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"It's the pit's": Human-modified animal bone from an Early Neolithic pithouse settlement (Blagotin) in central Serbia

« C'est dans les fosses ! » : ossements d'animaux modifiés par l'homme découverts sur un site d'habitat en fosses du Néolithique ancien (Blagotin) en Serbie centrale

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Abstract: This paper presents the spatial distribution of various artefacts (tools, ornaments) at the Early Neolithic (Starčevo culture) site of Blagotin, in central Serbia. The spatial pattern and nature of the various pit features, arranged in a circle around a larger, centrally located pit feature suggests that they were (for the most part) pithouse dwellings (*zemunice*). The central pithouse (ZM07) contained very large figurines on a fired clay floor placed over a human infant burial and a feasting pit. All of these suggest that the central pithouse may have had a ceremonial function. However, spatial analysis of bone artefacts, based on their morphotypes and presumed technical functions, does not indicate any specific activity associated with the central structure, while revealing that different activities occurred in the surrounding pithouses. The study also examines the degree of bone modification (shaped *versus* unshaped tools), levels of taxonomic identification, and the technological and taphonomic processes affecting the assemblage.
Keywords: Early Neolithic, Serbia, Starčevo culture, culturally modified animal bone, spatial distribution, polish versus morphology.

Résumé : Cet article présente une analyse de la répartition spatiale d'artefacts osseux (outils, ornements) découverts sur le site du Néolithique ancien (culture de Starčevo) de Blagotin, en Serbie centrale. La configuration spatiale et la nature des différentes structures en fosse, disposées en cercle autour d'une fosse plus grande et située au centre, suggère qu'elles correspondent, pour la plupart, à des habitations semi-enterrées (*zemunice*). La structure centrale (ZM07) contenait de très grandes figurines sur un sol en terre cuite, au-dessus d'une sépulture d'enfant et d'une fosse de banquet (festin rituel). L'ensemble de ces éléments suggère que la structure centrale pourrait avoir eu une fonction cérémonielle. Cependant, l'analyse spatiale des artefacts osseux, selon leurs morphotypes et leurs fonctions techniques présumées, n'indique pas de fonction spécifique clairement associée à cette structure, tout en montrant que différentes activités se sont déroulées dans les autres habitations semi-enterrées du même site. L'étude examine également la nature et le degré de modification des os (outils façonnés, outils non façonnés ou « outils bruts »), les niveaux d'identification taxonomique, ainsi que les processus technologiques et taphonomiques ayant affecté cet ensemble de mobilier.
Mots-clés : Néolithique ancien, Serbie, culture de Starčevo, os culturellement modifié, distribution spatiale, polissage ou morphologie.

INTRODUCTION

Most research on worked animal bones and teeth in archaeological contexts focuses on how they were made and used. Yet, worked bone has its own life history that can be inferred not only from the object itself, but also from its spatial and depositional context—i.e., where it was made, used, lost and/or discarded, as well as the activities at that location. Investigation of the spatial distribution of osseous industrial materials within settlements allows insight into the social and economic organisation of communities. In particular, it allows for testing of theories concerning whether each structure in the settlement represents a separate household unit or the site as a whole is the unit of production and reproduction (in other words, the household; Wilk and Rathje, 1982; Yanagisako, 2015). If the distribution of remains is the same from each of the residential structures in a settlement, this implies that each might be inhabited by a separate household. However, if the distribution of remains is different from building to building, this might suggest that the household encompasses the entire settlement.

In this essay, the spatial dynamics of worked bone in an Early Neolithic (early farming) community in southeastern Europe is explored as a means of inferring both the nature and location of activities.

1. BLAGOTIN

In the temperate environmental zone in the northern half of the Balkans (fig. 1 left insert), the earliest food producers are known as the Starčevo–Criș–Körös culture. The Starčevo culture of Serbia has been redated: 6200–5400 BCE cal. (Whittle et al., 2002; Biagi and Spataro, 2005).

Blagotin lies in central Serbia (fig. 1), on the edge of the village of Poljna (fig. 1 right inset), Situated at the base of the Blagotin Mountain, the site lies on a gently sloping terrace above an incised stream valley (fig. 2A). During the Neolithic, the stream in the valley below the site was probably fast-flowing, but relatively shallow (Greenfield and Jongsma, 2006; Greenfield and Jongsma-Greenfield, 2014). The region is filled with lush fields and forests, and covered by thick forest soils (Pešić, 1967).

The Early Neolithic contains typical Starčevo material culture and dates very early in the Early Neolithic (c. 6100 BCE). It is a single occupation of short duration (Whittle et al., 2002; Biagi and Spataro, 2005).

Based on the results from the surface survey, subsurface coring, and excavation, the Early Neolithic site is small and discrete (c. 100×200m), having an elliptical shape (fig. 2A) (Greenfield, 2000; Greenfield and Jongsma-Greenfield, 2014).

A number of Early Neolithic pit-features were discovered and excavated in the central part of the site (fig. 2B; Stanković and Runić, 1990; Stanković and Greenfield, 1992; Stanković and Leković, 1994; Greenfield, 1995). These features are semi-subterranean or pithouse structures (Serbia – *Zemunica*; ZM), and labelled as ZM01 to ZM07. Other deposits not initially identified as pithouses were named *Objekat* (OB; Serbian for installation), but which are now recognised as pithouses (OB01 and OB02, and are not always shown on maps of site).

The pit-features (ZM01–ZM06 in Sondas A–E and H–L) are distributed in a circle around a larger central pit structure (ZM07 in Sondas F–G; fig. 2B). This is similar to distributions observed in other Starčevo settlements (e.g. Vinča–Belo Brdo's basal horizon, Foeni–Salaș, and Knjepište; Vasić, 1936, Stanković, 1986, Greenfield and Jongsma, 2008; Greenfield and Kapuran, 2021).

The central pit-feature (ZM07) is the largest and has the deepest and most complex stratigraphy (Radoman, 1994; Greenfield, 2000; Greenfield et al., 2021). This and the other pit features were capped by a thick horizon of artefacts. Beneath, there is a thick layer of material atop a daub floor (fig. 3A). Two large clay anthropomorphic figurines (30 cm high) with accentuated thighs and stylised heads were found on the floor. Other finds include grain-shaped clay artefacts and lamps/altars for lighting/burning (Tomić, 1988; Stanković, 1993; Stanković and Leković, 1994; Stanković, 1995; Nikolić and Zečević, 2001; Vuković, 2005).

A series of deposits were found beneath the daub floor of ZM07. The upper layer is composed of a thick ash deposit containing a human infant (a few weeks old/neonatal) burial (fig. 3B bottom right corner). The lower deposit was a small pit full of animal bones (JA02 = Serbian *Jama* = Pit; fig. 3B). The bones were deposited in a single short episode, probably from a single feasting episode (Greenfield and Jongsma-Greenfield, 2018).

All of the peripheral pithouses were smaller and shallower. None of the pit features cut into each other. Both central and peripheral pithouses were connected across the site by a single exterior surface (stratum) suggesting that it was a single short-term occupation (Greenfield and Jongsma-Greenfield, 2014).

2. MATERIALS AND METHODS

Two main types of data were recorded regarding tool and ornament production: morphological modifications and surface polish from use. The resulting typology relies on these two criteria, which are discussed below.

Morphologically modified bones were those whose shape was altered by production (e.g. forming and piercing) and use (e.g. wear and retouching; fig. 4A-C). These bones were classified as tool, ornament, gaming, or indeterminate in shape and perceived function. Finer subdivisions of these general categories were made based on morphology that allowed categorisation of awls, chisels, scrapers, etc. The typology was based on previous analyses in the region (Srejović and Jovanović, 1958–1959; Bačkalov, 1979; Chokye, 1979, 1982–1983, 1983).

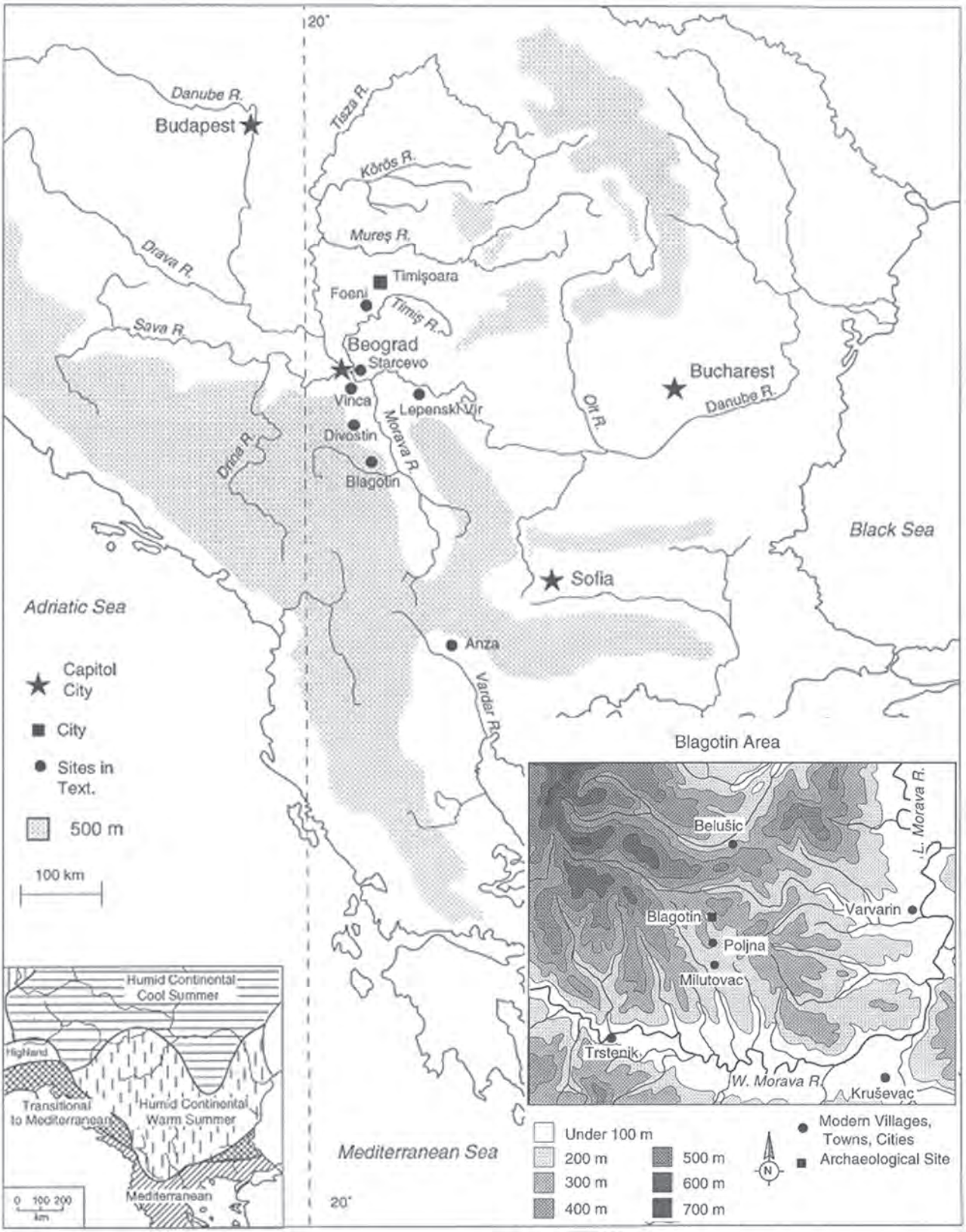
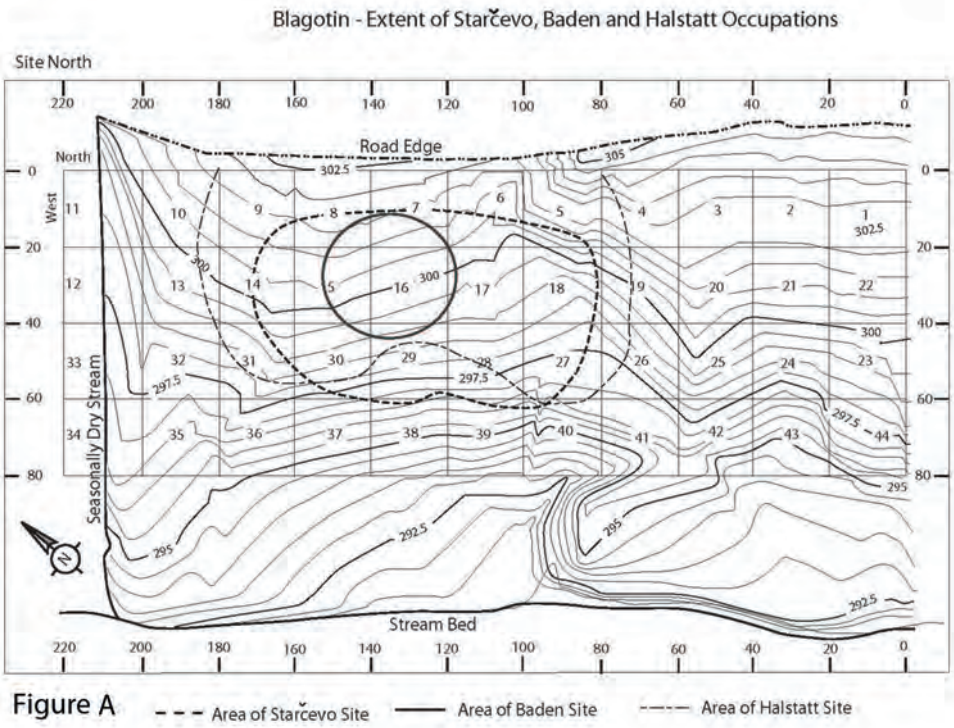


Fig. 1 – Map of region showing location of Blagotin, village of Poljna, and other modern and ancient communities. Inset right showing local region and topography. Insert left shows climatic regimes. All illustrations are property of the author (map L. Stene and H. Greenfield).

***Fig. 1** – Carte de la région montrant l'emplacement de Blagotin, du village de Poljna et d'autres communautés modernes. L'encart à droite montre la région locale et la topographie. L'encart à gauche présente les régimes climatiques (carte L. Stene et H. Greenfield).*



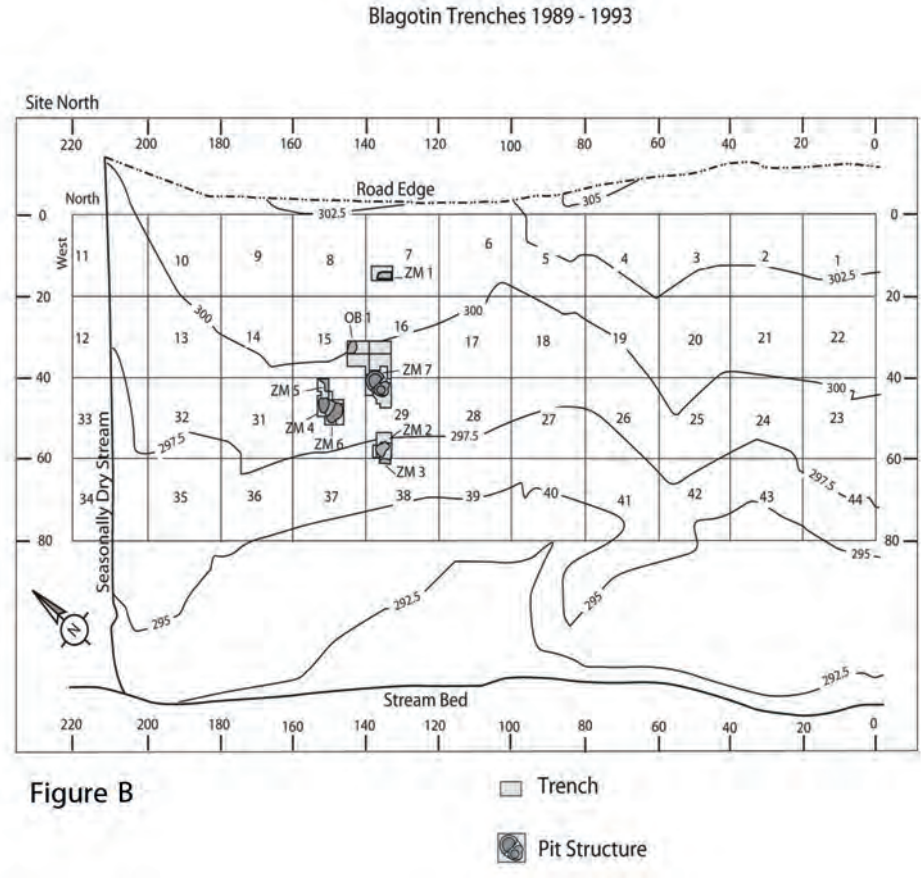


Fig. 2 – Archaeological contexts: A) Map showing extent of Early Neolithic, Eneolithic, and Early Iron Age occupation based on surface collection, coring, and excavation; B) Map showing location of main Early Neolithic excavated features (1990–1995; map L. Stene and H. Greenfield).

Fig. 2 *– Contextes archéologiques : A) carte montrant l'étendue de l'occupation du Néolithique ancien, de l'Énéolithique et du premier âge du Fer, d'après les prospections de surface, les carottages et les fouilles ; B) carte indiquant l'emplacement des principales structures fouillées du Néolithique ancien (1990-1995 ; carte L. Stene et H. Greenfield).*

Figure A

Figure B

Fig. 3 – Photographs of Pithouse ZM07: A) Photo of ZM07 daub floor with two large clay anthropomorphic figurines; B) Bone concentration in the pit (JA02) beneath ZM07 (centre) and ash deposit with human infant skeleton (lower right corner; photos S. Stanković).

***Fig. 3** – Photographies de la maison semi-enterrée ZM07 : A) cliché du sol en torchis de ZM07, avec deux grandes figurines anthropomorphes en argile ; B) concentration d’os dans la fosse (JA02) sous ZM07 (au centre) et dépôt de cendre contenant un squelette de nourrisson humain (angle inférieur droit ; clichés S. Stanković).*

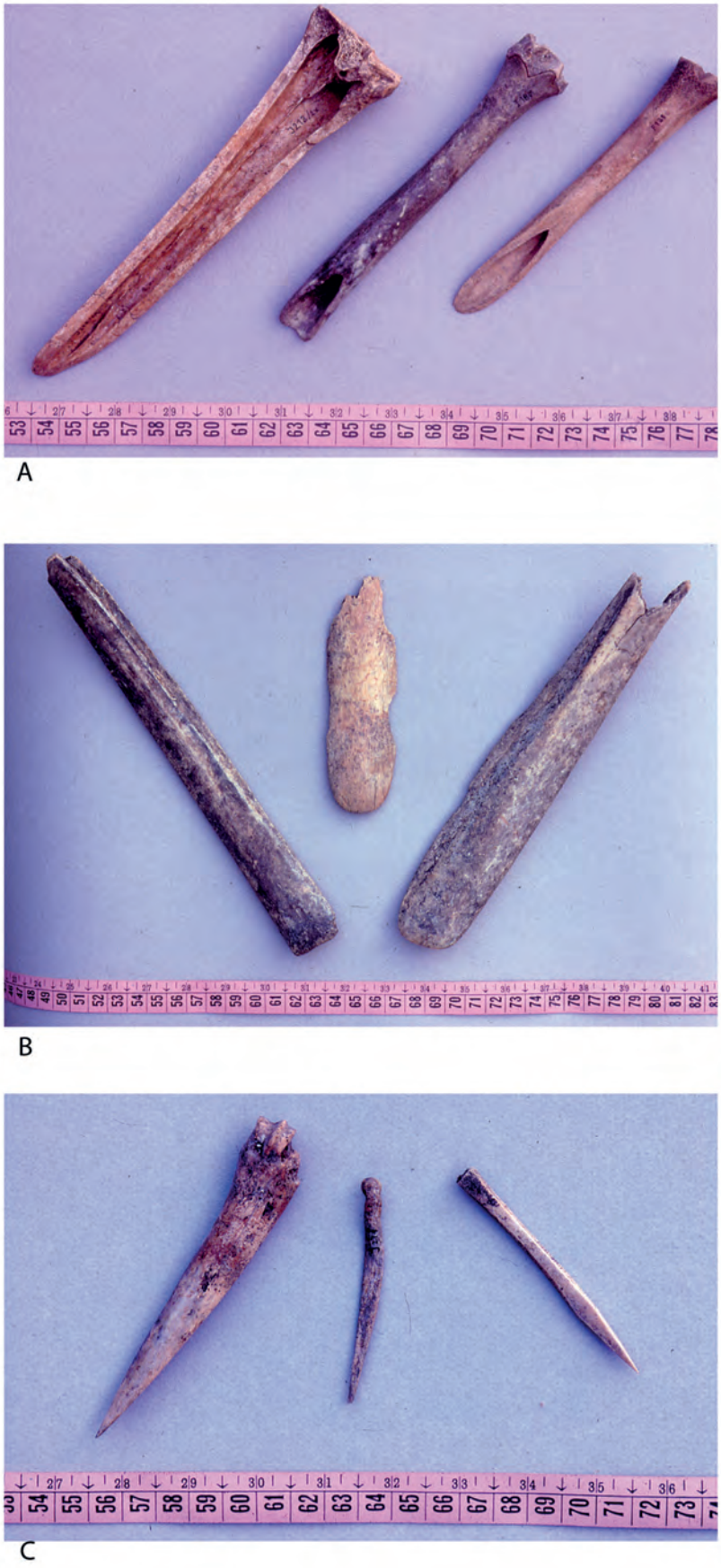


Fig. 4 – Some examples of Early Neolithic bone tools from Blagotin: A) Handles, B) Spatulas, and C) Awls (photos Z. A. Greenfield).
Fig. 4 *– Quelques exemples d'outils en os du Néolithique ancien de Blagotin : A) manches, B) spatules et C) poinçons (clichés Z. A. Greenfield).*

Surface use wear polish is the other major category that indicates bones were handled. Polish is typically from either hand holding or rubbing on some other material during use. The polish on the bones is not the result of taphonomic processes (e.g. soil movement) because the location of the polish on the bones was very specific. Typically, soil or cooking polish is found all over the bone surface, while use wear polish is limited to particular types of parts where it is held or used in an action (Rabinowicz, 1968; Olsen, 1989; González-Urquijo and Ibáñez-Estévez, 2003). Many tools/ornaments are identified as such simply based on the presence of use-wear polish. Four degrees or intensities of polishing (none, light-barely visible, medium, and heavy/mirror-like) were recorded for each specimen (Greenfield, 1986). Most polished bones were not shaped. The polished bones were likely expedient tools that were picked up and used for a relatively short period (Fisher, 1995; Choyke and Bartosiewicz, 1999). All shaped bones had some degree of polish (fig. 4A-C).

3. SOME GENERAL OBSERVATIONS

Only a very small proportion of the total bone assemblage was identified as tools/ornaments either morphologically or use-wear polish (2.15%; table 1-A). Use wear polish was the most common modification in the assemblage (87.6%), followed by shaped tools (11%), ornaments (0.28%), and indeterminate tools/ornaments (0.4%).

3.1. Polish intensity

The assemblage is almost nearly equally divided between light (41%; N = 291) and medium (45%; N = 316) polish, followed by heavy polish (13.7%; N = 97).

3.2. Bone functional categories

Most specimens were too fragmentary to be assigned to a type. These are the Tool (35%), Tool? (20%), and Polish only categories (32.6%) or 87% of the osseous industry (table 1-B). A few specimens could be assigned to a specific functional category (sub-type), such as one piece (pounder/tenderizer, ornament, smoothed, grinder, gaming pieces, scrap from tool making, scoop/spoon), two pieces (ornament?), and three pieces (raw material). The more common types are spatula (12 NISP; fig. 4B), rubber (16 NISP), handle (17 NISP; fig. 4A), and awl (29 NISP; fig. 4C).

3.3. Depositional context of culturally modified specimens

The depositional context varies widely between pithouses (table 1-B). Most specimens are deposited in the peripheral pithouses (80.9%; N = 573). This suggests that more activities occurred in the peripheral pithouses. Very few were found on exterior surfaces (0.6%; N = 4) between the pithouses or the plough zone (2.1%; N = 15).

Different frequencies exist between the various peripheral pithouses (table 1-C). Most are in ZM06 (42%) and ZM02 (21%). The others had fewer (0–3.4%). This suggests that either more activities related to tool/ornament production/use occurred in ZM06 and ZM02.

3.4. Functional bone categories by spatial context

Total assemblage size is not a predictor of the frequency of worked bones or functional categories. The frequency of modified bones between ZM07 (General) and ZM07–JA02 are very close (table 1-C). The ZM07 General deposits contain the most modified items (N = 75; 51%), while there are fewer in underlying ZM07–JA02 deposits (N = 58; 43%). In other words, there is little difference between the upper and underlying deposits.

More functions are found in ZM02 and ZM06 (N = 6) followed by ZM07 (N = 5) than in the other pithouses (table 1-B). Relatively few items could be assigned to a specific functional category. The most common are awls, handles, rubbers, and spatulas. Only single pieces could be identified for gaming, tool making, ornamentation, grinding, pounding, smoothing, and scooping.

4. OSSEOUS INDUSTRY BY TAXON

4.1. Ovicaprines (*Ovis aries*, *Capra hircus* and *Ovis/Capra*)

A large percentage (28%) of the ovicaprine bones was worked. There is a very unequal spatial distribution of the worked bone industry. Most were found in ZM06 (87 NISP; table 1-D).

There is one ulnar carpal with light use wear polish from ZM06. A single fragment (nasal bone) had heavy use wear and was probably used as an awl (ZM06). A polished hyoid was probably used as an ornament (ZM07-JA02).

A sizeable number of humeri (N = 14) and femora (N = 10) fragments were modified. A few were shaped into a tool (one/ZM04, two/ZM02, four/ZM07–JA02, and seven/ZM06).

Seven innominates with use wear were found (three/ZM02, three/ZM06, and one/ZM04).

Two mandible fragments with use wear on the horizontal ramus were found in ZM07 and ZM02.

Metapodia were the second most common ovicaprine element (45 NISP): one from OB01, seven/ZM02, four/ZM04, 17/ZM06, two/ZM07, and 13/ZM07–JA02. Once again, the peripheral pits are the locus for most activities as represented by awls, spatula, rubbers (polishing ceramics?), and raw material.

A phalange 1 was possibly a gaming piece (ZM06) given the nature of its polish.

Many radii were modified as tools (23 NISP). Some were shaped as spatula and handles (five/ZM02, three/ZM04, 13/ZM06, two/ZM07). Once again, the peripheral pits are the most intensive locus for activities.

Ribs are among the most common worked element (50 NISP). Three were used for rubbing and one as raw material for tool production. More morphological types are found in the peripheral pits than in the central pit: one/OB01, three/ZM02, nine/ZM04, 30/ZM06, four/ZM07, one from the infant grave/ZM07, and two/ZM07–JA02. The peripheral pits, in particular ZM06, are the most intensive focus for activities related to bone tool use.

Four scapulae fragments were modified based on use wear polish: one/OB01, two/ZM02, and one/ZM06.

Six tarsal bones had use wear polish (one from ZM02, ZM04, and ZM07 each, three from ZM06). Four were astragali, one was a calcaneus, and one was a tarsal 1. Only the astragalus from ZM04 was morphologically modified as it was ground down slightly and might represent an ornament or gaming piece.

Eighteen tibia fragments were modified: two/OB01, six/ZM04, seven/ZM06, two/ZM07, and one/ZM07–JA02. Two were handles and one an awl.

Sixteen ulnae, unarticulated with radii, were modified (two/ZM02, four/ZM04, six/ZM06, one/ZM07, one/infant grave in ZM07, and two/ZM07–JA02). Three are morphologically identifiable as awls, and the rest are displayed use-wear polish.

4.2. *Bos taurus*

Contrary to ovicaprines, a smaller percentage (15.4%; 110 NISP) of domestic cattle fragments was identified as worked bone (table 1-D).

The worked cattle remains vary by depositional context. Four femur fragments were culturally modified: one/ZM02 (distal shaft), one/ZM04 (distal shaft), and two/ZM06 (proximal shaft and distal shaft). The ZM02 specimen was a handle with the end hollowed out.

Ten humerus fragments were worked: one/Exterior surface, four/ZM02, one/ZM04, three/ZM06, and one/ZM07. Two were shaped as a handle and corer.

Four innominate fragments were identified based on use-wear only (three/ZM06 and one/ZM04).

One loose tooth from ZM04 (lower molar 1 or 2), was worked with medium use wear polish.

Five mandibular fragments were modified: two/ZM02, two/ZM04, and one/ZM07. Three are from the alveolus, one from the coronoid process, and one from the horizontal ramus. Only the latter was smoothed.

Six metapodia were worked: one/OB01, seven/ZM02, one/ZM04, three/ZM06, and one/ZM07. A whole specimen (used as a pounder/tenderizer). A proximal metatarsus was shaped into a handle.

There were six polished radii: one/OB01, two/ZM02, one/ZM04, one/ZM06, and one/ZM07–JA02.

As with ovicaprines, rib was the most frequently used element (34 NISP). They come from a variety of contexts: ZM02 (seven NISP), ZM04 (four NISP), ZM06 (19 NISP), and ZM07 (two NISP). One was morphologically modified for or by rubbing and two as spatulas.

Five scapulae were culturally modified. One each was from OB01, ZM02, ZM04, ZM06, and ZM07. One distal end was modified by rubbing and smoothing.

Two tarsal bones, one each from ZM04 (astragalus) and ZM06 (cuboid) had use-wear polish.

Tibia is another common element (13 NISP): five/ZM02, three/ZM04, four/ZM06, and one/ZM07. Two were shaped as handles.

Two ulnar fragments had use wear polish from ZM02: a proximal end and shaft and a shaft.

In contrast to ovicaprines, six vertebral fragments displayed use wear polish: four/ZM02, and one each from ZM04 and ZM07. Three specimens were thoracic, one cervical, one lumbar and one sacral vertebra.

4.3. *Sus scrofa dom*

Contrary to ovicaprines and cattle, few domestic pigs were modified (1.2%, table 1-D) and a smaller range of element (6, as opposed to 14–15 in ovicaprines and cattle). The frequencies per deposit type are quite small and vary widely (generally 1–4), with most in ZM07.

The distribution by context is very uneven (table 1-D). One distal shaft of a femur (ZM04) was probably a handle. Three polished humeri are from various contexts: one/OB01, one/ZM02 and one/ZM07. A few others had only light polish: a mandibular heel (ZM07–JA02), a whole phalange 3 (ZM04), two ribs (ZM07–JA02), and one atlas (ZM06).

4.4. *Sus scrofa fer*

A large number (18 out of 81) of wild boar fragments are modified (28.6%; table 1-D). This is the highest frequency of all taxa. The distribution of boar is different than that of domestic pigs, as there are many more element types and frequencies of culturally modified remains for wild boar. There are twelve element categories among boar and only six for pigs.

Only two were clearly shaped into tools (handle and awl). The rest were characterised by use-wear polish (femur, fibula, humerus, innominate, metapodia, phalange, radius, rib, scapula, tibia, ulna and vertebra). All are present in very low frequencies, with one or two specimens for the most part, except for fibula (with three).

A very unusual distribution appears by context (table 1-D). There are none in ZM07. This is unusual given its very large sample size. There is a femur distal shaft from the exterior context that is modified into a handle. Four specimens are from ZM02 (two scapulae, one ulna and one phalange 1). Six are from ZM04 (one each

of a fibula, humerus, metapodia, rib, tibia and lumbar vertebra). Seven are from ZM06 (two fibulae, and one each of innominate, metapodia, radius, rib, tibia). One fibula was an awl.

4.5. *Canis familiaris*

Four fragments of a domestic dog were modified (table 1-D): one proximal shaft tibia and three ulnae. These represent 36% of all dog remains. All specimens were from ZM06. Two were modified into awls.

4.6. *Bos primigenius*

Four aurochs bones were culturally modified (table 1-D) representing 10% of aurochs remains. There were only three element categories (metacarpus, rib, and scapula). Aurochs modified bone came from three deposits. One metacarpus (distal end) from ZM02, two rib shafts, one each from ZM04 and ZM06, one whole scapula from ZM06.

4.7. *Capreolus capreolus*

Twenty-one fragments of roe deer were modified (12.6% of all roe deers; table 1-D). A small range of elements were chosen for modification: crania (antler), femur, innominate, metapodia, radius, and tibia.

Capreolus specimens are limited to four pithouses (four/ZM02, one/ZM04, nine/ZM06, and six/ZM07; table 1-D). One was modified as a handle (ZM02 metacarpus) and two as awls (metapodia shafts from ZM02 and ZM07). All the rest exhibited only use wear polish. In ZM02, there is an innominate, metatarsal shaft, distal end of a radius and distal shaft of an ulna. Two specimens were morphologically modified into a recognisable type: a handle (proximal end metacarpus) and an awl (distal shaft). In ZM04, there is a proximal shaft of a femur. In ZM06, there is an innominate, two metapodia (distal end and a shaft), three radii (two shafts and one distal end), and two tibiae (proximal shafts). In ZM07, there is an antler tine and four metapodia (proximal end and shaft, distal end made into an awl, a shaft, and a whole).

4.8. *Cervus elaphus*

Several red deer fragments (28 NISP; 12% of all red deer elements) were modified (table 1-D). The range of element types is wider in red than roe deer (10 NISP). While the two taxa have the same elements: crania (antler), femur, innominate, metapodia, radius, and tibia, there are mandible, rib, tarsal, and vertebra for red deer.

Modified bones are found in almost all depositional contexts, including one/Exterior, three/OB01, six/ZM02, one/ZM04, nine/ZM06, and six/ZM07. In the Exterior, there is a radius. In OB01, there are mandible, metacarpus and tibia specimens. In ZM02, there is a femur (distal shaft), four metapodia (one proximal end, one shaft, two distal ends and shaft), and a rib shaft. One metapodium was shaped into an awl, one into a handle, and one was used as raw material. ZM04 had an innominate (body), metatarsus (shaft), three radii (two proximal ends and one shaft) and one rib (shaft). Two radii were shaped as handles. ZM06 contained an antler tine tip, a maxillary diastema, three tibias (two shafts and one distal end), and two thoracic vertebrae. The antler tine was modified to be a handle. ZM07 contained three specimens: two metatarsi (distal ends) and one thoracic vertebra. One metatarsus is an awl. In ZM07–JA02, there is a single whole astragalus.

4.9. *Lepus europaeus*

Four hare fragments were polished only (table 1-D). Two are from ZM04 and two from ZM06: a metapodium and ulna in each.

4.10. *Strix aluco*

One polished proximal end and shaft of a tawyny owl femur was modified from ZM07–JA02. In addition, there are nine other polished bird specimens that were unidentifiable to taxon (table 1-D).

4.11. Size class and indeterminate

A number unknown and size-class specimens had polish and/or morphological modification (table 1-D). Each varied in frequency of modified bone: large mammal (24% of all when combined with *Bos*/*Cervus*), medium mammal (18% when combined with *Ovis*/*Capra*/*Capreolus*), and small mammal (0.3%).

Large mammal is the most common size category in the assemblage (158 NISP). *Bos*/*Cervus* adds 11 more fragments to this size category for a total of 169 NISP (table 1-D). Most are flat and long bone fragments. Large mammal specimens are distributed across all deposits. One in Exterior deposits, seven in OB01, 37 in ZM02 (including two handles, a rubber, and three spatulas), 19 ribs and flat bones in ZM04, one long bone in ZM05, 68 mostly flat and long bone in ZM06 (and a mandible, scapula and 15 ribs), and 13 flat and long bones and some unknowns in ZM07. One is used as raw material for tool production. A splinter is stripped off the bone. Seven specimens come from ZM07-JA02, one of which is a rib. The rest belong to long or flat bone categories. One flat bone is shaped into an ornament, while two other flat bones are shaped into spatulas.

Medium mammals are very common (129 NISP, plus two from *Ovis*/*Capra*/*Capreolus*; table 1-D). There is a very limited range of elements for medium mammals: mandible, rib and vertebra. They are distributed across most deposits (OB01, ZM02, ZM04, ZM06 and ZM07). ZM02 contained an awl and a rubber. ZM04 contained a spatula. ZM06 contained a rubber. ZM07 contained two awls. ZM07–JA02 contained a scoop and a rubber.

Table A	NISP	%	NISP	%
0. Not modified	31459	97,80%		
1. Tool	79	0,25%	79	11,16%
2. Tool/Ornament	3	0,01%	3	0,42%
3. Ornament	2	0,01%	2	0,28%
4. Gaming	4	0,01%	4	0,56%
5. Polish only	620	1,93%	620	87,57%
Grand Total	**32167**	**100,00%**	**708**	**100,00%**

Table B			%									Total Sum of NISP
Tool type	**ZM06**	**ZM07**	**Exterior**	**OB01**	**OB02**	**ZM01**	**ZM02**	**ZM04**	**ZM05**	**ZM06**	**ZM07**	
0. Not modified												
(blank)	8719	17433	2,21%	2,55%	0,03%	0,25%	5,58%	6,04%	0,20%	27,72%	55,41%	31459
1. Tool												
Awl	6	9	0,00%	0,00%	0,00%	0,00%	34,48%	13,79%	0,00%	20,69%	31,03%	29
Grinder	1		0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	100,00%	0,00%	1
Handle	3		5,88%	0,00%	0,00%	0,00%	58,82%	17,65%	0,00%	17,65%	0,00%	17
Pounder/tenderizer			0,00%	0,00%	0,00%	0,00%	100,00%	0,00%	0,00%	0,00%	0,00%	1
Rubber	6	6	0,00%	0,00%	0,00%	0,00%	25,00%	0,00%	0,00%	37,50%	37,50%	16
Scoop/spoon		1	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	100,00%	1
Scrap from tool making			0,00%	0,00%	0,00%	0,00%	100,00%	0,00%	0,00%	0,00%	0,00%	1
Smoothed			0,00%	0,00%	0,00%	0,00%	100,00%	0,00%	0,00%	0,00%	0,00%	1
Spatula		5	0,00%	0,00%	0,00%	0,00%	41,67%	16,67%	0,00%	0,00%	41,67%	12
2. Tool/Ornament												
Raw material for ornament/tool		3	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	100,00%	3
3. Ornament												
Ornament		1	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	100,00%	1
Ornament?		1	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	0,00%	100,00%	1
4. Gaming												
Die?	2		0,00%	0,00%	0,00%	0,00%	25,00%	25,00%	0,00%	50,00%	0,00%	4
5. Polish only												
Tool	185	73	0,25%	2,74%	0,00%	0,00%	18,20%	14,21%	0,25%	46,13%	18,20%	401
Tool?	95	36	0,91%	5,94%	0,00%	0,00%	19,18%	14,16%	0,00%	43,38%	16,44%	219
Grand Total	**9017**	**17568**	**2,17%**	**2,57%**	**0,03%**	**0,25%**	**5,91%**	**6,21%**	**0,20%**	**28,03%**	**54,61%**	**32167**

Table 1 – Frequency distributions of human-modified remains by context and functional type: A) Frequency distribution by period of human-modified remains (tools/ornaments and polished specimens) compared to the general faunal assemblage (NISP); B) Frequency distribution of human-modified remains by functional category and depositional context (NISP); C) Frequency distribution of all human-modified and unmodified osteological remains by depositional context (NISP); D) Frequency distribution of human-modified osteological remains by taxon and depositional context (NISP).

***Tabl. 1** – Distributions de fréquence des restes modifiés par l'homme selon le contexte et le type fonctionnel : A) distribution de fréquence par période des restes modifiés par l'homme (outils/ornements et spécimens polis), comparée à l'assemblage faunique général (NISP) ; B) distribution de fréquence des restes modifiés par l'homme selon la catégorie fonctionnelle et le contexte de dépôt (NISP) ; C) distribution de fréquence de l'ensemble des restes ostéologiques modifiés et non modifiés selon le contexte de dépôt (NISP) ; D) distribution de fréquence des restes ostéologiques modifiés par l'homme selon le taxon et le contexte de dépôt (NISP).*

Table C	No		Yes	
Context	**NISP**	**%**	**NISP**	**%**
Exterior	694	2,21%	4	0,56%
OB01	802	2,55%	24	3,39%
OB02	11	0,03%		0,00%
ZM01	80	0,25%		0,00%
ZM02	1754	5,58%	148	20,90%
Capping horizon	435	1,38%	34	4,80%
General	1319	4,19%	114	16,10%
ZM04	1901	6,04%	98	13,84%
General	1901	6,04%	98	13,84%
ZM05	64	0,20%	1	0,14%
ZM06	8719	27,72%	298	42,09%
ZM07	17433	55,42%	135	19,07%
Grave	421	1,34%	2	0,28%
JA02	8074	25,67%	58	8,19%
General	8938	28,41%	75	10,59%
Grand Total	**31458**	**100,00%**	**708**	**100,00%**

Table D	Exterior	OB01	ZM02		ZM02 Total	ZM04 Total	ZM05 Total	ZM06 Total	ZM07			ZM07 Total	Grand Total		% of all elements	
Taxon	General	General	Capping horizon	General		General	General	General	Grave	General	ZM07-JA02		NISP	%		%
Domestic	1	9	12	53	65	50		143	2	32	21	55	323	45,30%	7987	4,04%
Bos taurus	1	3	8	29	37	19		41		8	1	9	110	15,43%	2685	4,10%
Canis familiaris								4					4	0,56%	15	26,67%
Capra hircus		1		2	2	1		11		3	2	5	20	2,81%	282	7,09%
Ovis aries		1	3	11	14	7		16		5	4	9	47	6,59%	1052	4,47%
Ovis/Capra		3	1	10	11	21		70	2	15	11	28	133	18,65%	3838	3,47%
Sus scrofa dom.		1		1	1	2		1		1	3	4	9	1,26%	115	7,83%
Wild	2	4	6	13	19	16		29		9	2	11	86	12,06%	658	13,07%
Aves sp.			1	2	3			2			1	1	10	1,40%	63	15,87%
Bos primigenius			1		1	1		2					4	0,56%	44	9,09%
Capreolus capreolus			2	3	5	1		9		6		6	21	2,95%	188	11,17%
Cervus elaphus	1	4	2	4	6	6		7		3	1	4	28	3,93%	261	10,73%
Lepus europaeus						2		2					4	0,56%	21	19,05%
Sus scrofa fer.	1			4	4	6		7					18	2,52%	81	22,22%
Unknown/size class	1	11	16	48	64	32	1	126		34	35	69	304	42,64%	23360	1,30%
Unknown				1	1	1							2	0,28%	6877	0,03%
Bos taurus/Cervus elaphus				3	3			7		1		1	11	1,54%	11	100,00%
Mammal - large	1	7	12	28	40	19	1	68		13	9	22	158	22,16%	6356	2,49%
Mammal - medium		4	4	16	20	11		50		18	26	44	129	18,09%	9977	1,29%
Mammal - small								1		1		1	2	0,28%	110	1,82%
Ovis/Capra/Capreolus						1				1		1	2	0,28%	29	6,90%
Grand Total	**4**	**24**	**34**	**114**	**148**	**98**	**1**	**298**	**2**	**75**	**58**	**135**	**713**	**100,00%**	**32005**	**2,23%**

Two rib shaft fragments had use-wear polish: one from ZM06 and ZM07 (table 1-D).

There are two small fragments of unknown mammal elements (table 1-D): one from ZM02 and ZM04.

CONCLUSION

Several observations can be made concerning the osseous industry at Early Neolithic Blagotin. Bone was actively utilised as raw material, but the overall number of shaped specimens is relatively low. By combining these with the bones that only displayed polish, it is possible to see some spatial distribution patterns.

The peripheral pithouses contain a higher proportion of humanly-modified bones than the central pithouse. Most human-modified bones are found in the peripheral pithouses (78.3%). The highest proportion of tools was found in two peripheral pithouses (ZM06: 42%; ZM02: 20%), followed by the central pithouse (ZM07: 19%). The other peripheral pits displayed much lower worked bone frequencies (0–3.4%). This pattern suggests that tool production and discard occurred differentially across the site and mainly in the peripheral ones.

Despite the proposal that ZM07-JA02 was the locus for one or more feasting events (Greenfield and Jongsma-Greenfield, 2018), there is no substantial difference between the lower (JA02) and the upper horizons of ZM07 in terms of the relative frequency of osteological remains bearing anthropogenic modifications.

The dearth of red and roe deer modified bones at Blagotin reflects the low number of these animal in the faunal assemblage, unlike many other Early Neolithic assemblages in the region (Greenfield, 1994; Greenfield, 2008a; Greenfield, 2008b; Brown and Greenfield, 2017 and 2024, Vitezović and Arampatzis, 2024), but reminiscent of northern sites (e.g. Foeni-Salaş) (Greenfield and Jongsma, 2008). It is unclear why this is the case as both types of deer are abundant in the faunal assemblage from the nearby site of Stragari in the valley (Greenfield, 2017). This likely reflects significant choice for other taxa, rather than the common assumption of deer availability in the surrounding region.

The distribution of humanly-modified bones does not follow the general bone frequency pattern by taxon, element, age, depositional context, etc. Bone is selected for modification with very different intents than animals selected for slaughter and consumption. Bone tool selection is a by-product of butchered assemblage.

The differential distribution of bone tools across the site informs as to the nature of economic (and potentially social) organisation during the Early Neolithic. Most human-modified bones are found in the various peripheral pithouses which suggests that a larger range of activities requiring the use of bone tools/ornaments occurred in the various peripheral pithouses (than in the central pithouse). In other words, the central pithouse remains a distinctive physical unit within the settlement where a limited range of activities occurred.

Finally, the distribution of human-modified bone varies between peripheral pithouses, suggesting that a different range of activities occurred in different pithouses. Socially, this would suggest that the inhabitants of the pithouses in these Early Neolithic settlements were not independent households, but part of a larger social unit, with activities divided across the settlement. In other words, such settlements were not composed of independent households, but instead were likely composed of co-dependent (probably related) family units.

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