[Supplementary material]

Tracking turtles in the past: zooarchaeological evidence for human-turtle interactions in the ancient Eastern Mediterranean

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Site descriptions

Clazomenae

Clazomenae (or Klazomenai) is located on the western coast of Anatolia (Turkey), on a shallow bay. The settlement dates back to the Late Bronze Age. In the first millennium BC, the site became one of the twelve Ionian cities, which was a 'league' of ethnic, economic, cultural, and religious affinities (Ersoy & Koparal 2012). There is no overlying Roman occupational phase. Excavations in the large territory of the city revealed houses, industrial buildings, and cemeteries. Sheep herding, keeping of what may have been free-ranging pigs, and olive oil production were important economic activities (Çakırlar *et al.* 2016). Ongoing zooarchaeological analysis indicates that despite its coastal location, marine exploitation was either not significant, or marine vertebrates were rarely brought to the settlement proper.

Kinet Höyük and Hisn al Tinat (=Kinet)

Kinet Höyük (=settlement mound) is located on a coastal plain in the north-eastern-most corner of the Mediterranean, at the back of Iskenderun Bay, Turkey (Gates 2013: 223). The plain is bordered by the Amanus Mountains in the east and the Mediterranean Sea in the west (Hodos *et al.* 2005: 62). The site is approximately 26m in height and covers an area of around 3.3ha. Hisn al Tinat is a low-lying Early Islamic/Byzantine settlement dating to the eighth to twelfth centuries AD, located 500m north of the main mound (Ramsay & Eger 2015). The mound has a long occupational sequence, of around 6000 years, ranging from the sixth millennium BC to the first century BC, with a re-occupation during the Crusader period, twelfth to fourteenth centuries AD (Redford *et al.* 2001; Gates 2013: 223). At present, the mound is situated about 525m from the coastline, as a result of geomorphological developments from the Hellenistic period onwards, which buried the natural harbour under a layer of alluvial sediment (Beach & Luzzadder-Beach 2008: 426). The general subsistence

economy of Kinet Höyük relied primarily on cereal agriculture and animal husbandry (Çakırlar 2003; Çizer 2006). The use of aquatic resources, such as fish and molluscs, and, to a lesser extent, the hunting of wild animals has also been attested to (Çakırlar *et al.* 2014, 2018).

BEY 006 (=Beirut)

Beirut was one of the most important harbours of the Eastern Mediterranean. BEY 006 is a designated plot in the souks (=markets) of Beirut that was excavated in the framework of rescue excavations from 1994 to 1996, ahead of the post-war reconstruction of 'Downtown Beirut' (Perring *et al.* 2003a). The site covers a long time span between the Persian period and the modern period and yielded large archaeological deposits dating to Roman and Medieval times (Perring *et al.* 2003a). The hand-collected and sieved faunal assemblage, which exceeds 45 000 specimens, consists predominantly of the remains of domestic mammals, especially pig; fish remains also occur frequently in the sieved part of the assemblage, but they have not been studied yet in detail (Perring *et al.* 2003b).

Tell Fadous-Kfarabida

The site of Tell Fadous-Kfarabida is situated along the Mediterranean coast in Lebanon, approximately 2km south of the modern-day town of Batroun. The site covers around 1.5ha in size and is delimited by the Wadi Bou Aaoun in the north and the Mediterranean Sea in the west (Genz 2014a: 69). The site was occupied from the Late Chalcolithic to the Middle Bronze Age (see table below). However, based on radiocarbon dating evidence, short hiatuses are assumed between phase I and phase II, phase IV and phase V, and phase V and phase VI (Höflmayer *et al*. 2014; Genz *et al*. 2016). The Chalcolithic was only recovered as a child burial and scattered finds. The Early Bronze Age starts *c.* 3100 BC with the Early Bronze II. The majority of the archaeological finds originate from the Early Bronze Age III layers, as these were the most extensively excavated (Genz *et al.* 2016: 81). This period dates between 2700 and 2300 BC. Early Bronze Age IV is represented with pits and is thought to end around 2000 BC (Genz *et al.* 2014, 2016). The Middle Bronze Age is represented by simple inhumations. The botanical and faunal remains indicate that the subsistence economy of Tell Fadous-Kfarabida relied on agriculture, in particular emmer wheat (*Triticum dicoccum*), olives (*Olea europaea*; Genz *et al.* 2009: 110–16 & 2016: 91–92), and domestic animals (Genz *et al.* 2009: 84–94 & 2016: 94–101). The scarce evidence of wild animals indicates that hunting did not play a major role (Genz *et al.* 2009: 90–91). In addition, marine resources

were heavily exploited, which is testified by the large number of remains of fish, molluscs and marine turtles (Genz *et al.* 2009: 84–94 & 2016: 94–101).

Tell el-Burak (=Burak)

Tell el-Burak is the southernmost coastal site we analysed. The site is located 9km south of Sidon and 4km north of Sarepta on the Lebanese coast. Similarly to Kinet, it is located on a narrow but well-watered coastal plain, limited by the Lebanese Mountains in the east and the Mediterranean Sea in the west. Burak yielded second and first millennium BC architecture, as well as some Ottoman period remains (Kamlah & Sader 2003). The faunal remains were hand-collected. In contrast to Fadous, Burak only infrequently yielded fish bone and mollusc shell assemblages (Çakırlar *et al.* 2013). The Middle Bronze at Burak dates between 1900 and 1700 BC, and it is represented by a fort-palace with murals. The Iron Age architecture is complex, and dates mostly between 720 and 360 BC. The Mamluk-Ottoman periods (1300–1700 BC) are also represented at the site.

NISP (number of identified specimens) and MNI (minimum number of individuals)

Frequencies of turtle specimens were calculated as percentages of NISP and MNI estimates. While NISP is fairly straightforward to calculate from primary specimen counts, MNI can be calculated in vastly different ways, so a short explanation of the MNI method used in this study is necessary. In this study MNI estimates derive from the most abundant portion of the most abundant element within spatio-temporal units of archaeological interest (e.g. Early Bronze Age II in Fadous). At Kinet and Fadous, humerus shafts were clearly more abundant than other symmetrical elements of turtles. All humerii except one measured distinctly at their smallest diameter, demonstrating that they represent different individuals. At Clazomenae, Beirut and Burak, MNI estimates are based on other elements, depending on the elements present per spatio-temporal unit. Other vertebrates are represented by a large number of species at all these sites. However, status of research, collection methods, biogeography, and assemblage size have varying effects on represented taxa and these effects are difficult to control. To have more control on % MNI estimates, we limited the taxa we include in the MNI estimates to middle to large-sized food mammals: sheep, goat, sheep/goat, pig, wild boar, cattle, and deer species are included in the MNI estimates. Distal humerii are the most common diagnostic zones that represent these taxa. In the MNI estimates of these taxa, completeness, age, and contexts have been taken into consideration. The MNI data from Late Bronze Age and Early Iron Age Kinet derive from Kabatiar (2017).

Table S1. Turtle remains from coastal sites in the Eastern Mediterranean.

	Site	Period	Rough calendar dates	NISP	% NISP (if specified)	Taxa	Remarks	Reference
		Greece						
1	Saliagos	Middle to Late Neolithic	4300–3700 BC	1	<0.1%	*Caretta caretta*	One complete femur	Renfrew *et al.* (1968)
		Turkey						
2	Istanbul	Byzantine period	Fourth to eleventh century AD	37		Cheloniidae	Elements unspecified 1.8% (of selected 'nice' specimens; not the entire assemblage)	Onar *et al.* 2013
		Cyprus						
3	Akanthou-Arkosykos	Early aceramic Neolithic	8200–7700 BC	1		*Caretta caretta*	Complete skeleton	Şevketoğlu (2006, 2008); Şevketoğlu & Hanson (2015)

4	Vrysi	Early Chalcolithic	4400–3900 BC	23	3%	Cheloniidae	Carapace, plastron, post-cranial elements	Legge (1982)
5	Phlamoudh-Melissa	Middle Cypriot III/Late Cypriot I	1750–1450 BC	1		Cheloniidae	Carapace fragment; **worked and polished**	Hesse *et al.* (1975)
6	Kition	Cypro-classical I to Hellenistic	350–312 BC	1		Cheloniidae	Carapace fragment; two edges show cut marks.	Reese (2008)
		Syria						
7	Ras Shamra	Early Bronze Age	3200–2000 BC	102	2.1%	Cheloniidae	Unspecified elements	Helmer (2002)
8	Tell Tweini	Early Bronze Age	3200–2000 BC	-		*Trionyx* sp.	Only the presence is of soft shell turtle is mentioned.	Linselee (2008)
9	Tell Kazel	Late Bronze		1		Cheloniidae	Unspecified elements	Badre (1990)

		Age/Iron Age						
		Lebanon						
10	Tell Arqa	Early Bronze Age	2600–2000 BC	-			Cheloniidae	Only the presence of sea turtle is mentioned.	Chahoud & Vila (2011)
11	Sidon	Early Bronze Age	2600–2000 BC	173		7.5%	*Chelonia mydas*; *Trionyx triunguis*	Post-cranial elements (one scapula, one humerus, two femurs) and carapace and plastron fragments; cut marks recorded on the bones.	Chahoud & Vila (2011)
		Middle Bronze Age	2000–1500 BC	Not specified, but rarely present			*Trionyx triunguis?*	A few fragments; elements not specified	Chahoud & Vila (2011); Vila (2006)
12	Sarepta	Iron Age					Cheloniidae		D. Reese *pers. comm.*
		Israel's Mediterranean coast						

13	Sha'ar Efrayim	Late Chalcolithic	Early half of the fourth millennium BC	2		*Trionyx triunguis*	Two carapace fragments	Horwitz (2011)
	Ashkelon	Early Bronze Age	3200–2200 BC	1	<0.1%	Cheloniidae	One plastron fragment	Whitcher Kansa (2004)
14		Middle Bronze Age IIA	1900–1550 BC	1	<0.1%	Cheloniidae	One unspecified fragment	Hesse & Fulton (2011) in press
		Iron Age	1150–1000 BC	15	<0.1%	Cheloniidae	15 unspecified fragments	Hesse & Fulton (2020)
		7th century BC		30	<0.1%	Cheloniidae	30 carapace fragments	Hesse *et al.* (2011)
15	Qiryat Ata	Early Bronze Age II	2950–2650 BC	1	0.9%	Cheloniidae	One carapace fragment	Maher (2014)

16	Tell Abu Hawam	Late Bronze Age	1400–1300 BC	2		Cheloniidae	One hyoid with butchery marks, one unspecified element	Zohar & Artzy (2019)
17	Tell Dor	Early Iron Age	1200–1000 BC	17		*Trionyx triunguis*; Cheloniidae	Carapace and other elements	Lisk (1999); Raban-Gerstel *et al.* (2008)
18	Tell Michal	Persian period	525–350 BC	1	<0.1%	Cheloniidae	-	Hellwing & Feig (1989)

NISP and MNI from hand-collected, wet-sieved and floated soil samples.

Clazomenae

Table S2. Hand collection during excavations yielded specimens as small as 0.5g. In 2013 and 2014, wet-sieving experiments took place at the site. 4mm and 2mm meshes contained very few fragmented bones, and surprisingly no remains of marine vertebrates such as sea turtles and fish.

	Hand-collected MNI		NISP	
Phase	**Medium and large food animals**	**Turtle remains**	**Turtle remains**	**Non-fish vertebrate remains**
Late Bronze Age (fourteenth to twelfth centuries BC)	7			452
Early Iron Age (eleventh to tenth centuries BC)	22	1	1	986
Iron Age (eleventh to fourth centuries BC)	15			162
Middle Iron Age (ninth to eighth centuries BC)	8			57
Late Iron Age (seventh to sixth centuries BC)	30	2	2	491
Grand total	**94**	**3**	**3**	**2148**

Table S3. Of 85 floated samples, 430 bones were sorted from light residue above 1 and 2mm mesh. Heavy residue of 26 samples from LIA were studied for this study. Only two fragments of turtle carapace were recovered from these samples.

	Hand-collected NISP			Hand-collected MNI			Sieved (1 & 2mm mesh)
Phase	**Turtle NISP**	**Vertebrate NISP**	**Turtle %NISP**	**Trionyx MNI**	**Turtle MNI**	**Medium and large food animals**	
Early Bronze Age (2800–2400 BC)	6	2427	0.2%	1	1	24	
Middle Bronze Age (2000–1550 BC)	4	2332	0.2%		1	8	No turtle remains have been found
Late Bronze Age (1550–1150 BC)	19	6257	0.3%		10[1]	394	
Early Iron Age (1150–900 BC)	3	2134	0.1%		2	92	
Middle Iron Age (900–700 BC)	259	7344	3.5%	1	5	34	
Late Iron Age (700–330 BC)	1364[1]	24822	5.5%		18	165	
Persian and Hellenistic Periods (330–50 BC)	4	2275	0.2%		1	38	
Byzantine/Islamic period (Hisn al Tinat; eighth to twelfth centuries AD)	1	817	0.1%		2	9	
Crusader Period (twelfth to thirteenth centuries AD)	9	7040	0.1%	1[2]	1	73	

Total	**1669**	**55448**	**3.0**%		vertebrate NISP = 430

[1] Two definite *Caretta* in this period.

[2]Kabatiar (2017)

[3] A worked carapace, i.e. an artefact.

Tell Fadous

Table S4. All identified turtle remains at Tell Fadous are *Caretta caretta.* There are no identified remains of *T. triunguis* or *C. mydas.*

	Hand-collected NISP			Heavy residue (2mm mesh)			Hand-collected MNI	
Phases	**Turtle NISP**	**Other vertebrate remains (except fish)**	**Turtle NISP %**	**Turtle NISP**	**Other vertebrate remains**	**Turtle NISP %**	**Turtle MNI**	**Medium and large food animals**
Chalcolithic		18	0.0%		3			
EBA	49	1989	2.4%		59		9	41
EBA II	15	959	1.5%		23			13
EBA II/III	3	164	1.8%					
EBA II?		36	0.0%					
EBA III	112	7065	1.6%	28	1948	1.4%	2	81
EBA III/IV	6	554	1.1%	7	87	7.4%	1	11
EBA III?	124	4005	3.0%	10	388	2.5%	7	69
EBA II-III?	1	24	4.0%					2

EBA IV?		34	0.0%					1
EBA IV	1	275	0.4%		685	0.0%	1	8
MBA I/II	2	499	0.4%	9	591	1.5%	1	9
Grand total	**313**	**15622**	**2.0%**	**54**	**3784**	**1.4%**	**22**	**235**

Beirut

25928 hand-collected remains have been studied from BEY006. Five carapace fragments were found.

Tell Burak

Table S5. 122 soil samples, in total 4038 litres of soil, were floated. Of the floated samples, bones were sorted from light residue above 1 and 2mm mesh. In total 227 vertebrate remains were identified among these bones. The samples contained no turtle bones. Of the heavy residue, 48 samples were sorted through 2mm mesh, in total 192 vertebrate specimens were identified in these samples. None contained turtle remains.

	Hand-collected NISP				**Heavy residue**	**Light residue (1 & 2mm mesh)**	**Hand-collected MNI**		
Phases	**Unidentified turtle**	***Tryonix tringuis***	**Other vertebrate remains (except fish)**	**Turtle NISP %**	**Turtle NISP %**	**Turtle NISP %**	**Unidentified Turtle**	***Tryonix tringuis* ***	**Medium and large food animals**

Iron Age	1		3286	0.5%	0	0	1		12
Iron Age: Phase A	4	2					1	1	6
Iron Age: Phase B	3	3					1	1	
Iron Age: Phases A–B		1							2
Iron Age: Phases D–B		1						1	1
Iron Age: Phases C–B									1
Iron Age: Phase C	2						1		
Iron Age: Phase D–C									1
Iron Age: Phase D	1						1		2
MBA							2		6
MBA Phase 1a	3		827	0.7%					
MBA Phase 2a	3								
Memluk/Ottoman	1	1	223	0.9%			1	1	2
Grand Total	**18**	**8**		**5006**	**192**	**227**	**8**	**4**	**33**

Table S6. Body part representations.

Body part	**Weight (g)**	
	Fadous	**Kinet**
Shell	4184.68	16719.7

Skull	286.70	314.40
Fore flippper	1104.19	2267.5
Hind flipper	237	415.3
Autopodia	76.36	72.50
Other	90.94	108.90

Table S7. Osteometric measurements of recent specimens.

Location	Specimen no.	Humerus breadth of shaft (BSH; in mm)*	Minimum straightline carapace length (SCLmin; m)*	Curved carapace lenght (CCLmin ; m)*	Collection date	Geographical origin	Data collected by
Chelonia mydas							
Smithsonian Institution National Museum of Natural History	313721	26.4	0.571	0.625	27 Dec 1989	Florida	Meghan Truckey, April 2010
Smithsonian Institution National	313722	26.2	0.568	0.654	27 Dec 1989	Florida	Meghan Truckey, April 2010

Museum of Natural History							
Smithsonian Institution National Museum of Natural History	313713	27.6	0.579	0.632	26 Dec 1989	Florida	Meghan Truckey, April 2010
Smithsonian Institution National Museum of Natural History	313718	20.9	0.502	0.543	26 Dec 1989	Florida	Meghan Truckey, April 2010
Smithsonian Institution National Museum of Natural History	313723	24.4	0.566	0.609	27 Dec 1989	Florida	Meghan Truckey, April 2010
Smithsonian Institution National Museum of Natural History	313724	24.8	0.64	0.719	27 Dec 1989	Florida	Meghan Truckey, April 2010
Smithsonian Institution National	313717	15.2	0.37	0.391	26 Dec 1989	Florida	Meghan Truckey, April 2010

Museum of Natural History							
Smithsonian Institution National Museum of Natural History	313719	17.7	0.408	0.448	26 Dec 1989	Florida	Meghan Truckey, April 2010
Smithsonian Institution National Museum of Natural History	313743	13.2	0.315	0.336	6 Nov 1988	Virginia	Meghan Truckey, April 2010
Royal Belgian Institute of Science, Brussels	4,534	26.1	0.54	0.61	21 Dec 1949	?	Koolstra, Çakirlar, Küchelmann; December 2017
Royal Belgian Institute of Science, Brussels	13910	28.8	0.65	0.70	August 1960	Zoo, Antwerpen	Koolstra, Çakirlar, Küchelmann; December 2017
Royal Belgian Institute of Science, Brussels	13909	16.4	0.38	0.413	1 Jan 1948	Mediterranean	Koolstra, Çakirlar, Küchelmann; December 2017

Tübingen University Archaeozoology Collection	RCL 2	13.4	0.32	Unknown	Persian Gulf	Çakirlar, 2010
Tübingen University Archaeozoology Collection	RCL 16	15	0.375	Unknown	Persian Gulf	Çakirlar, 2010
Caretta caretta						
Royal Belgian Institute of Science, Brussels	218.S	12.6	0.294	10 May 1872	Zoo, Brussels	Koolstra, Çakirlar, Küchelmann; December 2017
Centro de Arqueologia da Universidade de Lisboa	CIPA 1441	21	0.59	-	Portuguese coast	Simon Davis, 2010
Adnan Menderes University Veterinary Anatomy		20.7	0.589	-	Aegean	Cakirlar, 2017

* BSH is the humerus diameter explained by Zug *et al.* (2002); SCL and CCL are explained by Wyneken (2001).

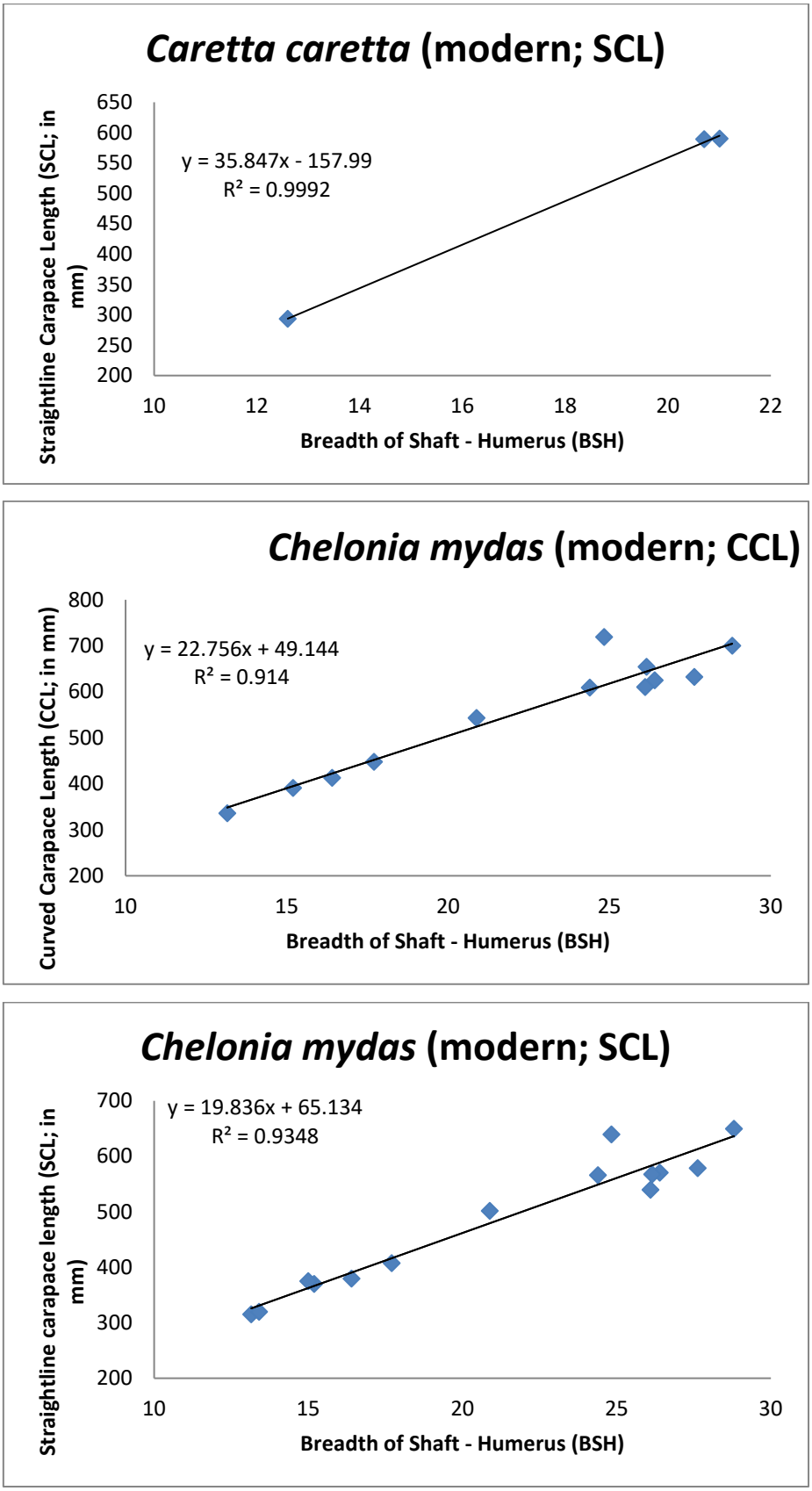

Figure S1. Regression formulae to reconstruct SCL (straight carapace length) and CCL (curved carapace length) from BSH (breadth of shaft of humerus) (figure by the authors).

Measurements of archaeological specimens

Chelonia mydas humerii

Table S8. Kinet Höyük (LIA = Late Iron Age; MIA = Middle Iron Age). BSH = (smallest) breadth of shaft = humerus diameter (Zug *et al.* 2002).

Faunal ID	Excavation year	Operation	Bag number	Locus	Lot	Side	Portion	Period	BSH (mm)
5090	1997	A	8534	332	374	Left	Shaft	7 -LIA	37.10
2945	1998	D	10254	138	365	Left	Shaft	7 -LIA	33.40
3968	1998	D	10578	147	381	Left	Shaft	7 -LIA	32.20
3968	1998	D	10899	159	392	Right	Shaft	7 -LIA	36.20
2972	1998	D	10988	162	397	Right	Shaft	7 -LIA	34.50
73	2001	EH	13944	221	407	Right	Shaft	7 -LIA	36.00
390	2001	EH	14003	226	421	Right	Shaft	7 -LIA	28.40
2595	2001	EH	14869	243	509	Right	Shaft	7 -LIA	35.90
6400	2002	EH	15628	271	582	Left	Almost complete	7 -LIA	36.50
6401	2002	EH	15628	271	582	Left	Shaft	7 -LIA	31.20
6402	2002	EH	15628	271	582	Right	Shaft	7 -LIA	33.50
5091	1997	A	8534	332	374	Right	Shaft	7 –LIA	34.20
4693	1997	A	7291	246	266	Left	Shaft	7 –LIA	39.90

764	1997	EH	8601	195	373	Right	Almost complete	7 –LIA	35.20
1604	1997	EH	8607	170	375	Left	Shaft	7 –LIA	36.30
747	1997	EH	8779	214	390	Right	Shaft	7 –LIA	35.80
165	1997	EH	8827	213	402	Left	Shaft	7 –LIA	32.00
19943	1998	A	8918	Below 201	Below 325	Left	Distal end	7 –LIA	33.10
2703	1998	D	10987	161	394	Right	Shaft	7 –LIA	36.40
12944	1999	D	12944	180	466	Left	Shaft	8 - MIA	39.90
6798	2002	EH	15680	279	593	Left	Shaft	8 - MIA	35.90
7165	2002	EH	15874	263	610	Right	Shaft	8 - MIA	36.10
8577	2002	EH	16391	309	688	Right	Shaft	8 - MIA	39.80

Caretta caretta humerii

Table S9. Tell Fadous-Kfarabida (Early Bronze Age). BSH = (smallest) breadth of shaft = humerus diameter (Zug *et al.* 2002).

Excavation year	Bag number	Faunal ID	Square	Locus	Portion	Side	BSH (mm)
2011	10247	8751	305/295	1646	Complete	Left	26
2009	9211	5700	295/295	802	Proximal half	Left	24,30
2009	9211	5699	295/295	802	Proximal half	Right	26,20
2009	10428	10036	295/295	801	Shaft	Right	26,20

Table S10. Kinet Höyük (Late Iron Age). LIA = Late Iron Age. bsh = (smallest) breadth of shaft = humerus diameter (Zug *et al.* 2002).

Faunal ID	Excavation year	Operation	Bag number	Locus	Lot	Side	Portion	Period	BSH (mm)
58	1997	A	8534	332	374	Left	Shaft	LIA	20.50

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