4	3.3%
Tibia	2	2.2%	24.9	1.4%
Tarsal/carpal bone	2	2.2%	4	0.2%
Metapodial	4	4.5%	11.5	0.6%
Indet. long bone	2	2.2%	20.2	1.1%
carapax fragment	30	33.7%	672.6	36.7%
plastron fragment	3	3.4%	113.3	6.2%
Indet. bone	4	4.5%	15.5	0.85%
Total	**89**	**100.0%**	**1832.1**	**100.00%**

Table 6 - Representation of Cheloniidae (marine turtles) elements at Tell Fadous-Kfarabida.

Wild mammals

Out of 3470 vertebra specimens, only 51 were ascribed to wild mammals, making up less than 1.5% of the vertebra fauna from Tell Fadous-Kfarabida. This low percentage reflects the small role wild mammals played in the subsistence economy of the settlement. It should be kept in mind, however, that due to heavy breakage (pre-depositional, post-depositional and excavation), most of the bones were missing their diagnostic sections, making the identification of rarer species somewhat difficult. Still, the fact that readily recognizable skeletal elements, such as antlers, gazelle horncores or cervid mandibles were also very rare (one antler fragment and no mandibles) testifies to the accuracy of this percentage.

With the exception of red fox, *Vulpes vulpes*, which could easily represent intrusions to the archaeological matrix, the wild mammals at Tell Fadous-Kfarabida are middle to large sized game animals. The brown bear (*Ursus arctos*) is represented with a single third phalanx, which may indicate that only the hide of this individual was brought to the settlement. Other than the red fox and the brown bear, there are no other wild carnivores represented at Tell Fadous-Kfarabida.

Deer and wild boar appear to be the most important game animals, while the Caprinae were of minor importance in terms of hunting (**Table 7**). *Gazella* sp. (gazelles), common in the archaeological contexts of the Levant, is yet to appear in Tell Fadous-Kfarabida. Wild goat (*C. aegagrus*) and wild sheep (*O. orientalis*) are present, but very rare. The Mesopotamian fallow deer are represented by their limb bones, and perhaps with one antler tine fragment. Out of 23 specimens of *D. d. mesopotamica*, only five provided accurate measurements (**Table 8**, measurements following von den Driesch 1976). The wild/domestic status of the «wild boars» (*Sus scrofa*) at the site is not always very clear cut. There are some rather large juvenile specimens in the assemblage, which one would normally expect to belong to a domestic rather than wild population. Nevertheless, the occurrence of fused and large specimens, as well as large canines validates the occurrence of wild boar at Tell Fadous-Kfarabida. One specimen represents a partial skeleton consisting of the posterior autopodium (foot) of an adult wild boar, found among the debris from the fill of the Phase IV house (context 535).

Taxon	NIS	NIS %	WIS	WIS %
Capra aegagrus	4	7.8%	59.4	5.1%
(wild goat)				
Ovis orientalis	1	2.0%	4.1	0.4%
(wild sheep)				
Dama dama mesopotamica	23	45.1%	499.7	43.1%
(Mesopotamian fallow deer)				
Cervus elaphus (red deer)	3	5.9%	52.1	4.5%
D.d. mesopotamica/	3	5.9%	112.5	9.7%
Cervus elaphus				
Capreolus capreolus (roe deer)	1	2.0%	8.5	0.7%
Sus scrofa (wild boar)	13	25.5%	410	35.4%
Ursus arctos (brown bear)	1	2.0%	6.1	0.5%
Vulpes vulpes (red fox)	2	3.9%	6.5	0.6%
Total	**51**	**100.0%**	**1159**	**100.0%**

Table 7 - Overview of wild mammals in the Tell Fadous-Kfarabida assemblage.

Specimen no.	Element				
1504	**Scapula**	**SLC**	**GLP**	**LG**	**BG**
		23.7	45.1	34.5	30.4
1255	**Humerus**	**Bd**	**DT**		
		38.5	34.8		
2440	**Tibia**	**Bd**	**Dd**		
		40.9	33.7		
1512	**Metacarpus**	**DD**	**Bd**	**Dd**	
		19	36.4	23.5	
1278	**Metatarsus**	**Bp**	**Dp**		
		39.4	36.4		

Table 8 - Standard measurements of Dama dama mesopotamica from Tell Fadous-Kfarabida.

Domestic mammals

The bulk of the vertebrate assemblage consists of the remains of domestic mammals. Only one *ASINUS* (domestic donkey) tibia is present in the assemblage, a specimen that was uncovered in a non-stratified context locus 204) close to the topsoil in Area II. Dogs (*CANIS*) are extremely rare. Moreover 3 specimens (a mandible with teeth, a radius and an ulna), probably belonging to the same adult individual, were found in and close to the topsoil in Area II (contexts 700 and 703). This partial skeleton may just as well be representing a modern specimen.

Sheep and goats dominate the domestic animal assemblage in NIS (69.2%) but not in WIS (36.3%). The most important meat provider, as indicated by

the WIS percentage, is the cattle. The kill-off pattern for sheep and goats (based on tooth eruption and wear) shows that sheep and goats were used primarily for meat and wool/felt production **(Fig. 23)**. Milk production does not seem to have been a priority at EBA Tell Fadous-Kfarabida. Goats were more common than sheep (209:153). Epiphysal fusion and tooth eruption and wear data for cattle and pigs also indicate normal culling patterns: The kill-off pattern for cattle is similar to that of sheep and goats, but with a lesser percentage of individuals surviving into old ages (6+ years); domestic pigs have been culled while still very young for the most part.

Method of retrieval	**Hand sampling**				**Wet-sieving**			
Description	**NIS**	**NIS %**	**WIS (gr)**	**WIS %**	**NIS**	**NIS %**	**WIS (gr)**	**WIS %**
BOS (cattle)	455	23.2%	15161.3	56.9%	1	3.6%	13.5	25.9%
OVIS (sheep)	153	7.8%	1716.5	6.4%				
CAPRA (goat)	209	10.6%	2810.8	10.5%	1	3.6%	3.4	6.5%
OVIS/CAPRA (sheep or goat)	998	50.8%	5170.1	19.4%	25	89.3%	35.1	67.2%
SUS (pig)	143	7.3%	1737.3	6.5%	1	3.6%	0.2	0.4%
ASINUS (donkey)	1	0.1%	23	0.1%				
CANIS (dog)	6	0.3%	32.8	0.1%				
Total	**1965**	**100.0%**	**26651.8**	**100.0%**	**28**	**100.0%**	**52.2**	**100.0%**

Table 9 - Overview of domestic mammal remains at Tell Fadous-Kfarabida (nomenclature following Uerpmann 1993).

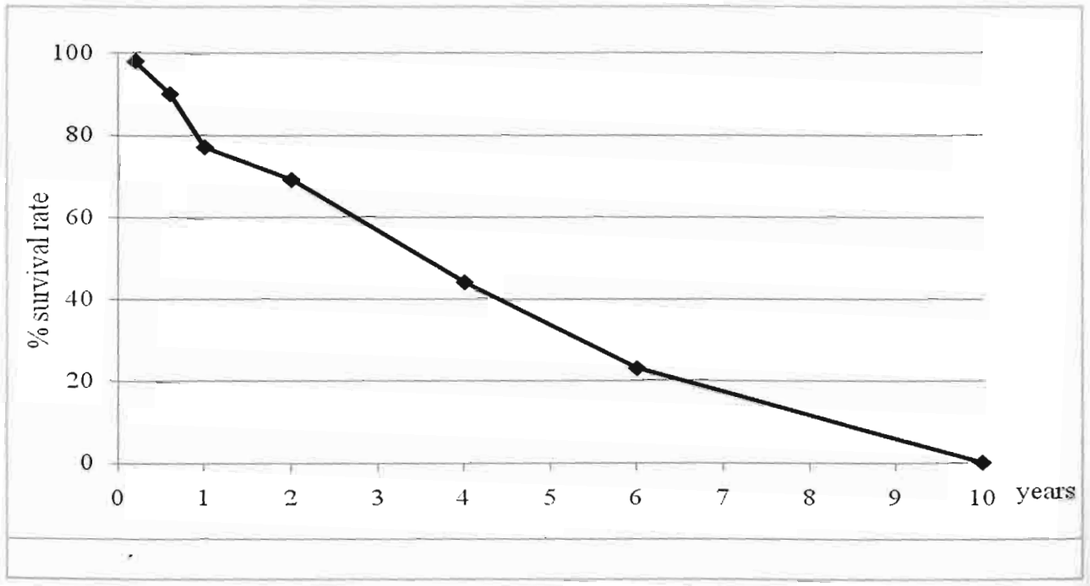


Fig. 23 - Kill-off pattern of sheep (OVIS) and goats (CAPRA).

There is an abundance of horn cores with skull fragments in the assemblage (73 specimens altogether of *BOS, OVIS and CAPRA*). Only a few occur as pairs belonging to the same individual (Added to the specimens found in 2007-9 excavations, is a goat horn core pair + frontal from the section cleaning in 2005). Accumulations of horn cores were found on the floor of Building 1, Room 1, and in lesser numbers in Room 2 of the same building (e.g. **Fig. 24**). This is also where *in situ* pottery was found **(Fig. 5)**. Other horn cores were present in the fill above the floors of these buildings, in other rooms and in street fills. Individuals of various ages are often represented in the same accumulation and juvenile and sub-adult individuals are very frequent. Very few (7 specimens) of these display butchery marks, which mainly cluster around the base of the cores on the skull. In one occasion, the cut mark on the skull indicated that the skull was split into two halves. How these horns were exactly used in EBA Tell Fadous-Kfarabida is not entirely clear. The fact that they were found in unmodified form, not necessarily in pairs, occasionally with butchery marks and mainly inside buildings and on floors suggests that they could be used as decorative items of certain symbolic meaning in living spaces.

Occasionally, domestic animals occur as partial skeletons in the archaeological matrix (altogether eight specimens, each partial skeleton counted as one specimen). Two of these (in contexts 400 and 407) are juvenile/sub-adult sheep/goat skeletons that should be associated with the Middle Bronze Age burials close to the surface of the mound. In addition to these partial skeletons, context 702, close to the topsoil in Area II and stratigraphically related to context 700 where a *Homo sapiens*' first phalanx was found, consisted entirely of exceptionally well-preserved adult goat bones, some of which may belong to the same individual. While context 702 has not been dated, deposits surrounded by it yielded Middle Bronze Age pottery. It is highly likely that these goat bones associated with human remain(s) are also associated with the Middle Bronze Age cemetery of Tell Fadous-Kfarabida. Another partial skeleton belongs to a neonate *SUS* deposited in a fill layer in Building 2. The preserved part is the forelimb, which may simply represent kitchen refuse. The two other partial skeletons, in context 613 (fill layer in the Phase IV house) and in context 1105 (stone collapse in Area I), belong to foetal or neonatal sheep or goat: In one skeleton the medial side of the metapodial diaphysis remains unfused, in the other it is in the process of fusing. Another sheep/goat partial skeleton was located in the foundation of a column base (context 245). Context 1107, directly below the stone collapse (context 1105) and in the soil layer covering the staircase in Area I, included neonatal bones belonging to another sheep/goat individual. Such extremely young intact or semi-intact specimens may represent ritual feasts.

Fig. 24 - A heavily encrusted goat horn core found in Locus 208 (Building 1, Room 2). Specimen no. 1256.

Discussion

The archaeofaunal remains from Tell Fadous-Kfarabida reflect the settlement's effective use of diverse ecological niches surrounding the settlement, with a strong emphasis on animal husbandry and marine exploitation. EBA inhabitants of Tell Fadous-Kfarabida kept cattle, sheep, goats and pigs. The large number of goats kept around the settlement must have imposed a heavy browsing pressure on the natural vegetation surrounding the settlement, turning the evergreen oak into a maquis landscape in time. Although, both the wood charcoal spectrum (Riehl and Deckers, in Badreshany *et al.* 2005) and the occurrence of deer species in the assemblage suggest a moist, partly wooded coastal landscape. On the other hand, the fact that wild mammals appear altogether in very low numbers in the assemblage may be indicative of a degrading terrestrial environment, strongly burdened by the impact of agriculture and animal husbandry in the vicinity of the settlement. The importance of cattle as primary meat providers is suggested by their high proportion as WIS.

A good amount of the subsistence activities at Tell Fadous-Kfarabida took place in or near the coastal waters. The molluscan spectrum represents a coastal environment similar to today; a rocky shore exposed to heavy wave action and sandy to sandy-pebbly bottoms in the infralittoral zone (slightly offshore). Limpet and topshell gathering took place mainly in the supralittoral zone (on rocky surfaces on the coast), and possibly just a 1-2 meters deeper. Other marine mollusks were probably collected on the beach as empty valves and snails. The limestone loving land snail *Helix* sp. must have thrived on the coastal hills around the site and on the settlement itself, providing the molluscan diet with an easily accessible food resource. Coastal waters were heavily fished. Demersal, mainly solitary fish were targeted probably off boats or on the shore using a hook and a line or by diving with spears. Offshore fishing expeditions after pelagic fish were rare. The fish spectrum is suggestive of a rocky mesolittoral indented by heavy wave action where species like *Epinephelus* and Sparidae can wander in relative safety, turning into a mixed rocky-sandy bottom a little bit deeper in the infralittoral. Marine turtles were an important meat provider. It is not clear from the current evidence whether they were caught in the sea or on the shore. Available nesting beaches in the vicinity of the site were restricted. Extant *Caretta caretta* (loggerhead turtles) populations prefer sandy beaches for nesting, whereas *Chelonia mydas* (green turtles) can use both sandy and gravelly beaches to lay their eggs. The pebbly beach south of the settlement, if in existence during the EBA, could have served as a capturing ground for green turtles. The freshwater sources near Tell Fadous-Kfarabida are only seasonally active, drying up during the summer months. The evidence for two freshwater species in the assemblage, the *Unio* valve from the 2005 excavations and the single *Tilapia* bone from the 2007-9 excavations, is too limited to argue for the perenniality of these freshwater sources during the EBA. These specimens could have been brought to the site from a distance.

Quantitatively, the present archaeozoological data from Tell Fadous-Kfarabida allows for general conclusions about the environmental conditions and subsistence strategies during the Early Bronze Age. The data has further implications about the ritual use of animals. For a meaningful diachronic and spatial evaluation of the archaeozoological data from the site, the database should be and will be expanded in the future.

Acknowledgements: I would like to thank Hermann Genz, Kamal Badreshany and Helen Sader for their fruitful collaboration in the Tell Fadous-Kfarabida project; Wim Van Neer and Wim Wouters for teaching me fish bones and allowing access to their rich collection; and last, but not least, to Helga Seeden who opened her beautiful Beirut home to me, making an interesting study stay also a very pleasant one.

III- Bone Tools from the 2007 – 2009 Seasons (E. J.)

Since archaeological excavation began at the site of Tell Fadous-Kfarabida a total of 51 worked bone objects, dated to different phases of Early Bronze Age, were collected. Two of them had already been discovered in section cleaning during the preliminary 2004 and 2005 seasons (Badreshany *et al.* 2005: 76-78) and are not included in the statistics presented below. More than half, that being twenty eight, of the assemblage of bone objects comes from the last (2009) season of excavation. This situation might be a result of reaching various floor level contexts on the site in this season, or the switch from employing workmen for manual labor to archaeological researchers and students at the site.

General Overview

Tools are the only worked bone objects found in Tell Fadous-Kfarabida (except for one object of unspecified function that will be described below in detail). These bone objects have tentatively been divided into four groups: points, spatulae, polishers and varia. Points constitute the largest group of tools including all the pointed objects, regardless the size or shape, with one or both tips sharpened. Perforation of soft materials, such as textile or leather was most likely their function. Spatulae are tools usually associated with weaving or basketry. They have a form of flat longitudinal plates usually narrowing down or rounded on both ends. Polishers or smoothing tools in this assemblage are represented by all the tools having blunt, worn-down working ends showing considerable abrasion resulting from continuous use. Last but not least, all the tools that did not easily fall into any of the above listed categories by means of shape or function were grouped together under the common title 'varia' and will be described in more details below.

The numbers of specific tools are presented in the table below **(Table 10)**. The significant dominance of Phases III and IV over Phase II, to which only few artifacts are dated, and Phases I and V, where no worked bones have yet been found, is easily noticeable. This disproportion results from the fact that Phase V was only represented by a few pits on top of the Tell, Phase II was only exposed in small section of the site, namely Room 1 in Building 1 **(see Fig. 2)**, and Phase I is so far only attested by the two child burials excavated in 2004 and 2005 seasons (Badreshany *et al.* 2005: 28-29). It is also clear from the table that points greatly outnumber the other tool types, which seems to be a situation common for EBA Levantine sites (Amiran *et al.* 1978; Marshall 1982; Doumet-Serhal 2006).

Not many reports presenting comparative material have been published, but it seems that the inhabitants of Tell Fadous-Kfarabida produced a relatively large quantity of bone tools. By contrast, only fourteen worked bone objects are published in the report covering three seasons of excavation in Sidon (Doumet-Serhal 2006: 277) where the excavated area was larger than that of Tell Fadous-Kfarabida. In the Early Bronze Age layers in Jericho, which is a site considerably larger and excavated for a much longer duration, the worked bone assemblage contains twenty objects (Marshall 1982: 616-619). Another example of an EBA site producing bone tools and implements is Arad. The amount and variety of worked bones found there is incomparably greater than the Tell Fadous-Kfarabida collection, but so is the site (Amiran *et al.* 1978: 57).

	POINTS	SPATULAE	POLISHERS	VARIA	Total	Total %
Phase II	5	-	1	-	**6**	12.2
Phase III	12	4	1	5	**22**	44.9
Phase IV	8	1	3	1	**13**	26.5
Unstratified	5	1	2	-	**8**	16.4
Total	**30**	**6**	**7**	**6**	**49**	**100**
Total %	61.3	12.2	14.3	12.2	**100**	

Table 10 - Numbers of particular tool types present in different Early Bronze Age phases.

Zooarchaeological Analysis

The material (with exception of the artifacts collected during the last two weeks of the 2009 season) was studied from a zooarchaeological perspective by Dr. Canan Çakırlar, whose analysis enabled drawing conclusions about the animals utilized for bone tool manufacture in Tell Fadous-Kfarabida. Resulting from modifications that bones undergo in order to become a tool, it is often impossible to identify both the part of the body and the animal from which the bone is derived, hence the considerable percentage of unspecified mammals of various sizes present in the graph below **(Fig. 25)**. All the tools were produced of long bones or ribs of mammals.

As can be seen on the graph a great majority of the tools was produced of bones of domestic animals, predominantly sheep/goat and cattle. Those three species, according to faunal analysis (Çakırlar, this volume), were also the most commonly consumed in the EBA Tell Fadous-Kfarabida, which explains their abundance in the worked bone assemblage. One tool was produced of a bone originating from a domestic pig. This mammal was not very popular among the animal skeletal remains collected, constituting only 7.3 % of the whole assemblage (Çakırlar, this volume). Wild animals were only represented by two tools, of which one was made of a fallow deer bone and one can most likely be ascribed to a boar. Fallow deer and wild boar are in fact the most common wild animals attested on the site, but their role in general was not significant with the total number of all wild mammals adding up to only 1.5% of the skeletal assemblage.

Contextual Analysis of Selected Artifacts

Due to the preliminary character of this study the results can only be of limited scope. The tools coming directly from the floor contexts of the three buildings discovered at the site, as well as several examples deserving special attention for other reasons, will be presented in more detail. They will be organized by the phases they belong to.

Only one tool belonging to Phase II comes from a secure floor context. It is a small sized pointed tool **(Pl. 5: 1)**, with all sides smoothed from wear or the manufacturing processes, with an almost perfectly rounded cross section. Unfortunately both ends of the tool are broken off, therefore, the complete shape cannot be fully reconstructed.

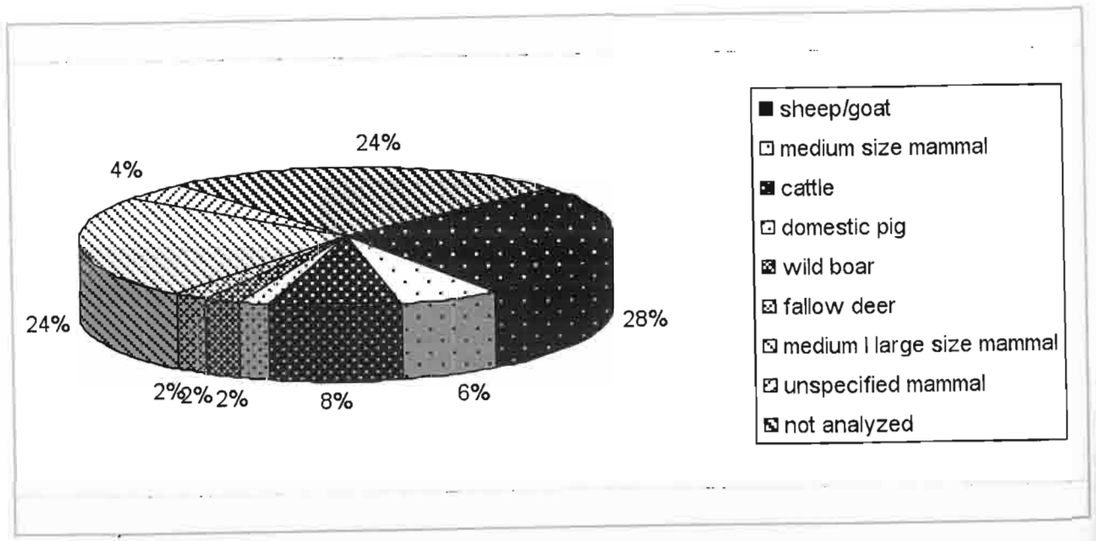


Fig. 25 - Animal species represented in the bone tool assemblage.

Phase III on the other hand produced a relatively large number of artifacts retrieved from the floor deposits of the EBA II buildings. All but one item have been collected from Building 1. Four points or perforating tools, three spatulae and two other worked bone objects of various shape and size were found in this building. From the floor in Room 2 two nearly complete perforating tools were collected **(Pl. 5: 3, 7)**, as well as all the spatulae. Two of them were also nearly complete, with only one of the very tips missing in each of them **(Pl. 5: 8, 9)**. The third one was missing a larger part of one of the working ends **(Pl. 5: 10)**. They were all manufactured in the same way and display the same characteristics. A plate cut out of a rib bone of a medium to large sized mammal was shaped by creating a narrowed, more or less sharp tip at each end of the tool. The outer sides and edges were smoothed by either wear or manufacturing processes, but the inner side retained the natural bone structure that was only in one case worn down to the point when the surface was mostly flat **(Pl. 5: 8)**. The other two points were found in the other room (Room 1) and they were both missing the handle extension of the tool **(Pl. 5: 2, 4)** that cannot be reconstructed. Despite different shapes, sizes and functions all the perforating tools were made of long bone splinters that were only properly smoothened on the outer surface and edges.

The two remaining worked bone objects found on the floor in Building 1 belong to the group called 'varia'. One of them is a knife-shape fragment of bone, of which a portion of the handle is broken off **(Pl. 5: 6)**. All the surfaces and edges are polished or smoothed by wear. A few cut marks are visible perpendicular to what would be the cutting edge if we were dealing with an actual knife. This edge is generally uneven and one can clearly see that it was the working edge, but it definitely is not, and it does not seem like it ever was sharp enough to really cut anything. It was found in the vicinity of the two partially preserved points in Room 1. The second specimen was already mentioned above, as the one object that might not be a proper tool, but more of a pendant **(Pl. 5: 5)**. The actual function, however, remains unknown. It is a flat plate made of a long bone shaft fragment belonging to a large mammal. Even though a piece is missing on one end of the tool it is clear that the plate was perforated in that part. The preserved end is rounded and slightly wider than the rest of the object, which edges are parallel to each other. All surfaces are covered with traces of manufacture (or use?). It was found in the same context (context 522) as most of the tools from Room 2.

One more tool dating to Phase III was discovered in Room 2 of Building 2. It is a relatively flat long bone splinter with perforation on one end and narrowing down towards the other end, which is unfortunately missing **(Pl. 5: 12)**. It could have been a perforated awl (point) or a spatula, although the latter type was usually made of ribs rather than of long bones.

Two more interesting bone objects were retrieved from layers belonging to Phase III. The first one, found in Room 3 of Building 2 in the fill layer not very high above the floor, was a rectangular longitudinal flat bone bar with holes drilled parallel to the shorter sides on both ends and in the middle of the object **(Pl. 5: 14)**. Remarkably, the perforation in the middle shows two openings on one side, whereas only one is visible on the other side. What seems to have happened is that the first hole was drilled at a wrong angle and therefore stops before reaching the surface, and only the second try appeared to be successful. The tool can be interpreted as a beam of a scale, which is confirmed by the parallels, coming from various EBA sites in Anatolia and the Aegean (Rahmstorf 2006: 72 and Abb. 10: 24-27). The examples presented there are slightly different in shape, with more rounded than rectangular cross sections, but the general idea seems to be the same.

The second object that might belong to Phase III was found under the floor of the EBA III building. It is a roughly circular in section longitudinal bone fragment, worked from all possible sides into a highly irregular shape **(Pl. 5: 15)**. The tips are narrowed down and, as opposed to the rest of the surface of the object, are not very

smooth. Although traces of wear/manufacture are visible on the surface, most of it is actually smooth and, therefore, gives the impression of being the final product and not an unfinished tool of some known type.

Only two points belonging to Phase IV were collected. One of them is a very small (4 cm long) needle-like tool **(Pl. 5: 11)**. The handle part of might have been broken off so the tool could have originally been larger, but with its thickness it could not possibly be much longer than it was at the moment of discovery. The other tool is a simple point made of a long bone splinter, the tip of which is circular in section, bearing visible traces of manufacture on the outer surface **(Pl. 5: 13)**.

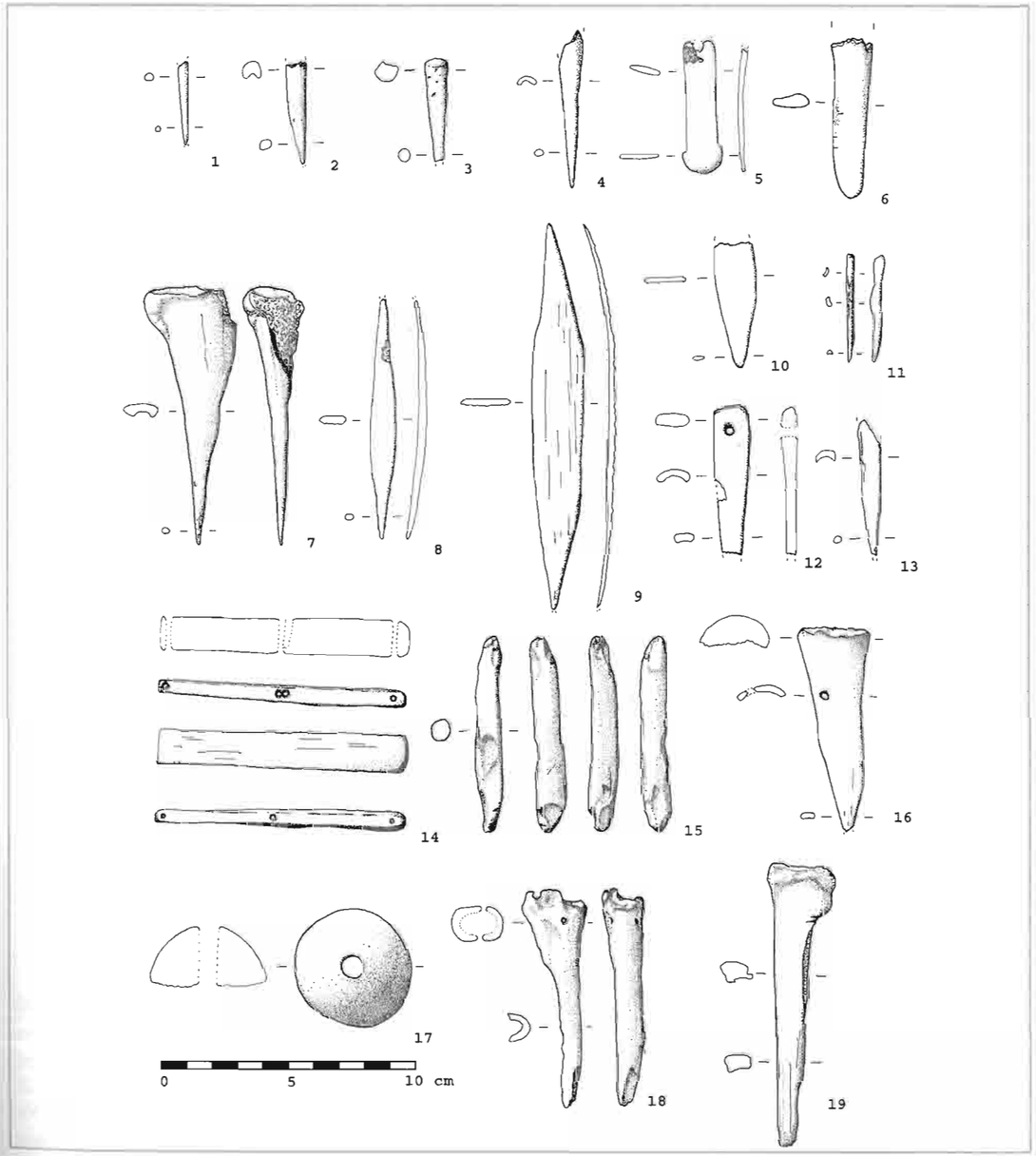
Three more tools were retrieved from fill layers dating to this phase as well. One of them is a wide perforating tool with a hole drilled on the level of one-third of its length closer to the handle on the side of the tool. The outer surface is smooth with some traces of wear/manufacture visible. The very end of the tip is broken off **(Pl. 5: 16)**. The tool was found in the fill within the EBA III house boundaries. The second tool is rather peculiar when compared with the bone tool assemblage from Tell Fadous-Kfarabida. It is a spindle whorl made of a part of the head of a rather large long bone, with a perforation in the very middle of it **(Pl. 5: 17)**. The side by which the fragment was connected to the rest of the bone remained unworked and shows the natural coarse structure of the spongy matter of the bone. The last EBA tool that falls into the scope of this study is representing the group of polishers **(Pl. 5: 18)**. The handle of this specimen is a natural joint surface of the bone. There is a perforation going all the way through this handle. Below the epiphysis the shaft of the bone was split diagonally and the working end was flattened.

Conclusions

As mentioned above, the number of bone tools in the Tell Fadous-Kfarabida assemblage is relatively large. This might be a result of careful collection methods including flotation, as well as separating worked objects from among the faunal remains. Points and spatulae, as well as the spindle whorl indicate the possible existence of a weaving industry, which is further supported by a few stone loom weights also found at the site. The concentration of tools in Room 2 of Building 1 suggests that the activities related to this industry might have been conducted in this particular place. This is also where the most of the horn cores, although with no visible trace of use, were found (see Çakırlar, this volume). However, further evidence is required to lend support to this idea. From the zooarchaeological perspective no specific preferences regarding the species utilized can be observed, and it seems like the mixture of animal species represented by the bone tool assemblage is a direct reflection of the general trend existing in the animal consumption at the site.

The Middle Bronze Age

One additional tool that seems worth mentioning is the only specimen dated to the Middle Bronze Age (Phase VI) found so far at the site. The tool bears various traces of manufacture and wear and based on its shape the function is not very clear **(Pl. 5: 19)**. If it was to be assigned to any of the general Early Bronze Age sub-groups, it would probably be allotted to the polishers. The handle is formed by almost the complete epiphysis, a portion of which was chipped off together with half of the shaft. Some deep cut marks can be found under the epiphysis on the side of the shaft and the surface created by those cuts on the bottom of the epiphysis is smoothed by wear. The shape of the remaining part of the shaft is very irregular, but is evidently worked on all edges and the inner side, while the outer side is only slightly polished. The tip is flattened by wear. The interesting observation about this specimen is that it was made of a deer bone. The tool was found embedded in a compact surface, possibly a floor, together with many Middle Bronze Age sherds. Unfortunately, since it is the only worked bone object in the Tell Fadous-Kfarabida assemblage dating to the Middle Bronze Age, no further interpretation can be attached to this discovery.



Pl. 5 - 1. FAD09.285/295.396 (context 236; Phase II); 2. FAD08.285/295.171 (context 222); 3. FAD07.285/295.295 (context 218; Phase III); 4. FAD08.285/295.199 (context 222; Phase III); 5. FAD09.290/295.204 (context 522; Phase III); 6. FAD08.285/295.208 (context 222; Phase III); 7. FAD09.290/295.209 (context 522; Phase III); 8. FAD09.290/295.196 (context 522; Phase III); 9. FAD09.290/295.202 (context 522; Phase III); 10. FAD09.290/295.214 (context 522; Phase III); 11. FAD09.290/300.92 (context 614; Phase IV); 12. FAD09.285/305.197 (context 451; Phase III); 13. FAD09.290/295.295 (context 537; Phase IV); 14. FAD09.290/305.124 (context 714; Phase III); 15. FAD09.290/300.100 (context 615; Phase III); 16. FAD09.290/295.265 (context 535; Phase IV); 17. FAD09.295/295.31 (context 802); 18. FAD09.290/305.176 (context 703); 19. FAD08.250/285.59 (context 1209; Phase VI).

IV- The Ground Stone Assemblage (A. D.)

Introduction

Ground stone artifacts provide a growing source of interest among archaeologists working in the Levant, but their study remains limited by numerous factors, including the absence of published data for comparison and consistent terminologies within those studies (Wright 1992; Merluzzi 2000; Ebeling and Rowan 2008). The studies that do exist come almost exclusively from the Southern Levant, and often from large, multi-period urban centers, such as Jericho and Megiddo, which contribute little towards the understanding of the production, use and exchange processes taking place in smaller cities, villages and rural communities (Ebeling and Rowan 2008; Milevski 2008). These processes have been explored very little in the Northern Levant, and, for the protohistoric periods, have not been explored at all in Lebanon[11].

This report has particular emphasis on the ground stone artifacts collected and recorded during the 2009 season of excavation at Tell Fadous-Kfarabida, but considers all ground stone artifacts collected from 2004-2009 for quantitative purposes. The classification system is based on that proposed by Wright (1992) for Levantine ground stone assemblages. Terminologies used generally conform to Wright's suggested glossary, with a few notable exceptions: the distinction between «grinding slabs» and «querns» has been dissolved, with «grinding slabs» remaining the sole term used to refer to the lower stationary stone in a pair of grinding tools, as macroscopic use-wear traces suggest that these stones were used for both rotary and lateral grinding at Tell Fadous-Kfarabida. «Mobile/stationary,» rather than «upper/lower,» are the preferred adjectives to describe the relative roles of paired processing tools[12]. Additional classifications have been preliminarily added where no existing terminologies were suitable.

Raw Materials[13]

The vast majority of groundstone objects from Tell Fadous-Kfarabida are made of fossiliferous limestone, which is abundant in the immediate vicinity of the site and along the length of the Lebanese coast. Other materials used include water-worn sedimentary «beach» pebbles, available both along the shoreline and throughout the alluvial fan on which the site sits, vesicular and non-vesicular basalt, and one instance each of sandstone, anthracite and carnelian. Despite the superficial homogeneity of the raw materials present, macroscopically observed variations in the fossil makeup of the limestones indicate that certain variations of limestone were exploited differentially for certain tool types. As the site lies on a coastal strip of exposed Sannine limestone overlaid by fluvial runoff containing mixed pebbles and boulders, this range of materials would not have been difficult to isolate and extract (Nader in Badreshany *et al.* 2005). Although such a marked preference for limestone over basalt is unusual, this may be explained by the site's distance from naturally occurring basalt sources; it is also possible that the rough, fossiliferous makeup of the local limestone was enough to mimic the desireable vesicular nature of basalt, thus reducing the need for constant re-pecking and minimizing the grittiness that often characterizes limestone tools, although further study is needed to assess this.

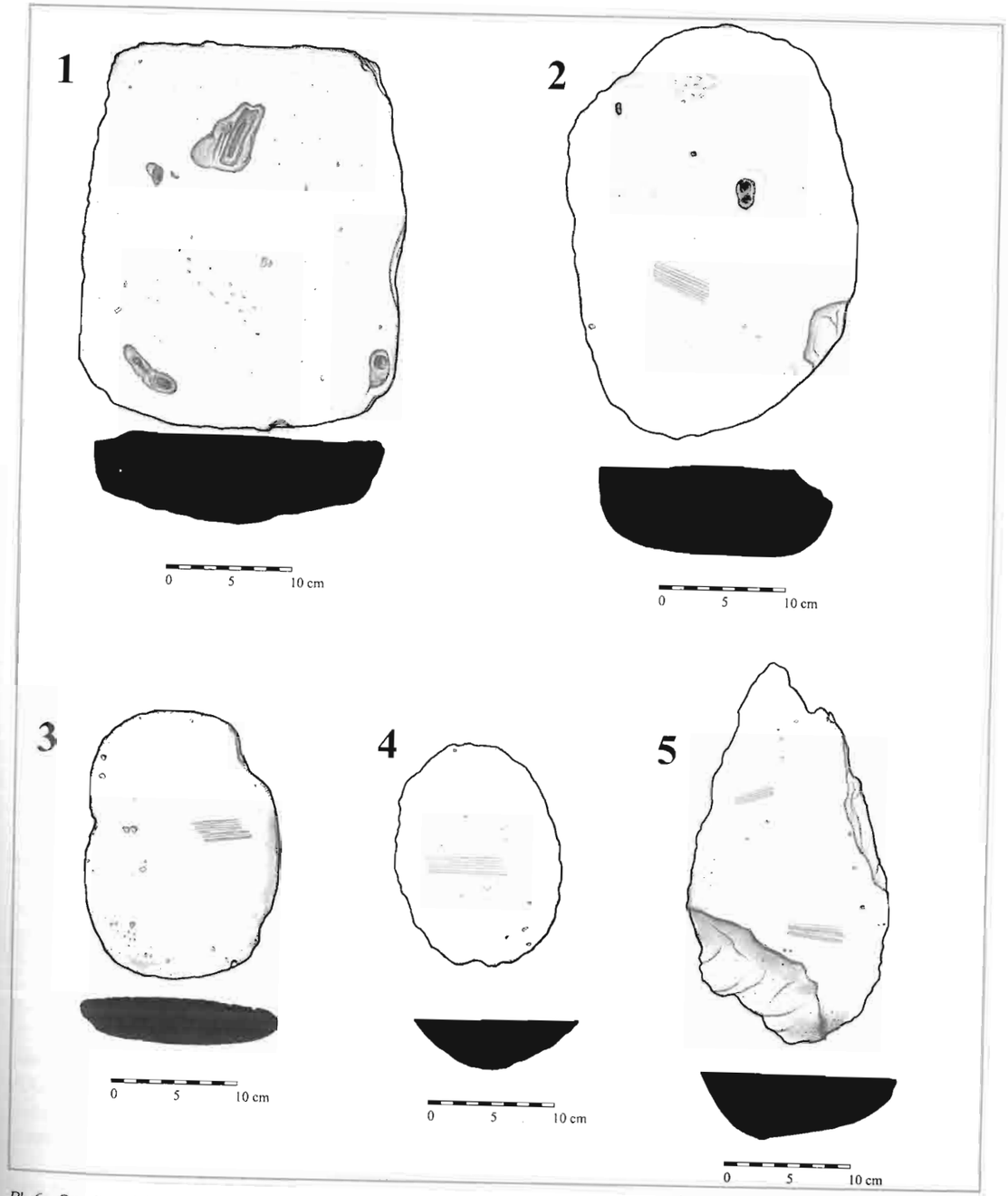
The Domestic Assemblage

Processing Tools

Grinding slabs (Complete = 10; Incomplete = 4)

None of the complete grinding slabs are particularly large or heavy, suggesting that they were used for producing relatively small amounts of ground material at a time, as would be suitable for daily household intake. Two general shapes have been recovered (**Pl. 6: 1-2**), rectilinear and ovate, but one complete and several incomplete artifacts imply that other shapes were in use as well.

The most common shape (4 complete, 2 incomplete), is ovate in plan and plano-convex with a flat base in transverse section, with a flat or slightly



Pl. 6 - Grinding slabs: 1. FAD09.290/295.187 (floor of Building 1, Room 2); 2. FAD04.0.12 (surface context); Handstones: 3. FAD08.285/295.176 (from cooking pot on the floor of Building 1, Room 1); 4. FAD08.285/295.186 (from storage bin in Building 1, Room 1); 5. FAD09.290/295.103 (from the floor of Room 2, Building 1); all except 1 show grinding striae.

concave, open use surface. All were made from fossiliferous limestone. All of the artifacts show some pecking on both the face and the dorsal side, and two of the slabs have visible lateral grinding striations on the face. This shape is typical of Early Bronze Age sites in the Levant (Byblos: Dunand 1958: Fig. 528; Hama: Thuesen 1988, 160-161; Jericho: Kenyon 1957: Fig. 14, Dorrell 1983, Fig. 230; Sidon: Doumet-Serhal 2006: Pl. 173a: 7-8; Tell Arqa: Thalmann 2006: Pl. 134).

The second most common shape (5 complete) is rectilinear in plan and oval or subrectangular in transverse section with a flat, open use surface. Grinding slabs of this shape are also the largest and heaviest of the complete artifacts, with mean measurements of 29.25x30 cm and a mean weight of 9 lbs. Three examples are of locally abundant fossiliferous limestone, while two are of highly vesicular basalt. Most show evidence of both lateral and rotary grinding on a single use surface. One of the limestone examples has aligned drill marks on the face, showing that it was likely used for purposes other than grinding. Basalt comparisons are seen at Ebla (Merluzzi 2000: Fig. 2), Hama (Fugmann 1958: Fig. 30: 7C 148) and Qiryat Ata (Rowan 2003: Fig. 6.1:1).

One limestone grinding slab is «pear-shaped» in plan, and plano-convex in transverse section. There are traces of light pecking on the face, while the dorsal side is worn entirely smooth. This tool could have served as both a lower stationary slab and a two-handed mobile handstone. Two of the incomplete basalt tools suggest a «saddle-shape,» but damage is too extensive for conclusive classification at this point.

Handstones (Complete = 9; Incomplete = 3)

The handstones have three general shapes, with limited variation among them **(Pl. 6: 3-5)**. All handstones are made of vesicular basalt.

The majority of the handstones (6 complete, 2 incomplete) are unifacial ovate or «teardrop-shaped» in plan, with a rounded wedge-like transverse section defined by sharp edges at the use surface **(Pl. 6: 5)**. All have pecking on the face and a well-smoothed dorsal side. With mean dimensions of 20.16x13.90x4.6 cm and an average weight of 2.41 lbs, handstones of this shape are the largest of those recovered, and would have necessarily been manipulated with two hands. It is this weight and the heavy pressure that could have been applied with them that creates the distinctive sharp edges on these tools, and distinguishes them from softer-edged stationary stones (this is also seen at Dayr 'Alla: Petit 1999: 149). Three have clear, uneven lateral striations on the face and one has what appears to be a combination of lateral and rotary striations on the face, and the other two are too worn for use wear to be visible.

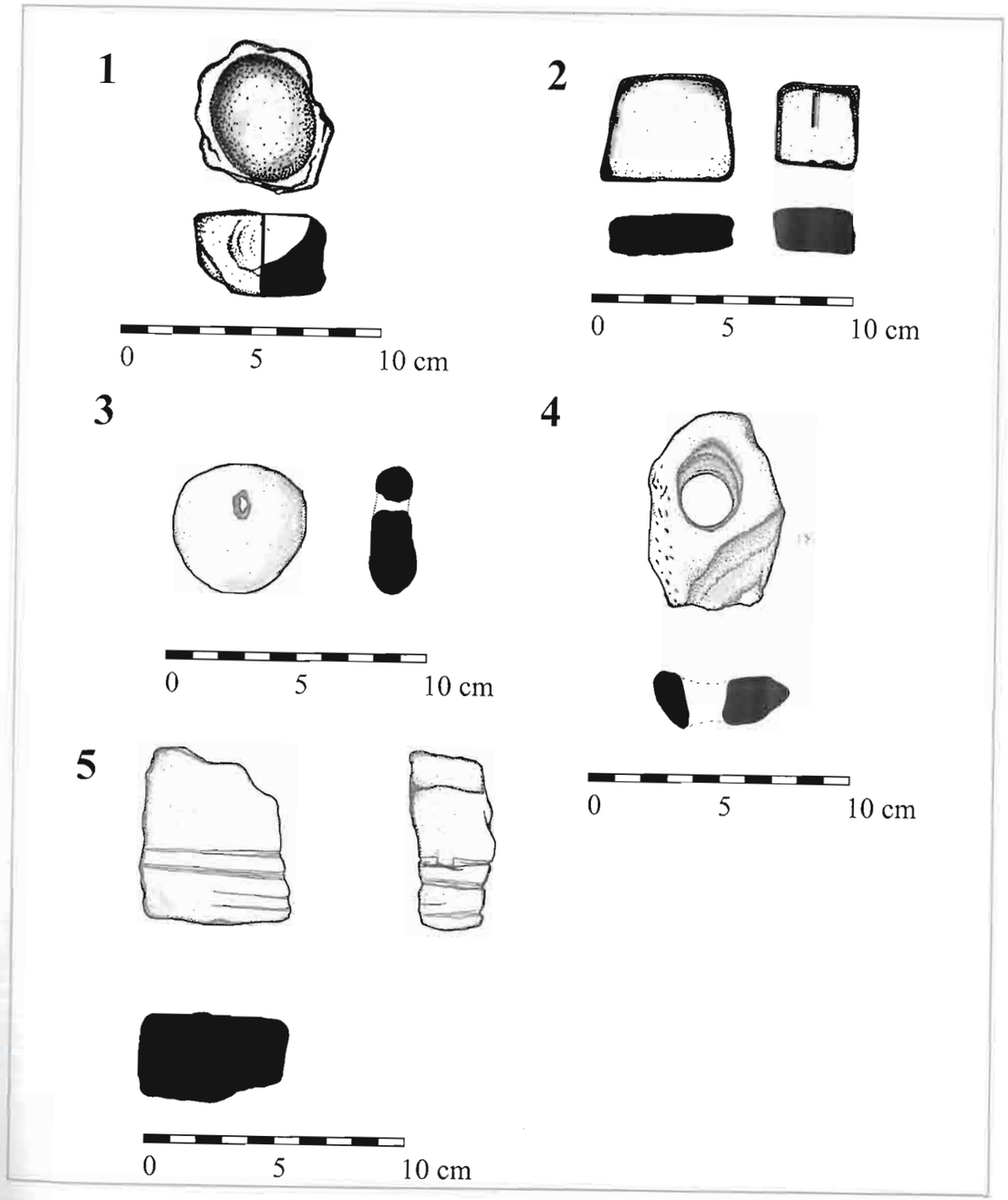
A second shape is represented by one artifact made of non-vesicular basalt. It is rectilinear in plan and flat in transverse section with gently rounded edges and corners **(Pl. 6: 3)**. Fine, regular lateral striations on one face and evidence of pecking on both faces, in combination with its flat, bifacially symmetrical morphology, suggests that it was intended to function as a bifacial tool. This tool's function is unclear, and requires further study; although it is small, it is both too thin and too wide for its weight to be comfortably manipulated with the hands. However, the chipped indents along the edges do suggest some preparation for the stone to be gripped in the hands, raising the possibility that it was used in fine, small-scale grinding activities for which the stone would have been supported in one hand as a stationary base while smaller rubbing pebbles or handstones were used for the active grinding or abrading. The closest parallel was collected by Copeland and Wescombe from Tell Hachbai in northern Lebanon, and is referred to as a «basalt rubber,» (Copeland and Wescombe 1966: Pl. 11b:11).

The final shape is represented by two complete unifacial ovate handstones, plano-convex in transverse section, symmetrical and finely shaped with lateral striations **(Pl. 6: 4)**. One incomplete example is also present.

Abrading and Polishing Tools (5 complete, 1 incomplete)

Three possible abrading pebbles and three polishing pebbles were recovered during the 2009 season. «Abraders» or «rubbers» are not always clearly distinguishable from small handstones, and indeed, these tools most likely were multifunctional.

Three small, cherty limestone tablets are well ground into geometric shapes with rounded corners and squared edges **(Pl. 7: 2)**. Two are



Pl. 7 - 1. Small limestone mortar FAD09.290/295.258 (context 532; from fill in the Phase IV building); 2. possible abrading pebble: FAD09.285/295.436-7; perforated stones: 3. FAD09.285/305.245 (context 458); 4. FAD09.290/305.104 (context 710); 5. grooved stone: FAD09.290/300.51 (context 609).

complete, one rectangular and the other trapezoidal, while the third is incomplete but was likely roughly cuboid. Morphological comparisons are seen throughout the Levant, but interpretations of the function of such small geometric stones varies greatly. They have been termed many things, among them «tokens» (Rowan *et al.* 2006: 585; Rowan and Golden 2009: 67), «amulets» (Bar-Adon 1980: Ill.24: 2), or «rectangular pebble» (Dunand 1954: Fig 307: 9387). Here, evidence of fine lateral striations on the surface of one of the stones is suggestive of abrading use, while the soft, chalky surface leaves this open to reinterpretation (also see Wright 1992: 70; Rowan 2003: 187).

The three polishing pebbles are small, naturally smooth sedimentary «beach pebbles,» of the type still common today along the coast and around the site. They have a high polish on both surfaces and two have very fine, very regular abrading striations on one face **(Pl. 7: 3)**. With average dimensions of 9.5x8cm, they fit into one hand and could have been used either as a mobile polishing abrader used against a stationary surface or as a handheld stationary tool.

Miscellaneous Fragments (7)

Seven fragments of basalt processing tools were found. These could be identified as parts of grinding tools due to remaining fragments of use surfaces, but not enough remained to confirm their original size or morphology.

Mortars (7 complete, 2 incomplete)

Six mortars were recovered during the 2009 season, of which four were complete, and three complete mortars have been recorded from previous seasons.

All complete artifacts from 2009 were small limestone pebble mortars with shallow u-shaped concavities (mean depth = 16.25 mm; **Pl. 7: 1**). All except one of the artifacts has rotary use-wear striations on the interior; this exception also appears to be an unfinished piece. Examples of similar limestone pebble mortars from the Early Bronze Age come from Qiryat Ata (Rowan 2003: Fig. 6.2:12-13) and Jericho (Dorrell 1983: 553).

All the pebble mortars were formed from natural pebbles of sandy, highly fossiliferous limestone. Under a handheld magnifying lense it was possible to identify a fossil composition containing mollusk bivalves, Nevinea type gastropods, and a high sand component, consistent with Cretaceous limestones as appear in the Abeih formation of Lebanon (Dr. Ali Haidar, personal communication). These artifacts offer great potential for further petrographic analysis to investigate material provenience.

The remaining three complete and two incomplete mortars are limestone boulder mortars **(Figs 26 and 27)**. They are made of dense, hard micritic limestone, which is widely available in the area and throughout coastal Lebanon. They both have broad u-shaped concavities and roughly rounded exteriors. The bases are the most roughly shaped part of the stone, as these tools were set into

Fig. 26 - Limestone mortar context 220 in Room 2 of Building 1 (Phase III).

Fig. 27 - Limestone mortar context 220 in Room 2 of Building 1 (Phase III).

the floor or working surface rather than on top of it (also evidenced by the *in situ* examples). While the mortars themselves are fairly large, their use surfaces are proportionally shallow (mean dimensions = 55.1x52.4x32.1 cm, mean use surface depth = 9.7 cm); as such, their size is likely related to the technique and position of those using them rather than to particularly large production quantities.

Pounders and Pestles

Seven pounders, four small pounder pestles and one pestle/handstone were recovered during the 2009 season **(Pl. 8: 1-2)**. All pounders and pestles are made of fossiliferous limestone.

It is likely true that most pestles served some crushing functions as well as grinding. The compact design of the four small pounder pestles combines the conventional morphologies of pounders and pestles in a way that seems uniquely intended to absorb more battering impact while the cylindrical shape would still allow for easy manipulation as rotary grinding tools. Comparatively, the single pestle/handstone is better suited to flat grinding and vertical crushing; it is ground flat on all sides, elongated rectangular in longitudinal plan and subrectangular in transverse section (a match for this type is found in Wright 1992: No. 138).

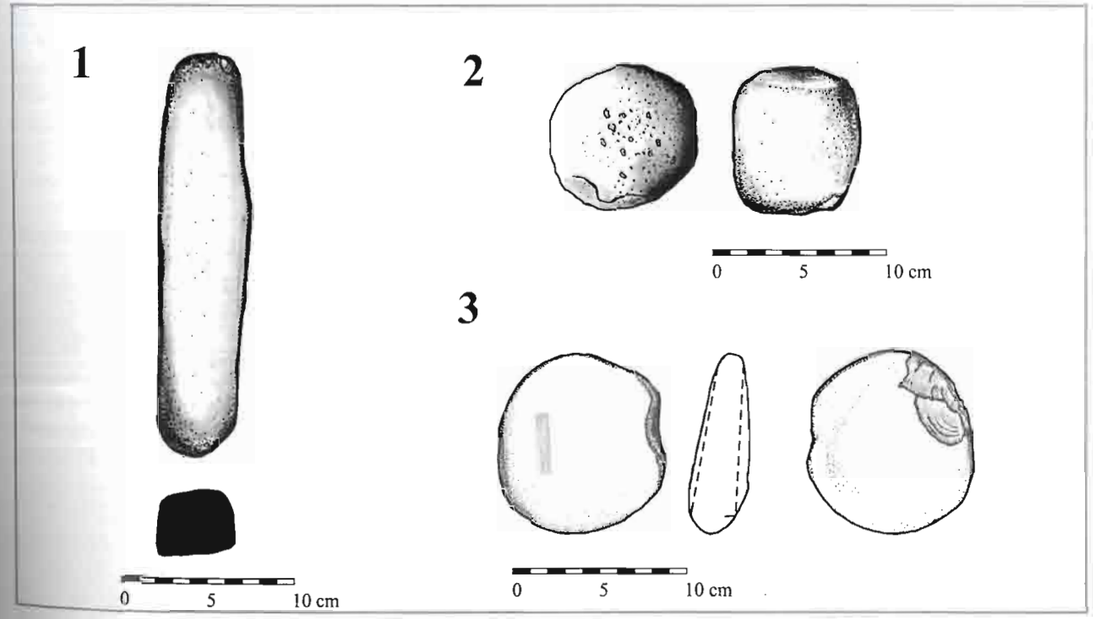
Of the seven pounders, five are made of limestone, one of cherty limestone, and one of flint. They are roughly spheroid, and all show evidence of battering at both poles.

Other domestic objects

Perforated Stones (Complete = 13; Incomplete = 8)

A total of 21 perforated stones of various sizes have been collected at Tell Fadous-Kfarabida (excluding the beads and pendants, described below). Most are medium to large limestone pebbles or sedimentary «beach pebbles,» either naturally shaped or ground to be roughly symmetrical, rounded triangular or ovate with one perforation set into the narrower end of the artifact **(Pl. 7: 3-4)**. Many of the incomplete artifacts are broken at the top of the perforation, where the stone would have been weakest and undergone the most stress.

Similar artifacts are commonly identified as counterpoise weights, although they may equally have served as sinkers, a possibility which should



Pl. 8 - 1. handstone/pestle FAD09.285/300.179; 2. pounder/pestle FAD09.290/295.279 (context 502); 3. polishing pebble with fine abrasion striae FAD09.290/305.131 (context 714).

be taken under particular consideration at this site, given its coastal position and the evidence for extensive fishing (see Çakırlar, this volume). Comparisons are seen throughout the region (Ebla: Merluzzi 2000: Fig. 11; Nahal Mishmar: Bar-Adon 1980: Ill.57; Qiryat Ata: Rowan 2003, Fig. 6.2: 9).

Three of the perforated stones are significantly larger and heavier than the rest. There are two shapes: the largest is a rough rectangular block formed from a small limestone boulder through chipping and abrading to flatten the surfaces, while the two smaller examples are triangular with rounded corners and naturally smooth surfaces. One of the triangular artifacts has two perforations at two different narrow points, one of which is broken; this could either have been part of the original design, or may represent reuse of the object after the first perforation broke. An additional incomplete artifact is ambiguous, as all that remains is the perforated end, which suggests a large rectangular shape. Comparisons are variously interpreted as large weights, digging weights, or small anchor weights (Amiran *et al.* 1978: Pl. 76; Merluzzi 2000: Fig. 11; Rowan 2003: 189; Frost 1969).

Finally, there is one incomplete example of a centrally perforated disk that likely functioned as a spindle whorl **(Fig. 28)**. It is the only sandstone object in the assemblage, and has a maximum preserved diameter of 5.8 cm and a perforation diameter of .7 cm. Similar objects are common in a variety of materials, throughout the Levant (For instance, Arad: Amiran *et al.* 1978: Pl. 76:7-27; Hama: Thuesen 1988: 166-167; Sidon: Doumet-Serhal 2006: Pl. 173a:1-5; Qiryat Ata: Shamir 2003: Fig. 7.5).

Fig. 28 - Spindle whorl FAD09.290/305.61 (context 702).

The Decorative and Miscellaneous Assemblage

Beads and pendants (Complete = 10, Incomplete = 1)

There are few studies of late prehistoric beads from the Levant (Wright's works on Neolithic beads from the Southern Levant are a notable exception; Wright *et al.* 2008; Wright and Garrard 2003; as is Pinnock's study of the beads from Ebla: Pinnock 1993), and therefore neither standardized descriptive terminology nor broad regional comparisons are readily available. As such, these objects are only briefly presented here according to Beck's general conventions (1928), and their study will be further developed separately at a later date.

There is a marked preference for fine grained limestone over other raw material types; 6 of the pieces are of this material, compared to one of basalt, one of sedimentary beach rock, one anthracite and one of carnelian from the Middle Bronze Age levels **(Fig. 29)**. Of the 7 artifacts which can securely be dated to the Early Bronze Age occupation phases of the site, this ratio increases to 6 limestone pieces to 1 basalt and 1 sedimentary beach rock.

The beads are all circular, including four sub-classes: circular sphere, short oblate, circular disk, and short cylinder **(Figs 30 and 31)**. There are three pendants, consisting of two circular rings **(Figs 32 and 33)** and an ovate «drop» pendant **(Fig. 34)**.

Unfortunately, most of the likely EBA beads come from mixed fill deposits, but they do seem to be particularly concentrated in the newest excavation areas opened to the north of Building 1; future excavation will clarify if this is an accurate impression. Comparisons of disk beads can be seen from the Early Bronze Age at Hama (Thuesen 1988: Pl. LII: 4) and the late Chalcolithic at Byblos (Dunand 1973: Pl. CLXVI: 33803), while spherical carnelian beads are also seen from the Early and Middle Bronze Age at Byblos (Dunand 1958: Fig. 863: 14136).

Fig. 29 - Carnelian bead FAD08.250/285.19 (context 1208, Phase VI).

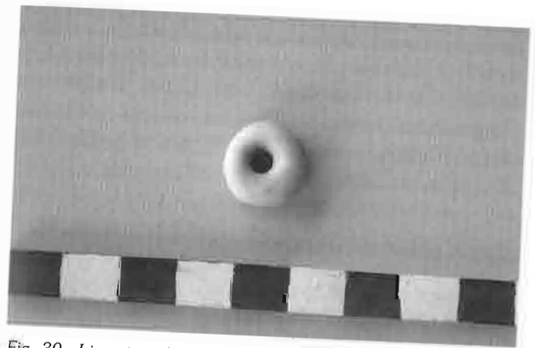


Fig. 30 - Limestone bead FAD09.295/295.39 (context 802).

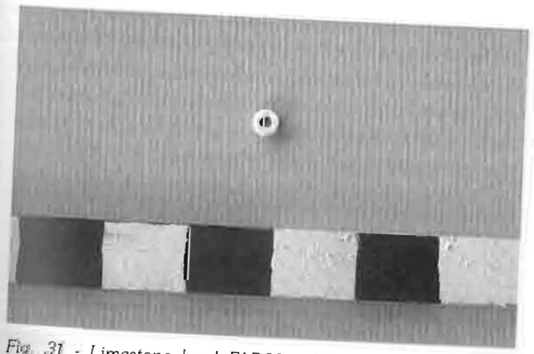


Fig. 31 - Limestone bead FAD09.290/305.169 (context 715, Phase III).

Fig. 32 - Basalt pendant FAD09.285/295.303 (context 244, Phase II).

Fig. 33 - Limestone pendant FAD09.295/295.30 (context 802).

Fig. 34 - Pendant, cherty limestone, FAD09.295/295.54 (context 803).

Grooved Stones

Large (2 incomplete)

These two large, ovate limestone cobbles have smoothly ground surfaces and tapered ends with wide circumferential, v-shaped lenticular grooves (previously published in Badreshany *et al.* 2005, Pl. 15:3). The grooves are uniformly wider and deeper on the lateral than on the longitudinal sides. They have very similar dimensions (26x18x14 cm and 24x15x16 cm).

Similar artifacts from the Early Bronze Age generally have been interpreted as battering tools in quarrying and stone dressing activities (Merluzzi 2000; Waelkens *et al.* 1992). Although quarrying near Fadous-Kfarabida is not yet evidenced, the selective exploitation of local stone resources is highly suggestive that it took place. Quarrying of specific limestone resources (as opposed to opportunistic gathering of exposed and loose rock) would require a specialized tool kit for isolating, extracting, and shaping stones. This does not exclude the possibility that these stones were also

used for dressing building stones; on the contrary, it is likely that such percussion tools would have been used at various steps of the stone working process, from extraction to final production and finishing.

Small (2 complete, 2 incomplete)

One small, spheroid, highly polished pebble of hard, non-vesicular basalt with a circumferential, u-shaped lenticular groove has been recovered from a floor surface in Room 1 (**Fig. 35**). Although so far this is a unique find at this site, small grooved pebbles of this type are found in great numbers from Early Bronze Age contexts at Byblos (Dunand 1958: Fig 539: 12110, 12341, Fig 778: 14696, Fig. 912: 15648, for example). A likely limestone mould for copper ingots, from a Middle Bronze Age context, is currently under publication (Genz and Sader, in press).

Of the two incomplete small grooved stones, one, which should more appropriately referred to as incised, remains only in a very fragmentary state (**Fig. 36**). The fragment is made of limestone, on which remains one central, lenticular v-shaped groove or knife-mark crossed perpendicularly by three similar grooves, suggesting that what remains is part of a larger geometric pattern, perhaps such as that which appears on an incomplete palette or «amulet» from Byblos (Dunand 1950: Pl. CXC: 12394). The other small grooved stone is a larger and thicker limestone pebble, rectilinear, subrectangular in transverse section. Three roughly parallel, uneven, lenticular grooves, v-shaped in cross-section, stretch across three faces (**Pl. 7: 5**). While these patterns may be decorative or symbolic, similar Neolithic cut-marked or grooved pebbles have been persuasively interpreted as tools in the production of beads or other fine, luxury materials (Wright and Garrard 2002; Wright *et al.* 2008). While there is not yet enough evidence to assert this here, the presence of the small pebble abraders and polishing pebbles alongside these small grooved stones demonstrates that there was some processing of non-agricultural fine materials here, which bears further attention.

Stone Disks (3 complete)

Three chipped limestone disks likely served as lids for large ceramic vessels. Two are of similar dimensions, with steeply faceted edges and flat surfaces such that they are discoid in plan and trapezoidal in section. Both are made of highly fossiliferous Cenomanian limestone. The third has more delicately chipped edges, and is plano-concave in section and discoid in plan. It is light-weight, red limestone.

Discussion

The ground stone assemblage from Tell Fadous-Kfarabida, though still small, provides evidence of a remarkable range of technological activity (construction/quarrying tools, utilitarian weights and a variety of food processing equipment) as well as social devices (from objects of personal adornment to incised stones and imported materials). It is preliminary to interpret much from the contextual situation; however, it is already

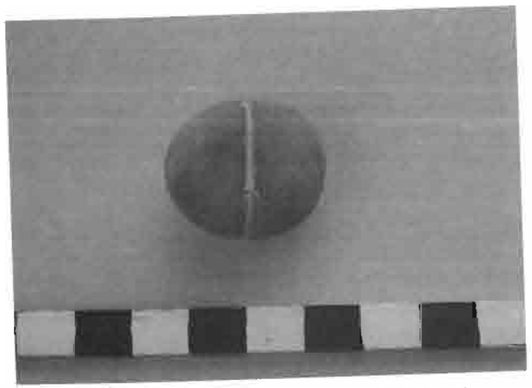


Fig. 35 - Grooved stone, basalt, FAD08.290/295.100 (context 508, Phase III).

Fig. 36 - Incised limestone fragment FAD08.250/280.76 (context 1113).

worth noting the evident contrast between the quantity, quality, and nature of the processing tools recovered from Rooms 1 and 2 of Building 1 during Phase III. The two basalt handstones were the most carefully curated objects here; one was discovered inside a cooking pot and the other in a storage bin. By contrast, the three grinding slabs and four basalt handstones from Room 2 all came from either directly on or just above the lowest exposed floor level. A polishing pebble, pumice stone, two limestone lids, and small basalt grooved stone from contexts associated with the same living surface are further evidence of the high proportion of fine and valuable stone products in use here. In both rooms, as throughout the site, basalt tools are maintained within living or storage spaces and kept even in fragmentary form, while so far no limestone tool fragments are attested, and indeed, limestone processing tools seem to be reused in other ways rather than curated over long periods (**Fig. 37**). Also notably, all the miniature mortars came from the Early Bronze Age III room (Phase IV) or just outside its walls, suggesting that with further evidence, chronological differentiation and development in processing tool technology may become visible.

The role of local raw material in the assemblage is also significant. Numerous studies, including ethnographic, historical, and chemical proveniencing, document the long-distance trade throughout history of non-precious stone as a raw material and as a finished product, even when local resources suitable for purely utilitarian purposes were readily available (Weinstein-Evron *et al.* 1999; Williams-Thorpe and Thorpe 1993); as early as the third millennium BCE, texts from Mesopotamia record the importing of handstones (Pettinato 1972: 73-78, quoted in Milevski 2008: 117). It is clear that raw material and its provenance in many cases had significance in the production of domestic toolkits that went beyond the purely utilitarian or convenient, and that this significance played a more complex role in the production, use, curation, and discard of ground stone artifacts than has typically been considered for protohistoric sites. The case at Tell Fadous-Kfarabida appears to be similar; although it is not yet clear if the raw material use for the domestic assemblages is solely local or from a variety of

Fig. 37 - Limestone grinding slab reused in the East wall of Room 2, Building 1.

sites, it certainly is carefully and selectively exploited for its purposes. Further study of these assemblages offers great potential to provide new insight into both local resource management and long-distance exchange networks.

Research in the Southern Levant has shown that the development of ground stone procurement, technology and its applications are linked to the development and organization of other production and exchange systems (see, for instance, discussion of the links between copper smelting and bead making in Wadi Faynan in the EBI: Adams 2002). Experimental research in food processing from the Southern Levant has also shown ties between ground stone technology and efficient resource management (fine processing allows extraction of maximum nutritional value from a smaller quantity of grain, by exposing a larger proportion of the surface of the grain, allowing a larger population to live off a smaller resource base: Wright 1994). Worked stones appear in numerous cultural settings, from the domestic to the religious and administrative. This is certainly true of the Northern Levant as well, but is much more poorly understood. The ground stone assemblage at Tell Fadous-Kfarabida offers great potential to illuminate these relationships on this site, and to contribute to their study in Lebanon and the Northern Levant. Until more ground stone assemblages are methodically collected and published, the full potential of this material will remain obscure.

V- The Botanical Finds from the 2007 and 2008 Seasons of Excavations (S. R and K. D.)

Introduction

During the 2007-2008 excavation seasons at Tell Fadous-Kfarabida 47 sediment samples were taken from various archaeological contexts and processed by hand flotation to extract carbonized plant remains. The samples were sorted and identified in the archaeobotanical laboratory at the University of Tübingen[14].

The results complement the archaeobotanical analysis conducted on the remains found in the 2004-2005 campaigns (Riehl and Deckers in Badreshany *et al.* 2005), and allow for a more detailed examination of the Early Bronze Age phases elaborated during the last campaigns (see Genz, this volume).

As for other bioarchaeological material groups, archaeobotanical research in Lebanon is virtually non-existent. So far, little data from Late Bronze Age and Iron Age samples from Kamid el-Loz, which are probably not representative of the site, has been published (Behre 1970; Baas 1980). Considering the geographical area of the Near East as a whole, the differences in the state of research in different countries becomes clear; a large number of sites are being investigated in Palestine and northern Syria, while only little information exists for sites in other areas.

The close proximity of the settlement on the sea coast opens up a perspective on the intense use of marine resources, as has already been demonstrated by the faunal analyses (Çakırlar, this volume). The role of agriculture within the subsistence economy is, however, unknown, as is the participation of Tell Fadous-Kfarabida within the Bronze Age trade system.

As has been suggested in earlier works, there are significant similarities in the composition of crop plant assemblages throughout the whole eastern Mediterranean region (Riehl, in press). The reflection of the Mediterranean cultural region within the crop assemblage from Tell Fadous-Kfarabida in comparison with other Mediterranean sites is of focal archaeobotanical and archaeological interest.

An important aspect of resource management concerns the acquisition of wood, which is also indicating the general outline of the woody vegetation. So far, such information is only available from the textual records, which mainly refer to cedar stands that are assumed to have diminished since the beginnings of the Early Bronze Age through extensive felling and trading of this precious wood into other dominions.

The up-to-date knowledge on the Early Bronze Age chronology of the site (see Genz, this volume) places Tell Fadous-Kfarabida in a fluctuating climatic framework. Meanwhile, information on climatic variation and its effects is available from a large number of palaeoclimatological archives, including sediment cores from lakes, speleothems, carbonate cutans, and stable carbon isotope data from plant remains (Enzel *et al.* 2003; Hazan *et al.* 2005; Migowski *et al.* 2006; Pustovoytov *et al.* 2007; Riehl *et al.* 2008).

These data suggest a general change from a relatively arid climate during the Early Bronze Age I to continuously increasing moisture until the Early Bronze Age IV, and a subsequent increase in aridity by the end of Early Bronze Age IV and the beginning of the Middle Bronze Age. The stable carbon isotope record in plant remains from some archaeological sites shows a temporary increase in aridity during Early Bronze Age III (Riehl *et al.* 2008). Local variations of the effects of climate change are also attested for some regions (Riehl and Bryson 2007). Under this premise, economic and environmental development at the coastal settlement of Tell Fadous-Kfarabida is a key aspect for understanding regional variation of climate effects in the Near East.

Based on these preconditions the main research questions at Tell Fadous-Kfarabida are:

- How does agricultural production fit into the subsistence economy at the settlement and how does it compare to other sites in the area of the Near East?
- Which wood resources were used and what do they tell us about the environmental dynamics and trade systems?
- Are there any climate relevant patterns in the archaeobotanical assemblages and the stable carbon isotope data, and if so, what do they indicate?

Results and discussion

In contrast with the rich faunal assemblages, the diversity of seed taxa seems comparatively restricted thus far. What at first view seemed to be a matter of unfavorable preservation conditions, more likely represents specific economic conditions at the settlement, considering the preservation of fragile wild plant seeds.

While emmer (*Triticum dicoccum*) and olive (*Olea europaea*) remains are the most abundant finds in the seed record, other taxa were only recorded in low numbers **(Tables 11 and 12)**.

This clear dominance of the two species throughout all phases results in a very even distribution of the whole set of taxa to the different phases, which is particularly evident considering taxa ubiquities, giving the impression of very stable agricultural production.

There is also little differentiation in the assemblages considering the different buildings excavated. Olive dominates the assemblages from Building 1, Room 1 and from Building 2, Room 4, while emmer chaff remains, which are abundant in all the rooms, dominate in Building 2, Rooms 1 and 2. Spatial patterns may be represented, and diverse archaeological objects, such as grinding stones in Building 1, Room 1, suggest a variety of food processing activities (see Damick, this volume). However, further confirmation by archaeological and archaeobotanical data is needed to support this hypothesis.

Agricultural production and dietary considerations

Emmer and olive remains are the most abundant crop finds throughout all phases at Tell Fadous-Kfarabida. Only the three samples of Phase II contain a considerable amount of barley grains. As only these three samples from Phase II could be analysed, it is unclear whether they are representative for the whole phase.

Other crops, such as lentil (*Lens culinaris*), fig (*Ficus carica*), free-threshing wheat (*Triticum aestivum/durum*) and grape (*Vitis vinifera*) only occur in small numbers **(Table 11 and Fig. 38)**. The seed and charcoal finds indicate that grapes were probably of less economic importance than olives (see below).

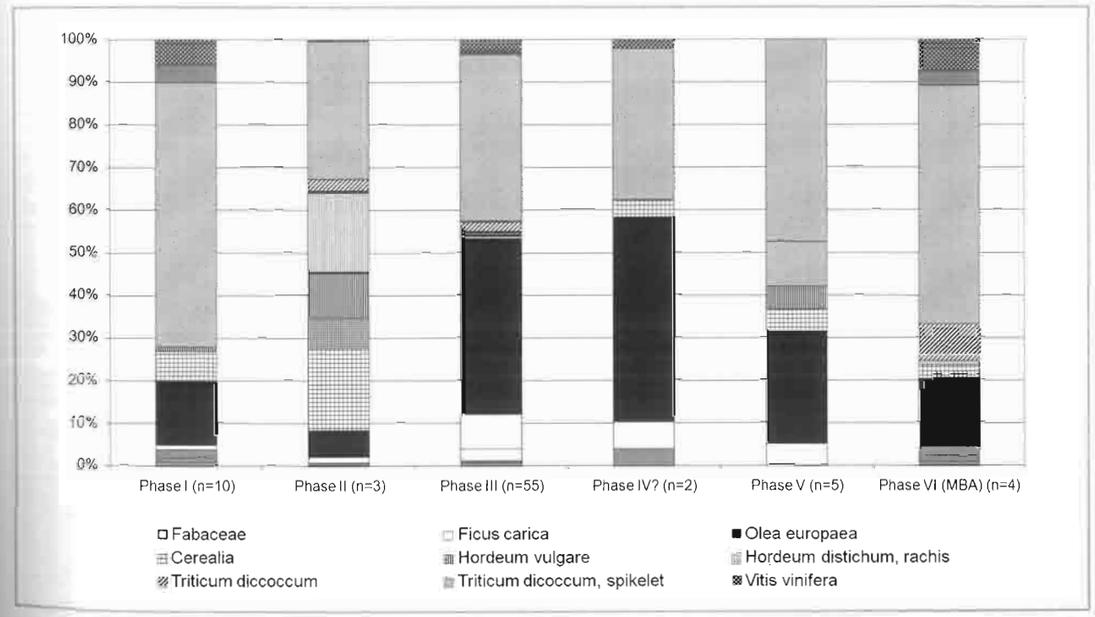


Fig. 38 - Crop proportions in the different phases; n=number of samples; Fabaceae (pulse crops).

Tell Fadous-Kfarabida 2004/2008								
	Family	Taxon	Phase I (n=10)	Phase II (n=3)	Phase III (n=55)	Phase IV? (n=2)	Phase V (n=5)	Phase VI (MBA) (n=4)
crop	Fabaceae	*Lens culinaris*	0	1	12	0	0	1
crop	Fabaceae	*Lens* sp.	0	1	6	2	0	0
crop	Fabaceae	*Cicer / Lathyrus*	1	0	0	0	0	0
crop	Fabaceae	*Pisum / Lathyrus*	1	0	0	0	0	0
crop	Fabaceae	*Vicia / Lathyrus*	0	0	1	0	0	1
crop	Fabaceae	Fabaceae, large	2	0	0	0	0	2
crop	Moraceae	*Ficus carica*	1	3	43	3	1	0
crop	Moraceae	*Ficus carica*, mineralized	0	0	122	0	0	0
crop	Oleaceae	*Olea europaea*	15	14	623	23	5	15
crop	Poaceae	Cerealia	7	42	8	2	1	3
crop	Poaceae	Cerealia, culm	0	17	3	0	0	0
crop	Poaceae	Cerealia, rachis	0	0	2	0	0	0
crop	Poaceae	*Hordeum vulgare*, grain	1	23	8	0	1	0
crop	Poaceae	*Hordeum vulgare*, rachis	0	1	3	0	0	0
crop	Poaceae	*Hordeum distichum*, rachis	0	41	0	0	0	1
crop	Poaceae	*Triticum aestivum/durum*, rachis	0	1	0	0	0	0
crop	Poaceae	*Triticum diccoccum*	0	6	33	0	0	8
crop	Poaceae	*Triticum* cf. *dicoccum*, spikelet	0	0	4	0	2	0
crop	Poaceae	*Triticum dicoccum*, spikelet	62	72	590	17	9	52
crop	Poaceae	*Triticum monococcum/dicoccum*, spikelet	4	0	6	0	0	0
crop	Poaceae	*Triticum* sp.	0	0	1	0	0	3
crop	Vitaceae	*Vitis vinifera*, pip	5	0	8	0	0	5
crop	Vitaceae	*Vitis* sp.	0	1	24	1	0	1
crop	Vitaceae	*Vitis* sp., mineralized	0	0	5	0	0	0
crop	Vitaceae	*Vitis vinifera*, stalk	1	0	9	0	0	1

Table 11 - Crop seed taxa and their absolute counts in samples of the Early Bronze Age Phases I-V and the Middle Bronze Age Phase VI; n (number of samples).

Tell Fadous-Kfarabida 2004/2008								
	Family	Taxon	Phase I (n=10)	Phase II (n=3)	Phase III (n=55)	Phase IV? (n=2)	Phase V (n=5)	Phase VI (MBA)(n=4)
wild plant	Apiaceae	Apiaceae	0	0	0	1	0	1
wild plant	Anacardiaceae	*Pistacia* sp.	1	0	4	0	0	1
wild plant	Asteraceae	*Picris* cf. *hieracoides*	0	1	0	0	0	0
wild plant	Boraginaceae	*Lithospermum arvense*, vk	0	0	2	0	0	0
wild plant	Caryophyllaceae	Caryophyllaceae	0	0	0	0	0	1
wild plant	Cyperaceae	*Carex* sp.	0	0	1	0	0	0
wild plant	Cyperaceae	Cyperaceae	0	2	0	0	0	0
wild plant	Euphorbiaceae	*Euphorbia peplis*	0	0	2	0	0	0
wild plant	Fabaceae	*Coronilla* sp.	0	1	0	0	0	0
wild plant	Fabaceae	*Fabaceae*, medium	0	1	7	3	2	1
wild plant	Fabaceae	*Fabaceae*, small	3	1	7	10	1	1
wild plant	Fabaceae	*Securigera securidaca*	0	2	0	0	0	0
wild plant	Fabaceae	cf. *Trifolium* sp.	0	0	4	0	0	1
wild plant	Lamiaceae	Lamiaceae	0	0	1	0	0	0
wild plant	Poaceae	*Aegilops* sp., spikelet	0	1	0	0	0	0
wild plant	Poaceae	*Eragrostis* sp.	0	1	1	0	0	0
wild plant	Poaceae	*Hordeum* sp.	1	0	0	0	0	0
wild plant	Poaceae	*Lolium temulentum/remotum*	0	6	0	0	0	0
wild plant	Poaceae	*Lolium* sp.	6	14	25	0	0	1
wild plant	Poaceae	*Lolium / Festuca*	1	0	2	0	0	0
wild plant	Poaceae	*Phalaris* sp.	0	4	0	0	0	0
wild plant	Poaceae	*Poaceae*, large	12	36	7	3	1	1
wild plant	Poaceae	*Poaceae*, medium	0	9	8	0	0	0
wild plant	Poaceae	*Triticum* cf. *dicoccoides*, spikelet	0	0	1	0	0	0
wild plant	Liliaceae	*Ornithogalum / Muscari*	1	1	1	0	0	0
wild plant	Polygonaceae	*Rumex* sp.	1	0	0	0	0	0
wild plant	Portulacaceae	*Portulaca oleracea*	0	0	1	0	0	0
wild plant	Primulaceae	*Anagallis* sp.	0	0	0	1	0	0
wild plant	Ranunculaceae	*Adonis* sp.	0	2	0	0	0	0
wild plant	Rubiaceae	*Galium* cf. *mollugo*	0	1	0	0	0	0
wild plant	Rubiaceae	*Sherardia arvensis*	1	0	1	0	0	0

Table 12 - Wild plant seed taxa and their absolute counts in samples of the Early Bronze Age Phases I-V and the Middle Bronze Age Phase VI; n (number of samples).

Considering the crop proportions and ubiquities throughout the Tell Fadous-Kfarabida phases, so far there is no hint of any climatic impact on these assemblages. There also is no significant difference in the composition of the Early and Middle Bronze Age samples.

Looking at Early Bronze Age crop production patterns on a broader regional scale, the high ubiquity in olive stones (almost 100%) at Tell Fadous-Kfarabida is well comparable to other coastal sites in Syria and Palestine (**Fig. 39**). This observation is also valid for the high emmer proportions, which clearly differentiate the coastal from the inland sites (**Fig. 39**). The Early Bronze Age ubiquities of grape pips at Tell Fadous-Kfarabida are up to 40%, considering only the more representative Phases I and III with their higher sample numbers. This, however, would not suggest a large-scale production of grapes, compared to the obviously intensive use of olives. The intense maintenance of this crop by coppicing is also suggested by the wood charcoal finds (see below and **Fig. 40**).

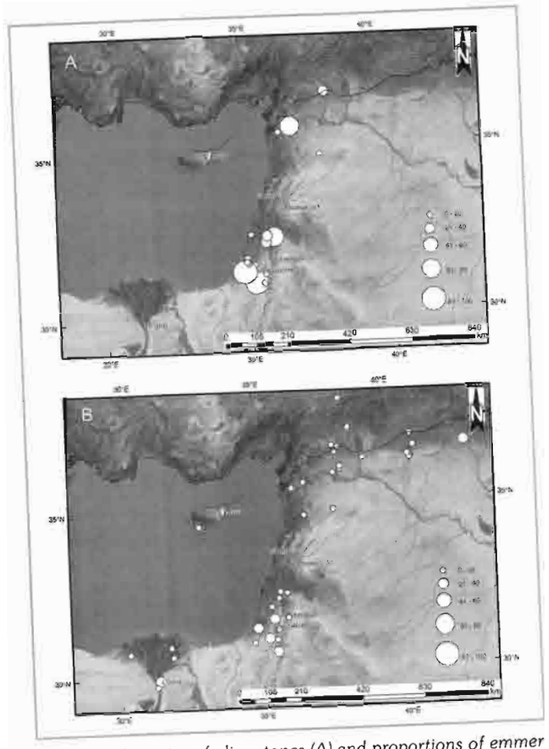


Fig. 39 - Ubiquities of olive stones (A) and proportions of emmer finds (B) in Near Eastern archaeological sites; Data set is complete up to and including publications from 2007.

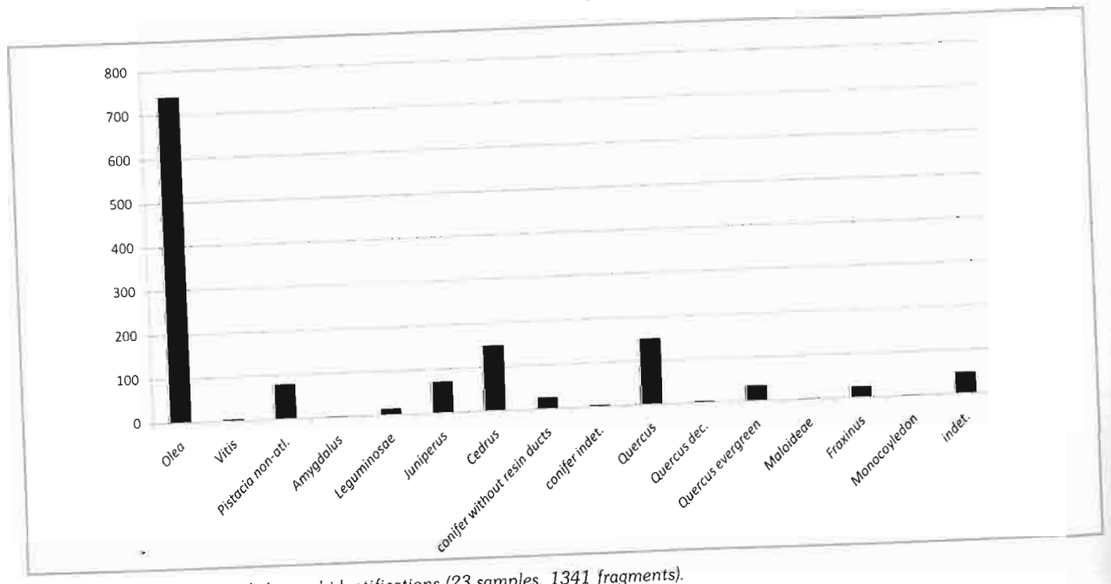


Fig. 40 - Absolute counts of charcoal identifications (23 samples, 1341 fragments).

Sample ID	Taxon	Period	$\delta^{13}C$ V-PDB (‰)	$\Delta^{13}C$ V-PDB (‰)
TF05BP27	*Hordeum vulgare*	EB II	-23,76	17,82
TF05BP19	*Hordeum vulgare*	EB II	-22,63	16,64
TF05BP19	*Lens culinaris*	EB II	-25,11	19,22
TF05BP04	*Olea europaea*	EB II	-23,85	17,91
TF05BP35	*Olea europaea*	EB II	-20,76	14,70
TF04BP09	*Olea europaea*	EB II	-18,50	12,36
TF04BP04; TF05BP19	*Triticum dicoccum*	EB II	-27,06	21,27
TF05BP19	*Vitis vinifera*	EB II	-26,68	20,88

Table 13 - Stable carbon isotope ratios in crop remains from Tell Fadous-Kfarabida; values between $\Delta^{13}C$ 22-17 ‰ generally do not indicate stress, values below $\Delta^{13}C$ 17 ‰ increasingly indicate stress through reduced water availability.

It is worth noting here that the samples of Phase III contained large numbers of mineralized fig and grape seeds, indicating specific preservation conditions for some contexts. Most of these mineralized plant seeds are from fill on the floor of Room 2 in Building 1. It is unclear so far whether these seeds were mineralized before or after deposition.

Wild plant seeds did not contain any moisture indicators, which is surprising in comparison with other archaeological sites in the Near East. This, however, correlates well with the faunal remains, and in particular with the fish remains, which were almost exclusively of marine origin (see Çakırlar, this volume). This indicates that irrigation was not practiced, and that crops were not cultivated near natural freshwater resources. Obviously, rain-fed agriculture could be practiced without considerable yield losses throughout the periods recorded at Tell Fadous-Kfarabida.

Stable carbon isotope values in a few crop remains deriving from Early Bronze Age II contexts resulted in a very broad range, mostly indicating moderate or no drought stress on the crop plants during the fruiting period. Only two of the olive pips indicated a strong stress signal ($\Delta^{13}C$ 14,70 and 12,36‰). This indicates well-balanced natural conditions for agriculture, with only minor indications of drought stress particularly in the olive fruits. The ancient farmers probably made good use of natural depressions to cultivate more-demanding crops.

However, at the moment, the data set is very limited and requires further investigation for representativeness.

Considering the ancient diet at Tell Fadous-Kfarabida the faunal remains indicate a very broad spectrum of different sources of protein, with a large component of seafood (see Çakırlar, this volume).

Amongst the olive remains a large number of the stones were intact, indicating that probably the fruits were consumed. So far, oil production within the settlement is not indicated.

Meat of domesticates and olives contributed to a diet that was also rich in fat, but the large amounts in emmer show that together with the carbohydrates of this crop, the Tell Fadous-Kfarabida settlers had well-balanced diets.

Wood resources

In total 23 samples containing 1341 charcoal fragments were investigated from the 2007-2008 campaign. Within the samples there were often fragments that were not identifiable due to vitrification (these were not included in the indet. list). Tissue deformation, fissures and fusion often affect small pieces of wood such as twigs. Rapid combustion at high temperatures, specific conditions of combustion or taphonomy, and the state of the wood before combustion may have had equal results (Marguerie and Hunot 2007).

Most of the samples derive from Phase III, but there are also some included from Phases II, IV and possibly VI (1 sample). Overall, the composition of almost all the samples is very similar.

The main taxon identified is *Olea* **(Fig. 40)**, represented in about 55% of the charcoal fragments. Its ubiquity was almost one hundred percent. The abundance of olive charcoal correlates with the seed data and the suggested importance of olive cultivation.

Quercus (oak), *Juniperus* (juniper), *Pistacia* non-atlantica (pistachio), which was also present in the seed samples, Leguminosae spec. (pulses) and *Cedrus* (cedar) occurred in relatively high counts. *Cedrus* charcoal occurred in five samples. The nearest stands of *Cedrus* today are located about 20 km east of Batroun. Under the assumption of a similar distribution area in the past, this may indicate that distant wood resources were used regularly due to a lack of local wood resources. The origin of cedar finds will be of particular interest to future wood charcoal investigations at Tell Fadous-Kfarabida.

Vitis (grape), *Amygdalus* (almond) and a Maloideae (apple-type) species were only represented by one fragment each.

Environmental aspects

The charcoal assemblage represents typical Mediterranean vegetation in a modern sense. The high abundance of crop species, namely olive, amongst the wood remains indicates the strong anthropogenic signal in the wood resources. Although it is impossible to differentiate between cultivated and wild *Olea* charcoal with the common wood anatomical methods, the dominance of olive stones amongst the crops indicates the presence of the cultivated species.

Of all the cases where *Quercus* fragments were large enough to differentiate between deciduous and evergreen species, evergreen species were clearly dominant. Only two fragments of deciduous oak were found. Evergreen oak and juniper, which are often indicative of a landscape degraded by browsing animals, may have occurred as scrub varieties, and therefore there may have been a lack of wood in the vicinity of the site.

Looking at the human impact on the landscape, taxa, such as *Euphorbia* sp. and *Muscari/ Ornithogalum*, support a theory of the degradation of the vegetation by grazing and browsing, which has been also suggested by the faunal analysis (see Çakırlar, this volume).

The archaeobotanical record indicates a considerable openness of the flora throughout the Early Bronze Age. This is in good agreement with the Lebanese pollen record, which shows a relatively low arboreal pollen concentration with a strong decrease some centuries after 4000 cal. BP (Hajar *et al*. 2008). After 3500 cal. BP, arboreal pollen values are increasing again. Such degenerative processes are, however, invisible in the crop plant composition.

Conclusions

Archaeobotanical data of the Early to Middle Bronze Age site Tell Fadous-Kfarabida provide the opportunity to fill a considerable research gap in Lebanese archaeology and to understand the contribution of this area to the dynamics of ancient agricultural and economic systems in the Near East.

So far, the archaeobotanical data do not reflect global climatic fluctuations as known from the investigation of palaeoclimate archives and from stable carbon isotopes in cereal remains of some other Near Eastern archaeological sites. Overall, the landscape seems to have already experienced a massive degradation by anthropo-zoogenic impact during the Early Bronze Age.

Freshwater availability is still unclear, at least there are no moisture indicators in the archaeobotanical assemblage that support the idea of sufficient freshwater sources in the vicinity of the site. Stable carbon isotope data of some crop finds from Tell Fadous-Kfarabida did not show any particular stress signal, which would point to sufficient rainfall. With the available data from Tell Fadous-Kfarabida, however, it cannot be excluded that future investigation at the site will change this preliminary result, because more archaeobotanical data from the site is needed, also to enable comparison with other sites in the Near East. Taphonomic problems may also be involved as the number of taxa, particularly in the small-seeded assemblage, is low and vitrified charcoal pieces are numerous.

The remains of olive and emmer are the most abundant finds throughout all the phases and periods, suggesting very stable agricultural production. Because the taxa diversity of the whole assemblage is low, this working hypothesis may change with further archaeobotanical sampling.

VI- The Geophysical Survey (A. D.)

Project Overview

During the week of 5 July 2009 to 12 July 2009, a team from the Archaeological Geophysics Lab at the University of Akron conducted a shallow subsurface survey of the archaeological site of Tell Fadous-Kfarabida, located approximately two kilometers south of Batroun on the Lebanese coast. The geophysical survey was designed to identify additional features associated with structures revealed during the archaeological excavations and to direct future investigations.

Basic Principles

Magnetic gradiometry relies on the measurement of the strength of the earth's magnetic field which, depending on one's location on the planet, measures between 35,000 and 70,000 nT (nano Tesla). Materials on and just below the ground surface, such as those found in archaeological, or geological, features, often cause localized changes in the magnitude of the earth's magnetic field. When a survey is conducted, a series of measurements is taken along the transects of a north-south oriented grid to measure these localized changes (gradients).

Those areas that are archaeologically or geologically uniform will have a gradient of zero. When the instrument passes over a material on or just below the surface that distorts the earth's magnetic field, the gradient measured is no longer zero. Anthropogenic features, such as pits, walls, compacted surfaces or pyrotechnic installations, are typically represented with a gradient ranging from 0.1 nT to 50.0 nT. By systematically plotting the samples using computer modeling software (GeoPlot 3.0), we can map subsurface changes in the earth's magnetic field which are caused by these archaeological or geological materials.

Survey Methods

The survey at Tell Fadous-Kfarabida was carried out with an FM-256 Fluxgate Gradiometer made by GeoScan Research. This instrument is capable of detecting variations in the magnetic field as small as 0.05 nT. Its dual sensors effectively filter out the ambient magnetic field, recording only the disturbances caused by local subsurface features. Surveys were conducted using a sample density of sixteen samples per square meter. This was accomplished by collecting eight samples per meter along transects 50 centimeters apart within ten meter by ten meter survey units.

The same bulldozing work that allowed the site's discovery also created obstacles to successful geophysical survey of the site. Great piles of stone and iron-laden rubble dominated the surface. In order to cover the largest area, our survey grid squares had to be staggered to fit in between the piles. There were six units on the main mound (Area II) with two additional half units placed immediately adjacent to the excavation trench. Three units flank the excavations in Area I on the southern lower mound. The entire survey dataset consisting of 16,000 data points was processed in contiguous sections using Geoplot 3.0 (also by GeoScan Research) to remove any survey errors, to clean the dataset of out-of-range values, and to maximize the visibility of any features of interest. Processes used include despike, search and replace, clip and zero mean traverse. The clean and processed data were then exported to Surfer Surface Mapping System (made by Golden Software) to be re-assembled and displayed.

Results and Interpretation

Fig. 41 shows the clean and processed data collected from all units at Tell Fadous-Kfarabida. **Fig. 42** presents the same dataset overlaid on the plan of site showing excavated features, topography, and modern surface features. I have used light grey lines to indicate some anomalies of archaeological interest. Small circles with a cross are used to indicate those anomalies that are likely to be buried iron. Some of these readings were so strong that they were replaced with dummy readings during processing and so are rendered in the same grey shade as the background of the dataset image. It is possible that some of these dipoles are in fact large mafic stones such as basalt, but it would be impossible to determine without excavation.

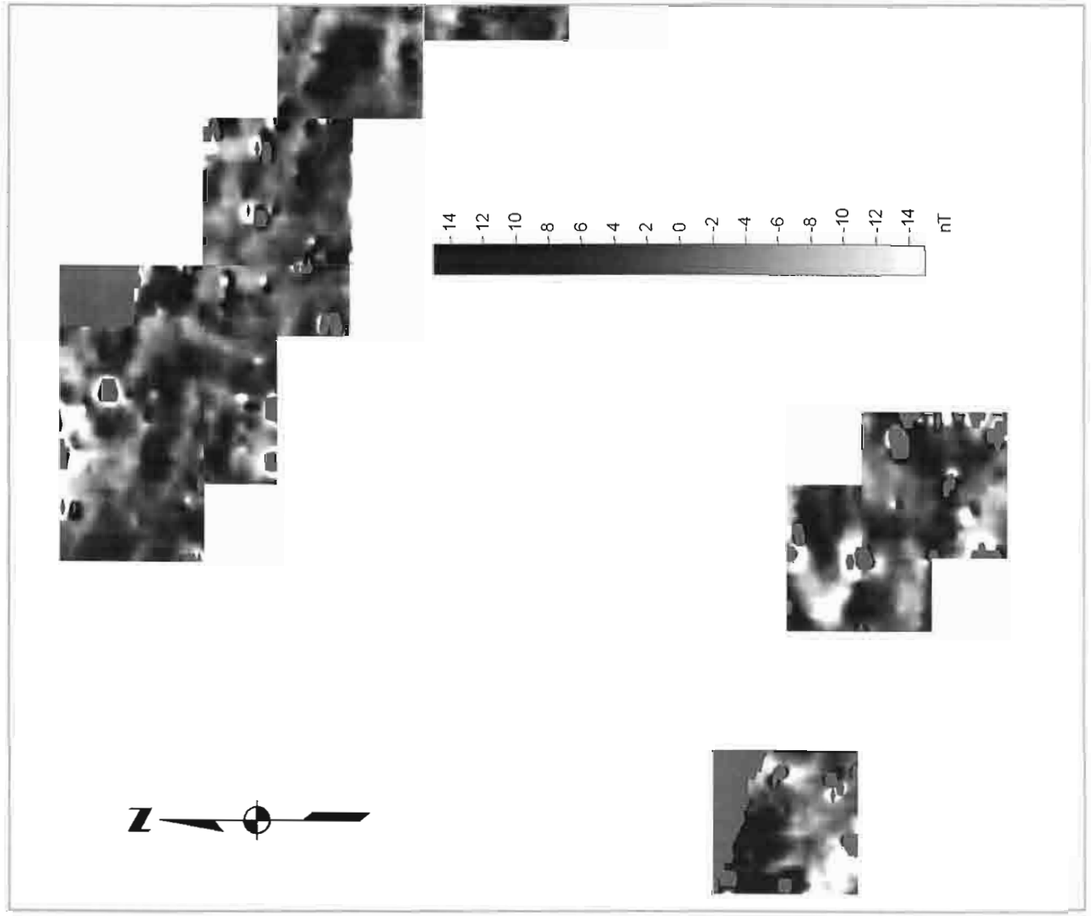


Fig. 41 - Processed archaeomagnetic data collected from all units at Tell Fadous-Kfarabida.

The comparison between the features showing up in the geophysical survey and the excavated architecture in Area II shows that the structures which can be identified mainly seem to belong to Phase IV. Several of the wall features seen in the survey image clearly are aligned with walls of buildings belonging to Phase IV that have been excavated. While there is significant interference from buried modern materials in the form of dipoles, there is also sufficient clarity and continuity to discern these and other rectilinear features.

The observed overburden atop the walls in the western section and the excavated overburden atop the walls revealed last season are both approximately one meter; this depth sensitivity is typical on sites with architecture of this scale and material. Rectilinear features appearing in the light grey to white shades indicate a lower magnetic intensity typical of the partial limestone construction encountered in Phases III and IV. There are several wall features that appear to enclose an area of higher intensity (marked A and B in **Fig. 42**); this is a typical characteristic of the compacted soils that would be found inside a dwelling. The round dark features (marked C and D) are suggestive of pits due to their size and rather crisp edges; it is interesting that they appear in pairs. Unfortunately the architecture of Phase III is generally covered by more than 1 m of overburden and thus

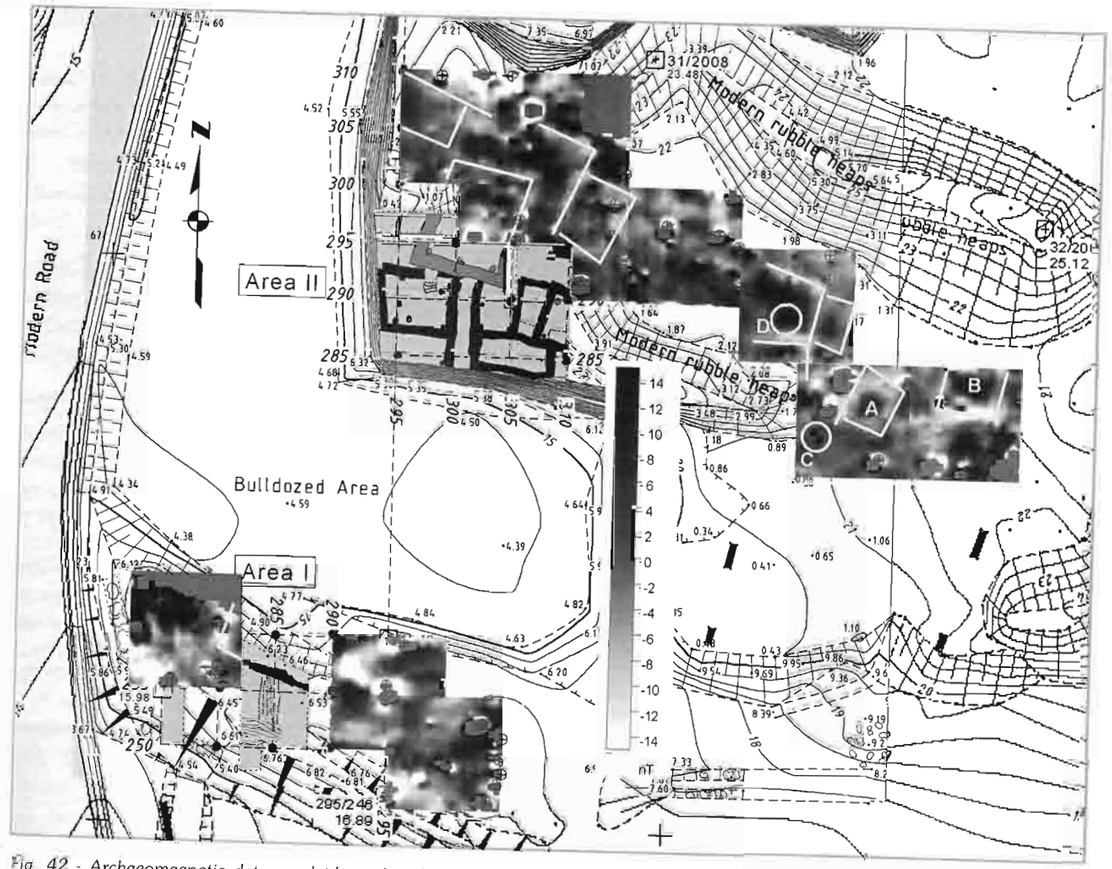


Fig. 42 - Archaeomagnetic data overlaid on the plan of site showing excavated features, topography, and modern surface features (topographic map courtesy P. Breuer).

does not clearly show up in the geophysical survey.

The previous work on the site identifying the several building phases and typical use of previous phases combines with these indications of later phase construction to suggest that the area surveyed and beyond is likely to yield structural features of interest. During the field season there were indications that the orientation of the alignment of excavated structures had a correlation with the construction phase. This slight variation is lost in the magnetic image, but it is clear that there are several more buildings still preserved in Tell Fadous-Kfarabida.

The survey conducted in Area I yielded a much less promising result. During excavation a wall and a staircase was revealed that was large enough to be interpreted as a city wall. It was hoped that geophysical survey in this area would show the continuation of this monumental structure and indicate its course to the southeast. Unfortunately this was not the case. The feature is visible to the west of the excavated wall but it is not as strong, nor as large as expected. It does not appear at all in the southeast. It is likely that the consistent but weak intensity feature that would represent the stone wall is obscured by the not so consistent and much stronger intensity topsoil that is deposited in various thicknesses, and compactions throughout the survey area. The close proximity of some very obvious modern disturbance also severely limited the possibility of a clear result.

Notes

1- American University of Beirut, Department of History and Archaeology, P.O.Box 11-0236, Beirut, Lebanon.

2- Institute for Prehistory and Quaternary Ecology, Rümelinstrasse 23, D-72070 Tübingen, Germany.

3- The British Institute in Amman, Jordan.

4- American University of Beirut, Department of History and Archaeology, P.O.Box 11-0236, Beirut, Lebanon.

5- Institute for Prehistory and Quaternary Ecology, Rümelinstrasse 23, D-72070 Tübingen, Germany/ Senckenberg Gesellschaft für Naturforschung, Frankfurt, Dienstort: Universität Tübingen/Germany.

6- Institute for Prehistory and Quaternary Ecology, Rümelinstrasse 23, D-72070 Tübingen, Germany.

7- University of Akron, USA.

8- During the 2007 season (Genz and Sader 2007, 10-11), the installation was referred to as a possible storage bin.

9- See Genz and Sader, 2008, and Genz 2008, 129-130 for a discussion of this type in Lebanon.

10- Called Phase 2 in Badreshany *et al.* 2005, 81-84.

11- Tell Arqa and Sidon offer the only other intensively investigated Early Bronze Age sites in Lebanon to date. Neither has produced a comprehensive ground stone study; both have concentrated primarily on the chipped stone industry, and Sidon's continuous occupation levels suffer from highly broken stratigraphy and much contamination from later use periods (Thalmann 2006; Doumet-Serhal 2006).

12- The «mobile/stationary» combination refers more generally to the use potential of the artifacts, and is used widely in French («courant/dormant») writing, thus bridging these bodies of research; the latter is particularly useful in the archaeology of Lebanon.

13- I am very grateful to Dr. Ali Haidar, Assistant Professor of Geology at the American University of Beirut, for his cooperation and assistance in the identification of raw materials in the ground stone artifacts. Any errors are, of course, my own.

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