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ZOOARCHAEOLOGICAL STUDIES AT ÜÇAĞIZLI CAVE:
PRELIMINARY RESULTS ON PALEOLITHIC SUBSISTENCE AND
SHELL ORNAMENTS

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This paper presents preliminary findings on two aspects of the faunal remains from Üçağızlı Cave—subsistence trends and ornament assemblages, the latter of which are among the oldest in the world. Seven cultural layers have been identified in Üçağızlı Cave as of August 2000, spanning the earliest Upper Paleolithic (41 KYA) through early Epipaleolithic (17 KYA) periods (Dinçer et al. 2001; Kuhn et al. 1999; 2001). This shelter lies tucked into the southwest face of a promontory on the Hatay coast of south-central Turkey, adjacent to a high-walled, narrow valley that may have presented exceptional advantages for hunting roe deer, fallow deer, and wild goat, remains of which abound in the cultural deposits. The diverse contents of the Paleolithic deposits indicate that it was a residential camp for much or all of its occupation history; there are stone tools, bone and antler implements, cobble grinding stones and anvils, food debris in the forms of broken bones and shell, ornaments, hearth features, and, in layer group B, a remarkable rock alignment (possibly a wind-break) dating to 30-35 KYA.

TAPHONOMY AND GAME PROCESSING

Bones in Üçağızlı Cave tend to be very well preserved, although calcite concretions obscure the surfaces of many. Signs of human modification are prevalent nonetheless, including tool marks that suggest on the basis of ethnographic data extensive defleshing of ungulate carcasses, possibly to prepare meat or hides for smoke-drying.

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Clean transverse fractures are common on ungulate leg bones, typical of through-bone dismemberment rather than disarticulation at the joints. Some limb segments are still in articulation, indicating limited sedimentary disturbance after Paleolithic humans discarded them. Marrow was removed from most large bones, evidenced by impact cones and spiral fractures, but there are no indications of bone pulverizing and boiling, the most intensive form of marrow rendering known among later foraging peoples.

Tooth eruption/wear data indicate that some of the sub-adult ungulates died at exactly the same age, probably in autumn. It is likely that only one to a few animals were hunted at any one time, however, based on the rich mix of ungulate species (Table: 1a).

Burning damage is prevalent on bones and often intense (calcination). In fact, the great concentrations of unlaminated wood ash in the initial Upper Paleolithic and Ahmarian layers are unusual. Paul Goldberg's study of sediment micromorphology indicates the presence of many "baked" (fire-hardened) surfaces, but most of the ash generated by wood fires was subsequently scooped-up and dumped into small piles nearby, usually near the shelter walls, hence the lack of visible layering in the many ash pockets we find. The high volumes of wood burned at this site imply cold season occupations and/or that additional fuel was required for cooking or smoking animal products.

Although the technological characteristics of the stone tool industries shift over time, as noted by Steven Kuhn and Kris Kerry (Güleç et al., this volume), a common theme in all but the Epipaleolithic assemblages is the high incidence of end-scrapers. These tools suggest a rather special range of activities and may have been directed to butchering ungulates and/or tanning hides.

In addition to bones, there are many mollusk shells in Üçağızlı Cave. People exploited certain large-bodied marine mollusks as food, whereas much smaller marine and brackish water species were the raw material for ornament-making. The marine mollusks consumed as food are mainly turbans (*Monodonta*) and limpets (*Patella*); the broken edges of the turbans and limpets are always sharp and unabraded (there is no evidence of wave working), meaning that these mollusks were collected while alive, in contrast to the situation for ornamental shells. Burning is substantially higher on turbans than on limpets, suggesting that only turbans were heated prior to consumption (Table: 2).

Shells are present in all of the cultural layers, but those from the earlier Upper Paleolithic are ornamental types almost exclusively (Table: 3). The shelter may have been situated farther uphill from the Mediterranean shoreline then, and edible mollusks not transported to the shelter for this reason. This does not account for the great abundance of edible shellfish remains in the Epipaleolithic layer, which is dated to the more recent shoulder of the Last Glacial Maximum.

Amazingly, many of the shells in the Ahmarian through Initial Upper Paleolithic layers retain original protein pigment—conchiolin—an observation confirmed by Stafford Research Laboratories (Boulder, Colorado, U.S.A.). Radiocarbon dates on these shells, and associated charcoal samples, testify to their antiquity.

TRENDS IN PALEOLITHIC SUBSISTENCE

Table 3 reveals significant shifts in faunal composition from the Initial Upper Paleolithic (37-41 KYA), the Ahmarian (B layer group, 30-36 KYA), and the early Epipaleolithic (17 KYA). Variation in ungulate species frequencies over time may simply reflect paleoclimate oscillations and associated changes in local vegetation. Roe deer is especially common in the middle of the sequence (Ahmarian Phases, possibly with more forest cover), whereas wild goat dominates (possibly more sub-alpine or arid conditions) the ungulate fractions before and after.

However, other variation in species frequencies reflects changes in the nature of Paleolithic human subsistence, independent of climate-driven shifts in animal community structure. Specifically, there is good evidence for increases in humans' dietary breadth, especially by the early Epipaleolithic period. The ecological term "diet breadth" refers to the relative emphasis that foragers place on one food type over another in accordance with differences in their energetic return, in other words the trade-off between the cost of obtaining and processing a food item and its net yield. A predator can afford to ignore lower quality prey if the probability of finding a superior type in the near future is high. Rich foraging conditions therefore foster a narrow diet. As the supply of preferred prey dwindles, however, broadening the diet to include common but lower yield prey types maximizes a predator's returns per unit expenditure by reducing search time. Under these conditions, evidence of increasing dietary breadth is expected to take the form of greater proportional evenness among high-ranked and low-ranked prey items.

Simplifying the prey categories in the Üçağızlı faunal assemblages according to body size (large and small types) and work-of-capture (slow-moving and quick-moving types) reveals a trend toward greater evenness among prey types (Table: 1b). Ungulates, the highest ranked of all prey due to their large body size, were the overwhelming source of animal protein during the Initial Upper Paleolithic; quick small animals were seldom exploited. Ungulates also dominate the Ahmarian layer group, but slow small prey were used in higher proportions than before. By the Epipaleolithic, ungulates were relatively minor sources of meat, and humans' reliance on quick small prey increased greatly. Slow, easily collected animals in the Hatay region are mainly shellfish and tortoises. Quick small animals—birds, hares, and fish—are more costly to obtain, either because foragers must be equally quick to catch them, or foragers must make and maintain special tools to outwit them.

Consistent with other Mediterranean faunal series, there is strong evidence of expanding diet breadth during a generally cold climate phase, the opposite of the conditions that foster expansions of small-bodied species in animal communities (Stiner et al. 1999; Stiner 2001). This phenomenon occurs earliest southward in the Levant (Galilee region), somewhat later in the Hatay and northern Mediterranean rim. Climate-independent expansions in dietary breadth are thought to be responses to a dwindling supply of preferred (high-ranked) prey. Increasing diet breadth over thousands of years may suggest increases in human population densities well before the origins of agriculture. Stress on the faunal resource base is certainly in evidence by the early Epipaleolithic (17 KYA) in the Hatay region, when a variety of quick-flight small prey were hunted most intensively.

ORNAMENTS

Nearly every Paleolithic ornament from Üçağızlı Cave was made from shell. The only exception so far is one deeply incised terminal phalanx (claw) from an eagle or large vulture. There is significant variation in the mollusk species emphasized for ornament-making by period, and five distinct frequency patterns are apparent (Table: 4). The Epipaleolithic ornament assemblage is the most taxonomically diverse for its size; it is distinguished further by the unique presence of *Dentalium* (tusk) shells, like cases of similar age southward in the Levant. *Columbella* and *Nassarius* occur in all layers in Üçağızlı Cave, but they were favored equally during the Ahmarian phases (Layers B-B4), whereas *Nassarius* was emphasized almost exclusively in the early Upper Paleolithic phases (layers G-H-I). The substantial presence of *Theodoxus* in Layer C sets this assemblage apart from the others; these snails inhabit fresh or brackish waters of the Jordan Rift and Asi drainage.

How do we know these shells are Paleolithic ornaments? In addition to being quite small (<2.0 cm.), about 20% of these shells display abrasion from wave-working, suggesting that people generally collected them as vacant, beach-cast shells (Table: 5). What is more, a high proportion of the shells used for ornament-making are ecologically rare species (e.g. carnivores that exist high in food chain), reflecting strong preferences on the part of humans. Rounded, basket-shaped or pearl-shaped forms are

especially common in the ornament assemblages of Uaęızlı and elsewhere on the Mediterranean Rim; people made use of different molluskan families and genera across the northern and eastern Mediterranean Rim, apparently to meet a common aesthetic. At Uaęızlı, demand was met through the preferential acquisition of *Nassarius gibbosula* and *Theodoxus jordani*.

Between 63-90% of small shells interpreted to be ornaments are perforated. Gastropod shells usually were punched through the flange and/or the apex (especially *Columbella rustica*), prefaced by some pre-boring or pecking; there is no evidence of grinding or drilling techniques. The lips of moon snails (*Naticarius*) from the Ahmarian layers were instead "sawn" to create a slit-shaped holes. Pre-existing holes on wave-worked shells were also exploited by humans, but many of the holes have sharp, irregular edges. Symmetrical, beveled holes drilled by naticid and muricid predators are easily distinguished from human-caused perforations and are rare (3%) overall.

As is true at other Mediterranean Upper and Epipaleolithic sites (Stiner 1999), the shell ornaments in Uaęızlı Cave appear to have accumulated in the deposits along with other camp litter, shed gradually and accidentally by humans in a variety of contexts. However, the distinctly non-random concentrations of ornamental shells along the north and northeast walls of the shelter contrast markedly with the nearly random distributions of food shells and unguulate body parts. We have yet to find shell beads in tightly packed clusters or in strung positions (as might occur in human graves), but the peculiar concentrations of ornament shells suggests that some of the ornament concentrations could represent semi-disturbed caches.

Some of the shell ornaments from the Initial Upper Paleolithic are dated to 41,000 radiocarbon years, among the oldest known anywhere in the world and therefore of great interest with respect of the evolution of self-decoration, and presumably ethnicity and symboling behavior, in early human societies. While the presence of ornaments is quite unusual for the initial and early Upper Paleolithic in the Levant in general, including the Ahmarian, there is the case of Ksar 'Akil in Lebanon, where the same array of food and ornamental species were found in deposits of roughly equivalent age (reviewed in Kuhn et al. 2001). As in Uaęızlı Cave, the relative abundance of food to ornament shells is high in the late Upper/Epi-Paleolithic layers, low in the early Upper Paleolithic.

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Table 1: Large and small game frequencies for the Epipaleolithic, Ahmarian, and Initial Upper Paleolithic samples from Uçağızlı Cave.

a. by taxon:						
Initial Upper Paleolithic	Epipaleolithic		"Ahmarian"			
	N	%	N	%	N	%
LARGE GAME (UNGULATES):						
wild goat (<i>Capra aegagrus</i>)	57	13	112	14	104	48
roe deer (<i>Capreolus capreolus</i>)	27	6	298	37	29	13
fallow deer (<i>Dama mesopotamica</i>)	9	2	108	13	42	19
wild cattle (<i>Bos primigenius</i>)	—	—	4	<1	9	4
wild boar (<i>Sus scrofa</i>)	—	—	8	1	4	2
SMALL GAME:						
edible shellfish (<i>Patella & Monodonta</i>)	139	31	234	29	21	10
birds (<i>medium & small</i>)	70	15	14	2	1	<1
hare (<i>Lepus capensis</i>)	100	22	—	—	—	—
spur-thighed tortoise (<i>Testudo graeca</i>)	19	4	1	<1	2	1
fish	8	2	4	<1	—	—
CARNIVORES:						
small carnivores (<i>Vulpes, Felis & Martes</i>)	15	3	15	2	2	1
large carnivores (<i>Canis & Ursus</i>)	1	<1	6	1	1	<1
LARGE RAPTORS (special use likely):						
huge bird	7	1	2	<1	—	—
TOTAL	(452)		(806)		(215)	
b. by size and work-of-capture categories:						
Initial Upper Paleolithic	Epipaleolithic		"Ahmarian"			
	N	%	N	%	N	%
Large game (<i>all ungulate species</i>):	93	22	530	68	188	89
Slow small game (<i>shellfish & tortoises</i>):	158	37	235	30	23	11
Quick small game (<i>birds, hares & fish</i>):	178	41	18	2	1	<1
TOTAL	(429)		(783)		(212)	

Notes: (N) shellfish counts are MNI to correct for mean size differences relative to vertebrate remains; all other counts are NISP. Raptors likely were used for ornamental and perhaps ritual purposes; one claw was modified for suspension. These data are estimates based on samples collected during the 1997 and 1999 excavation seasons.

Table 2: Summary of damage frequencies by shell type for all assemblages from Üçağızlı Cave.

variable	(O) small gastropods	(O) tusk shells	(O) most bivalves	(F) large turbans	(F) limpets
PERCENTAGE VALUES BASED ON NISP OR MNI:					
beach polish (% of NISP)	21 %	5 %	3 %	0 %	0 %
completeness (MNI/NISP)	.96	.53	.51	.43	.66
perforation (% of MNI)	69 %	90 %	17 %	0 %	0 %
burned (% of NISP)	5 %	0 %	3 %	16 %	2 %
punched-out spire (% of NISP)	27 %	n/a	11 %	39 %	<1 %

(O) ornamental shells; (F) food species. Perforation count refers to sectioning in the case of tusk shells. Data are for all layers combined. (nd) no counts available yet.

Table 3: Relative abundances of ornamental and food marine mollusks in the Epi- and Upper Paleolithic layers of Üçağızlı Cave.

period (layer)	orn MNI	food MNI	orn+food MNI	% (MNI) ornaments	% (MNI) food
EPI	46	105	151	31 %	69 %
B	359	991	1350	27 %	73 %
B1-4	456	1056	1512	30 %	70 %
C	70	60	130	54 %	46 %
E-E2	47	12	59	78 %	22 %
F-F2	50	1	51	98 %	2 %
G-H-I	57	3	60	95 %	5 %

Table 4: Relative abundances (MNI) of common and uncommon taxa in the ornamental shell assemblages from the Epi- and Upper Paleolithic layers of Üçağızlı Cave.

shell types	EPI MNI (%)	B MNI (%)	B1-4 MNI (%)	C MNI (%)	D MNI (%)	E-E2 MNI (%)	F-F2 MNI (%)	G-H-I MNI (%)
<i>Columbella rustica</i>	10 (22)	123 (34)	204 (45)	29 (41)	3 (50)	29 (62)	11 (22)	4 (7)
<i>Nassarius gibbosula</i>	10 (22)	191 (53)	203 (44)	20 (29)	3 (50)	12 (25)	32 (64)	50 (88)
<i>Dentalium</i> spp.	9 (20)	0 (0)	0 (0)	0 (0)	0 (0)	1 (2)	0 (0)	0 (0)
<i>Gibbula</i> spp.	11 (24)	16 (4)	5 (1)	1 (1)	0 (0)	1 (2)	0 (0)	1 (2)
<i>Theodoxus jordani</i> (+)	0 (0)	12 (3)	15 (3)	16 (23)	0 (0)	1 (2)	5 (10)	0 (0)
marine bivalves	4 (9)	9 (2)	16 (3)	1 (1)	0 (0)	0 (0)	1 (2)	0 (0)
other species	2 (4)	8 (2)	13 (3)	4 (6)	0 (0)	3 (6)	1 (2)	2 (3)
total assemblage MNI	46	359	456	70	---	47	50	57
N-species	13	19	15	9	---	7	5	5

Note: Data are from secure proveniences excavated 1997-2000 are included in the calculations. (+) This category represents fresh- and brackish water taxa, dominated by *T. jordani* but including a few specimens of the genera *Corbicula*, *Melanopsis*, and *Potomida*, nearest sources of which would be the Orontes River drainage.

Layer	total NISP	total MNI	MNI/NISP completeness index	(%) NISP burned	(%) NISP beach worn	(%) MNI perforated	(%) MNI mollusk predated	(%) MNI perforated	(%) NISP color retained
EPI	59	46	.78	(5)	(20)	(63)	(0)	(0)	(2)
B	385	359	.93	(7)	(33)	(74)	(6)	(9)	(23)
B1-4	481	456	.95	(6)	(33)	(77)	(3)	(16)	(23)
C	70	70	1.00	(11)	(31)	(81)	(3)	(11)	(27)
E-E2	48	47	.98	(10)	(44)	(68)	(0)	(13)	(12)
F-F2	50	50	1.00	(8)	(42)	(90)	(0)	(20)	(22)
G-H-I	58	57	.98	(2)	(57)	(74)	(3)	(14)	(10)
all layers combined	1157	1091	.94	(7)	(34)	(76)	(3)	(13)	(21)

Table 5. Abundance and damage frequency data for ornamental mollusks by layer.