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# A PRELIMINARY SURVEY OF THE BIRDS FROM VELIKENT (BRONZE AGE, DAGHESTAN, RUSSIA)

Arturo Morales-Muñiz[1] and Yekaterina Antipina[2]

This paper presents a preliminary overview of the bird remains from the early/middle Bronze Age site of Velikent, a series of mounds situated on the Caspian coastal plain of the Russian republic of Daghestan. A total of 25 taxa, including 21 species, have been identified thus far. They represent species from both aquatic and terrestrial biotopes, although one species, the Great bustard, *Otis tarda*, constitutes the dominant element of all subsamples. Whether this was actually so or not and whether most of the secondary patterns reported below are trustworthy is an open question partly due to the small samples thus far available for study and partly to a manual retrieval of remains that will need to be improved in the future if patterns are to be coupled with those available for comparison from other faunal sets, domestic mammals in particular.

Key words: birds, Bronze Age, Caspian Sea, Daghestan, hunting, Velikent

The archaeological site of Velikent is situated on the southern edge of the contemporary village of Velikent which is ca. 25 km northwest of Derbent and ca. 12 km west of the present-day shore line of the Caspian Sea, approximately in the middle of the sea's littoral plain (Fig.1). The archaeological remains are located in five separate natural mounds (I-V) ca. 5-7 meters high. These natural clay mounds constitute part of an ancient terrace formed by an earlier transgression of the Caspian.

A.A. Rusov first recognized the archaeological significance of this site in the late nineteenth century. Subsequently, under the direction of M.G. Gadzhiev, the Institute of History, Archaeology, and Ethnography of the Daghestan Scientific Center, USSR Academy of Sciences, conducted excavations at Velikent from 1977 to 1979 and from 1982 to 1984. The Daghestan-American Velikent Expedition (DAV), established in 1993, conducted a preliminary field season in 1994 and two later field seasons in 1995 and 1997. From 1998 through 2000, yearly seasonal digs have been undertaken by the Daghestanis (Gadzhiev et al. 1997, 2000).

The faunas from Velikent did not receive detailed attention until Morales-Muñiz (in Gadzhiev et al. 1997, 2000) and Morales-Muñiz and Antipina (2000) presented preliminary reviews from the 1995 and 1997 field seasons. The same authors have recently concluded a detailed analysis of the mammals from the 1995-2000 campaigns from which the bird remains reported in this paper come (Antipina and Morales-Muñiz, in prep.). Faunal analyses were undertaken 1) to document whether or not the occupation at Velikent was a continuous one throughout the chronological sequence and 2) to define the nature of the subsistence economy at the site, in particular domestic stocks and the relevance of the exploitation of the Caspian Sea resources. To that end, two mounds have been excavated. Mound II, the older one, evidenced a chronocultural sequence that spans from 3,300 to 2,800 B.C. The sequence of mound I ranges from 2,700 to 1,800/1,700 B.C. (Magomedov, pers. com.). Using a square grid, a series of excavated trenches in both mounds uncovered a complex stratigraphy that revealed stratified fill from domestic areas arranged along a sequence of three building horizons (Gadzhiev et al. 1997, 2000).

## MATERIALS AND METHODS

Most of the remains reported originate from two trenches, IIC and IID, located in mound II. The sediments consisted of stratified fill, mostly from open courtyard areas containing various features that included hearths and a series of pits. All remains were retrieved manually, a method that often implies possibly important taphonomic losses that seriously limit the inference potential of the samples, as well as the use of abundance estimators other than the identified number of remains (Grayson

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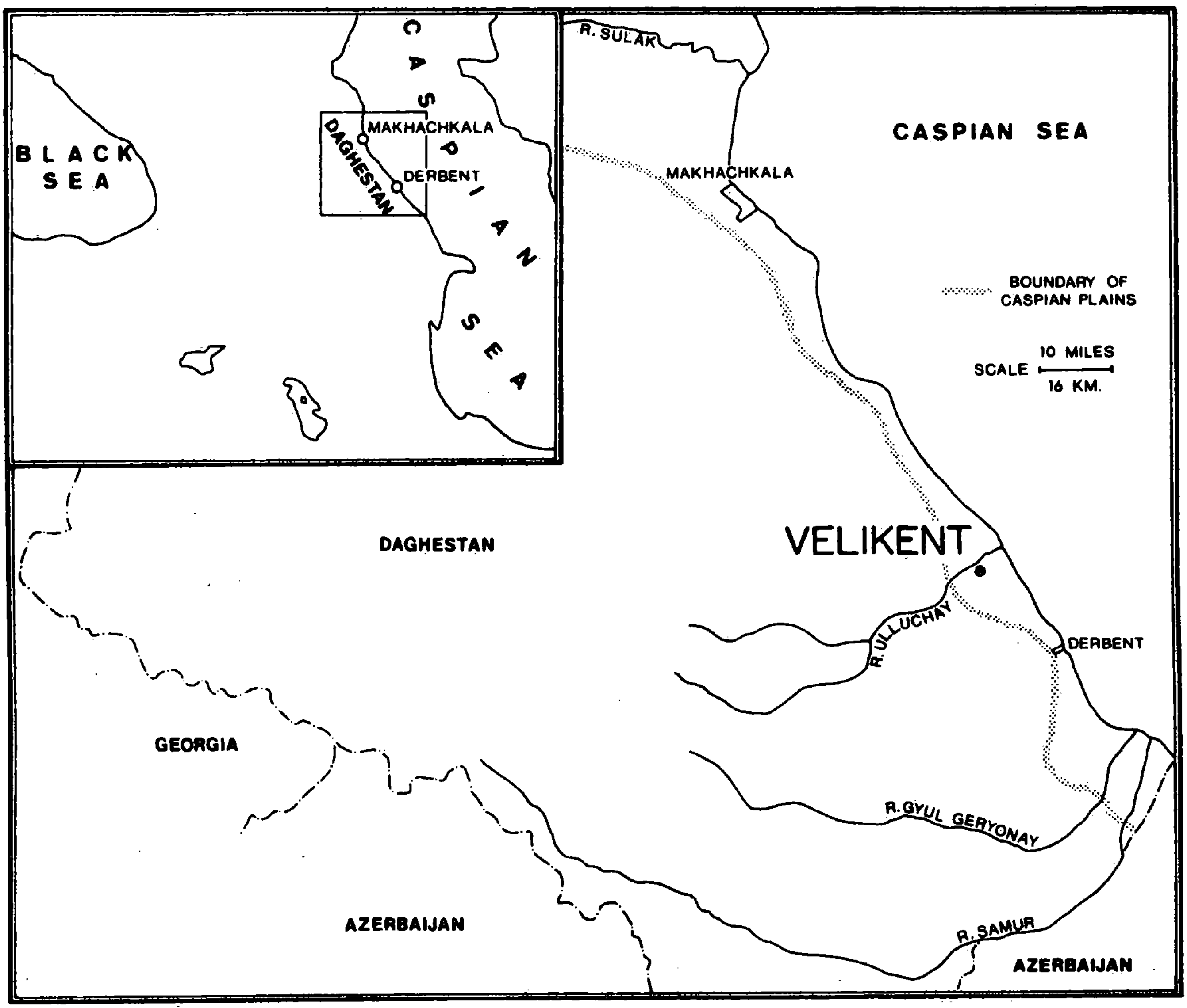

Figure 1. Map of Daghestan, showing the location of Velikent and the extent of the Caspian coastal plain.

1984). The skewed distribution of remains, concentrated on the IIC '95 trench and minimal representation of bird bones from mound I, similarly restricts the comparative possibilities of the samples from the various other units.

The identification of remains was carried out using the reference collection of one of us (AMM), housed at the Universidad Autonoma de Madrid. The western Palearctic character of the Caspian Sea avifaunas, together with the migratory habits of many species, ensured that this reference collection permitted a reliable taxonomic assignment of most remains (Dement'iev 1951; Harrison 1982). This reliability is strengthened in the case when a particular bone morphology (i.e., a morphotype) was only possessed by a restricted number of species (Table 1). In some difficult cases, such as those of certain waterfowl and corvids, use was made of diagnostic features mentioned in the works of Bacher (1967), Tomeck and Bochenski (2000), and Woelfle (1967).

Estimation of the minimum number of individuals (MNI) followed conventional procedures (e.g., Clason 1972; Grayson 1984) for the various archaeological units (i.e., levels, pits, and so on) provided by the excavators. Measurements will not be considered in this preliminary overview. Recording complementary data, in particular

Table 1. The Velikent bird taxa grouped according to morphotypes with an indication of osteologically similar species in the area at present. Species codes as in Table 2.

| Morphotype | Species in Velikent | Osteologically Similar Species Present in the Area |
|---|---|---|
| 1 | 1 | *Ardea purpurea* (smaller), *Casmerodius alba* (slight osteological differences) |
| 2 | 2 | *Ciconia nigra* (smaller) |
| 3 | 3 | *Anser fabalis*, *A. brachyrrhynchos* (both smaller) |
| 4 | 4 | none of that size and morphology |
| 5 | 5, 6 | *Cygnus columbianus* (smaller; see Fig. 2) |
| 6 | 7 | *Tadorna ferruginea* |
| 7 | 8, 9 | *Anas strepera*, *A. clypeata*, *A. penelope* (smaller than 8# similar to 9), *A. crecca* *A. querquedula* (smaller than 9# much smaller than 8) |
| 8 | 10 | *Aegypius monachus* (larger, slight osteological differences) |
| 9 | 11 | *Aquila heliaca* (smaller) |
| 10 | 12 | *Aquila pomarina* (?) / *A. rapax* (?) (missing from reference collection) |
| 11 | 13 | *Falco tinnunculus* (slight morphological differences), *F. vespertinus* and *F. naumanni* (both smaller); *F. peregrinus* and *F. cherrug* (both larger) |
| 12 | 14 | none of that size and morphology |
| 13 | 15 | none of that size and morphology |
| 14 | 16 (large)<br>17 (small) | none of those sizes and morphologies |
| 15 | 18 | none of that size and morphology |
| 16 | 19 | none of that size and morphology |
| 17 | 20 | *Numenius phaeopus*, *N. tenuirostris* (both smaller) |
| 18 | 21 | *Corvus corax* (larger), *C. monedula* (smaller), *C. frugilegus* (slight morphological differences; see Fig. 3) |

fractures and manipulative traces, was carried out whenever possible. A combined use of such data together with skeletal abundance profiles permits gross analysis of assemblage in terms of taphonomic groups (*sensu* Gautier 1987). For paleoenvironmental purposes, use was made of the concept of the analogue as defined by Baird (1989), with complementary biological data taken from Boev (1993), Dement'iev (1951), Harrison (1982), Jonsson (1992), Nikol'skii (1891/1892), and Silant'ev (1898).

## RESULTS

Table 2 provides a general overview of the bird assemblage from Velikent and Table 3 provides a distribution of the bird remains in the various trenches by campaigns. At this gross level of analysis, one peculiar feature is the high taxonomic diversity of the samples in relation to their minuscule sample sizes. This ratio reflects to no small extent an extensive taphonomic loss that influences the comments that are to follow. Also, the skewed distribution of remains, both taxonomically and in terms of archaeological units, dictates that only data from trench IIc and the Great bustard sample (65% of the identified NISP) can be considered to have minimal potential reliability.

Indirectly, the method of retrieval likewise might be responsible for the generally good condition of remains and for their rather restricted fragmentation (see below), both contingencies aiding identification and high level of resolution, with barely 7% of the samples remaining unidentified. Retrieval biases in certain skewed skeletal distributions (i.e., dominance of appendicular bones, Table 4) would require additional data in order to be substantiated.

Due to the limiting factors summarized in Table 1, the reliability of identifications is not strictly comparable for the various taxa, with osteologically distinct species such as coot, pheasant, and Great bustard posing no major problem, but the various duck remains being more questionable. During the identification process, a series of diagnostic features were either spotted (Fig. 2) or called into question (Fig. 3), although in most cases

Table 2. The Velikent bird assemblage in terms of identified number of remains (NISP) and minimum number of individuals (MNI).

| Taxon | Code | NISP | % | MNI | % |
|---|---|---|---|---|---|
| Gray heron, *Ardea cinerea* | 1 | 2 | 1.4 | 2 | 2 |
| White stork, *Ciconia ciconia* | 2 | 1 | 0.7 | 1 | 1 |
| Greylag goose, *Anser anser* | 3 | 9 | 6.4 | 6 | 6 |
| Lesser white-fronted goose, *Anser erythropus* | 4 | 16 | 11.4 | 8 | 8 |
| Whooper swan, *Cygnus cygnus* | 5 | 1 | 0.7 | 1 | 1 |
| Mute swan, *Cygnus olor* | 6 | 3 | 2 | 3 | 3 |
| Unspecified swan, *Cygnus* sp. |  | 1 | 0.7 | 1 | 1 |
| Shelduck, *Tadorna tadorna* | 7 | 1 | 0.7 | 1 | 1 |
| Mallard, *Anas platyrrhynchos* | 8 | 5 | 3.5 | 4 | 4 |
| Shoveler, *Anas clypeata* | 9 | 1 | 0.7 | 1 | 1 |
| Unspecified waterfowl, Anatidae indet. |  | 3 | 2 | 2 | 2 |
| Griffon vulture, *Gyps fulvus* | 10 | 2 | 1.4 | 2 | 2 |
| Golden eagle, *Aquila chrysäetos* | 11 | 3 | 2 | 3 | 3 |
| Spotted eagle, *Aquila clanga* | 12 | 2 | 1.4 | 1 | 1 |
| Hobby, *Falco subbuteo* | 13 | 2 | 1.4 | 2 | 2 |
| Hobby/Kestrel, *Falco subbuteo/F. tinnunculus* |  | 1 | 0.7 | 1 | 1 |
| Pheasant, *Phasianus colchicus* | 14 | 3 | 2 | 2 | 2 |
| Coot, *Fulica atra* | 15 | 1 | 0.7 | 1 | 1 |
| Great bustard, *Otis tarda* | 16 | 65 | 46.4 | 45 | 44.5 |
| Little bustard, *Tetrax tetrax* | 17 | 3 | 2 | 3 | 3 |
| Avocet, *Recurvirostra avosetta* | 18 | 4 | 2.8 | 1 | 1 |
| Black-winged stilt, *Himantopus himantopus* | 19 | 1 | 0.7 | 1 | 1 |
| Curlew, *Numenius arquata* | 20 | 1 | 0.7 | 1 | 1 |
| Hooded crow, *Corvus corone* | 21 | 7 | 5 | 6 | 6 |
| Hooded crow/Rook, *Corvus corone/C. frugilegus* |  | 2 | 1.4 | 2 | 2 |
| Total identified |  | 140 | 100% | 101 | 100% |
| Aves indeterminate |  | 11 |  | - |  |

osteometry was needed in order to substantiate specific assignals (Morales and Antipina, unpub. data). The case of the Spotted eagle is special in that, despite a perfect match with our reference specimen, the lack of presumably similar species in our collection does not allow one to ascertain to what extent the features recorded on the distal tarsometatarsus are diagnostic for determining species (Fig. 4 ).

### Taphonomic Questions

To determine the identity of the agents involved in the formation of the Velikent bird assemblages would prove crucial for setting apart human behaviors from those of other potential bone accumulators. This subject is far from new and has given rise to an important literature of its own (Bochenski 1997; Bochenski et al.1998,1999; Bramwell et al.1987; Ericson 1987; Gautier 1987; Laroulandie 2000; Livingston 1989; Morales and Rodriguez 1997; Mourer-Chauviré 1983; and Serjeantson et al.1993). As it happens, when several agents converge upon the same assemblage, to set them apart from one another is far from straightforward because most signatures are subject to no small amount of convergence (*sensu* Morales and Rosello 1998).

At Velikent both the domestic nature of the deposits and the almost total dominance of consumed domesticated mammals point toward the human accumulation of animal remains (Antipina and Morales, in prep.). Such an hypothesis is reinforced by the application of the criteria of Mourer-Chauviré (1983) to the samples. Thus, the combined abundances of coracoid + humerus + femur (59%) over the combined total represented by these three bones, plus the radius, ulna, carpometacarpus, tibiotarsus, and tarsometatarsus, would define Velikent as an "anthropic" accumulation (Table 4). Preybirds as accumulators could be ruled out on the grounds of the low frequencies of carpometacarpus + tarsometatarsus (14% of the previous overall total) and of the comparatively

Table 3. Distribution of avian taxa, expressed as NISPs, for the different excavation units.

| Taxon/Unit | IIC'95 | IIC'97 | IIC'98 | IIC'00 | Total IIC | IID'97 | IID'98 | Total IID | IA'95 | IA'97 | OC'00 | I |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Grey heron, *Ardea cinerea* | 2 | | | | 2 | | | | | | | |
| White stork, *Ciconia ciconia* | 1 | | | | 1 | | | | | | | |
| Greylag goose, *Anser anser* | 6 | | 1 | | 7 | | 1 | 1 | | | 1 | 1 |
| Whitefronted goose, *A.erythropus* | 12 | | 2 | | 14 | | 2 | 2 | | | | |
| Whooper swan, *Cygnus cygnus* | 1 | | | | 1 | | | | | | | |
| Mute swan, *Cygnus olor* | 1 | | | 1 | 2 | | 1 | 1 | | | | |
| *Cygnus* sp. | 1 | | | | 1 | | | | | | | |
| Shelduck, *Tadorna tadorna* | 1 | | | | 1 | | | | | | | |
| Mallard, *Anas platyrrhynchos* | 4 | | | | 4 | | | | | | 1 | 1 |
| Shoveler, *Anas clypeata* | 1 | | | | 1 | | | | | | | |
| Anatidae indet. | 3 | | | | 3 | | | | | | | |
| Griffon vulture, *Gyps fulvus* | 2 | | | | 2 | | | | | | | |
| Golden eagle, *Aquila chrysaetos* | 2 | 1 | | | 3 | | | | | | | |
| Spotted eagle, *Aquila clanga* | 2 | | | | 2 | | | | | | | |
| Hobby, *Falco subbuteo* | 1 | | | | 1 | | 1 | 1 | | | | |
| *Falco subbuteo/F. tinnunculus* | 1 | | | | 1 | | | | | | | |
| Pheasant, *Phasianus colchicus* | | 1 | 2 | | 3 | | | | | | | |
| Coot, *Fulica atra* | 1 | | | | 1 | | | | | | | |
| Great bustard, *Otis tarda* | 38 | 6 | 4 | 2 | 50 | 1 | 11 | 12 | 1 | 1 | 1 | 3 |
| Little bustard, *Tetrax tetrax* | 3 | | | | 3 | | | | | | | |
| Avocet, *Recurvirrostra avosetta* | 4 | | | | 4 | | | | | | | |
| Stilt, *Himantopus himantopus* | 1 | | | | 1 | | | | | | | |
| Curlew, *Numenius arquata* | | | | | | | 1 | 1 | | | | |
| Crow, *Corvus corone* | 3 | | 1 | | 4 | | 2 | 2 | | | 1 | 1 |
| *Corvus corone/C. frugilegus* | 2 | | | | 2 | | | | | | | |
| TOTAL IDENTIFIED | 93 | 8 | 10 | 3 | 114 | 1 | 19 | 20 | 1 | 1 | 4 | 6 |
| Aves indeterminate | 8 | | | | 8 | | 3 | 3 | | | | |
| TOTAL STUDIED | 101 | 8 | 10 | 3 | 122 | 1 | 22 | 23 | 1 | 1 | 4 | 6 |

low frequencies of proximal humeri (24%, unpub. data) in the humerus samples. More important, these patterns are essentially the same as those based on the Great bustard samples (e.g., coracoid + humerus + femur = 83%; carpometacarpus + tarsometatarsus = 3.7%; proximal humeri = 27%).

Other Velikent patterns appear more consistent with remains accumulated either by preybirds or natural deaths. In this way, the application of Ericson's index provides a value of 68 (65 for the Great bustard), which these authors consider indicative of "natural" accumulations (Ericson 1987). Serjeantson et al. (1993), on the other hand, report a high frequency of upper limb bones in accumulations of shearwaters preyed on by gulls and explain this in terms of the upper limb bones' greater tendency to remain articulated for a longer period when undisturbed (meaning absence of butchering). Finally, Bochenski (1997) records the humerus as being the most common bone on accumulations of Snowy owl meal leftovers. All these data indicate that, despite uncertainties, a high frequency of upper limb bones does not conform, in principle, with a strictly anthropic accumulation of bird bones

At Velikent, analysis of archaeological bird assemblages requires consideration of many other factors, not just skeletal profiles, in order to avoid taphonomic convergence (e.g., Livingston 1989 working on data from Rich 1980; see also Bochenski et al. 1998, 1999; Bramwell et al. 1987; Laroulandie 2000). When complementary data are taken into consideration for our assemblages, the following picture emerges:

a) Fire. Only 13 bones exhibit traces of fire in one

Table 4. Skeletal distributions within species. Species codes as in Table 2.

| Bone category | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | TOTAL | % |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Cranium | | | | | | | | | | | | | | | | 1 | | | | | | 1 | 0.7 |
| Mandible | | | | | | | | 1 | | | | | | | | | | | | | | 1 | 0.7 |
| Vertebra | | | | 1 | | | | | | | | | | | | 2 | | | | | | 3 | 2.2 |
| Costa | | | | | | | | | | | | | | | | 1 | | | | | | 1 | 0.7 |
| Sternum | 1 | | 2 | | | | | | | | | | | | | | | | | | | 3 | 2.2 |
| Scapula | | | | | | | | | | | | | | | 1 | 1 | | 1 | | | | 3 | 2.2 |
| Furcula | | 1 | | 1 | | 1 | | | | | | | | | | 2 | | | | | | 5 | 3.7 |
| Coracoid | | | 1 | 1 | 1 | | | 1 | | | | | | | | 11 | 1 | | | | | 16 | 12 |
| Humerus | | | 3 | 3 | | 1 | | 1 | | 2 | | | | 2 | | 26 | 2 | | | | 1 | 41 | 30.8 |
| Ulna | 1 | | | 2 | | | 1 | 1 | | | 3 | | | | | 1 | | 1 | 1 | | 1 | 12 | 9.0 |
| Radius | | | | 1 | | | | | | | | | 2 | | | 3 | | | | | 1 | 7 | 5.2 |
| Carpometa-carpus | | | 1 | 5 | | | | | 1 | | | | | | | 1 | | | | | | 8 | 6.0 |
| Femur | | | 1 | | | | | 1 | | | | | | | | 7 | | | | | 1 | 10 | 7.5 |
| Tibiotarsus | | | | | | 1 | | | | | | | | 1 | | 7 | | 1 | | 1 | 2 | 13 | 9.7 |
| Tarsometa-carpus | | | | 1 | | | | | | | | 1 | | | | 1 | | 1 | | | 1 | 5 | 3.7 |
| Phalanx | | | 1 | 1 | | | | | | | | 1 | | | | 1 | | | | | | 4 | 3.0 |
| TOTAL | 2 | 1 | 9 | 16 | 1 | 3 | 1 | 5 | 1 | 2 | 3 | 2 | 2 | 3 | 1 | 65 | 3 | 4 | 1 | 1 | 7 | 133 | 100.0 |

form or another. Six bones, namely one carpometacarpus of shoveler, three humeri (one from the lesser White-fronted goose plus two from unspecified ducks), and a sternum and phalanx from the Greylag goose, are charred. One unspecified splinter was calcinated and the remaining bones in this sample (all except one unspecified splinter from Greylag goose) were burned in a more conventional way (i.e., no extensive surface erosion). Overall, the dominance of waterfowl in this sample is overwhelming (27% of this group's NISP), especially when one considers the restricted contribution of this group to the overall assemblage, which may point toward a differential treatment of remains worth exploring in the future.

b) Manipulative traces. These appear to be restricted to a cut mark on the distal articular surface of a humerus and a drilled proximal furcula. Both bones belong to the Great bustard. In view of this species' abundance, large size, and putative food value, samples of such low frequencies are all the more remarkable and more difficult to explain in terms of manual retrieval (see below).

c) Fracture patterns. Most, if not all, recorded fractures at Velikent are post-depositional. Those parts more likely to be missing are the fragile laminar or tubular portions of bones (Fig. 5). Diagenetic factors might also be responsible for the scarcity of other laminar/tubular elements such as ribs, furcula, or even the skull (the only skull bone retrieved was a pterygoid [Table 4]), but one cannot be sure with the data at hand. The evidence against this sample qualifying as a "natural" accumulation involves the absence of bones below a critical threshold of 3 cm (unpublished data), reinforcing our original impression of a great taphonomic loss having taken place. Under such circumstances, it would be futile to speculate on whether the missing portions of the avian assemblage would change the characteristics of our samples referred to in the last three paragraphs.

d) Age data. All remains, except for a Great bustard tibiotarsus, apparently belong to adult birds (*sensu* Hargrave 1970), meaning a bird able to fly.

e) Articulated specimens. None has been recorded at Velikent.

Put together, data from a) and b) essentially point to human accumulation of remains despite low frequencies

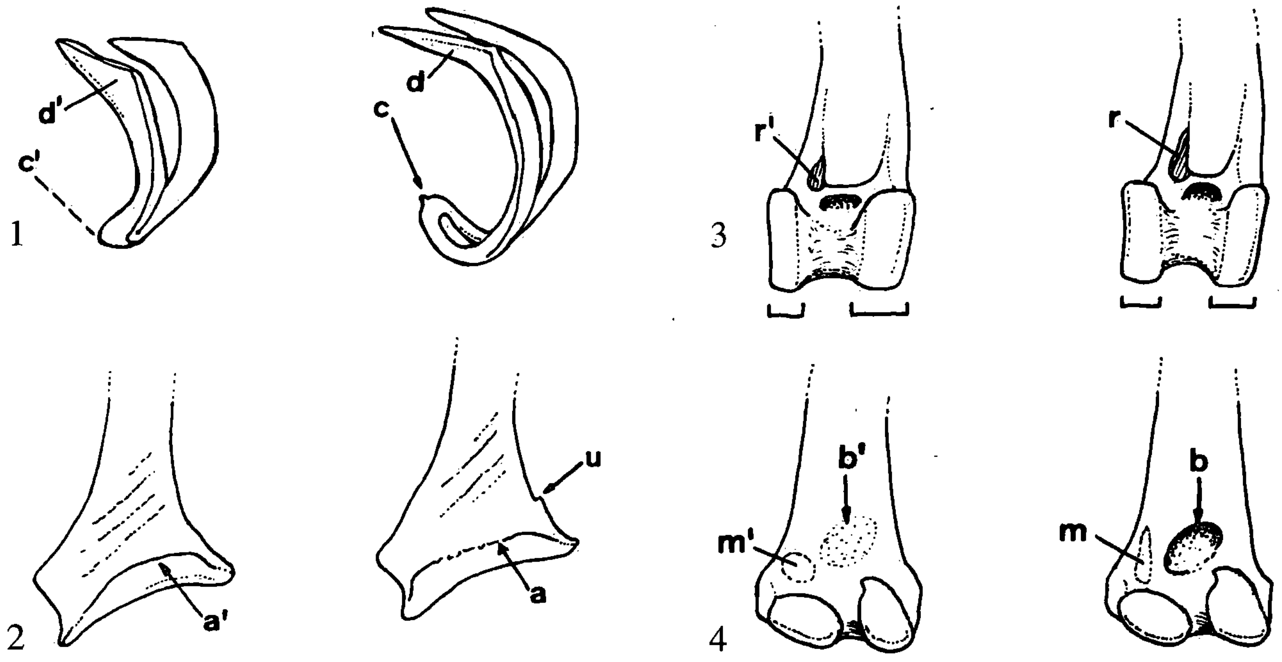

Figure 2. Differences in selected bones of Whooper swan (WS, on right in 1-4) and Mute swan (MS, on left in 1-4). For the furcula (1, depicted in semilateral view), the dorsal process is long and cylindrical in WS (d) and short and flattened in MS (d´), whereas the caudal arch is elongated and bent dorso-caudally in WS (c) but short, blunt, and directed ventro-caudally in MS (c´). The coracoid (2, depicting the caudal view of the distal extremity) in WS exhibits a sharp uncinated process (u) and an irregular margin for the *facies articularis caudalis* (a), whereas MS lacks an uncinated process and the *facies articularis caudalis* has a sharp and straight margin (a´). In the tibiotarsus (3, depicting the dorsal view of the distal extremity), the lateral and medial condyles are of similar width in WS, but in MS the lateral condyle is clearly wider than the medial condyle. In addition, MS has a comparatively smaller muscular impression over the *Retinaculum* (r´) than WS (r). The humerus (4, depicting the lateral/dorsal view of the distal extremity) of WS exhibits a deep *impresio musculi brachialis* (b) with a sharp proximal (upper) margin, which is nowhere to be seen in the very shallow *impresio musculi brachialis* of MS (b´). Finally, WS displays a very shallow (flat) muscular impression over the medial condyle (m) that is round and bump-like in MS (m´).

of burned and chopped bones. On the other hand, the absence of anthropic fractures in c) speaks in favor of a natural accumulation, in particular when one considers the large size of the most frequent taxa. Conversely, d) and e) do not support either one or the other alternative. All this forces us to rely on context provided on archaeological grounds and by data from other faunas in order to decide what sort of taphocenosis the avian one is. When this strictly circumstantial evidence is taken into account, without ruling out the possibility that certain taxa could have become incorporated into the taphocenoses in a more or less "natural" manner (i.e., Gautier's taphonomic "intrusive" groups numbers 4 and 5), we tend to favor humans as the main accumulators of birds at Velikent. Determination of the anthropic assemblages as consumption refuse (i.e., Gautier's group number 1) or manufacture refuse (group number 2) would require larger and more trustworthy samples.

## Complementary Biological and Cultural Remarks

Table 5 summarizes a selection of biological features for the different species and their zooarchaeological record in the East European steppe sites from a qualitative standpoint. One peculiar feature is the discordance exhibited between aquatic and steppe taxa where steppe birds constitute the bulk of the remains, both in terms of NISP and MNI, but only a minimal fraction of the diversity, a fact that relates in part to the contribution of the Great bustard to the samples (Table 6). If partial recovery is important, a size bias toward the largest birds should be expected, but should not, in principle, apply to comparisons restricted to the larger

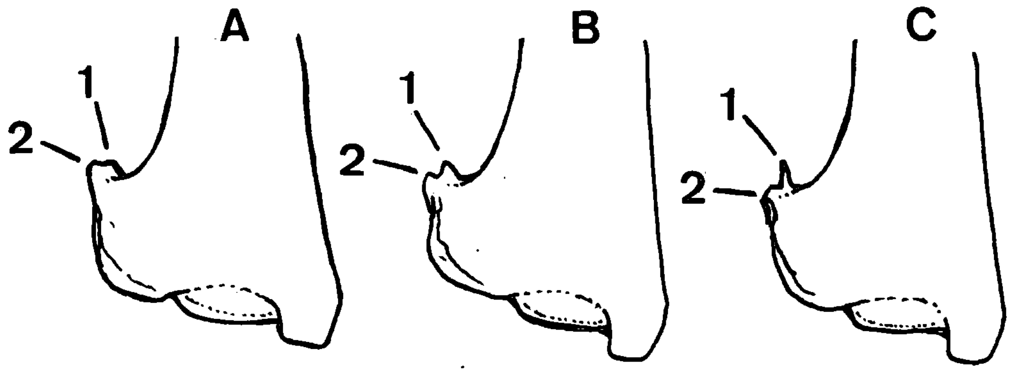

Figure 3. Distal humeri of selected corvids. For crow (*Corvus corone*, A) the internal apex of the *processus supracondylaris dorsalis* (1) is approximately of the same length or shorter than the external apex (2) as reported by Tomeck and Bochenski (2000) on 84% of their specimens. That this feature might be subjected to a lot of geographic variation is indicated by the fact that close to 50% of our reference specimens (14) exhibit the alternative conditions reported by these authors for 73% of their rooks (B, internal apex longer) and 62% of their jays (C, internal apex developed as a spike). Thus the need to allocate one of the corvid humeri from Velikent, with its broken internal apex apparently developed as a spike, to the category of *Corvus corone/C. frugilegus* (Table 1).

fraction of the sample. Within this group of large birds Great bustard was probably the main meat source, with the diversity and relative frequencies of swans and geese indicating that the cropping of aquatic birds was secondary to that of terrestrial birds and was not restricted or preferentially targeted to particular species.

This logic, however, partly breaks down if, for any reason, large birds cannot be considered strictly comparable as a group in the area around Velikent. First, waterfowl are more vulnerable in the summer, when molting. Second, the easiest time of year to catch bustards in great numbers is after a heavy snowstorm (Nikol'skii 1891/1892; Silant'ev 1898). Such seasonal limitations have both economic and taphonomic implications in terms of time devoted to the activity, processing of carcasses, bones that could end up in the sediments, and the like. Third, waterfowl, but not the Great bustard, provide products other than meat. Swan, for example, has always been considered a low-quality meat in Daghestan; what hunters were seeking from these birds were feathers, not likely to leave traces in the sediments (Dement'ev 1951; Nikol'skii 1891/1892; Silant'ev 1898). Like feathers, eggs leave few or no signatures at the level of coarse analysis. Obviously, partial recovery would compound the difficulties involved in a direct comparison of remains, but if large-sized birds are not strictly comparable to start with, there should be no point in trying to specify provisioning strategies beyond a very coarse level of analysis documenting that both terrestrial and aquatic biotopes were cropped.

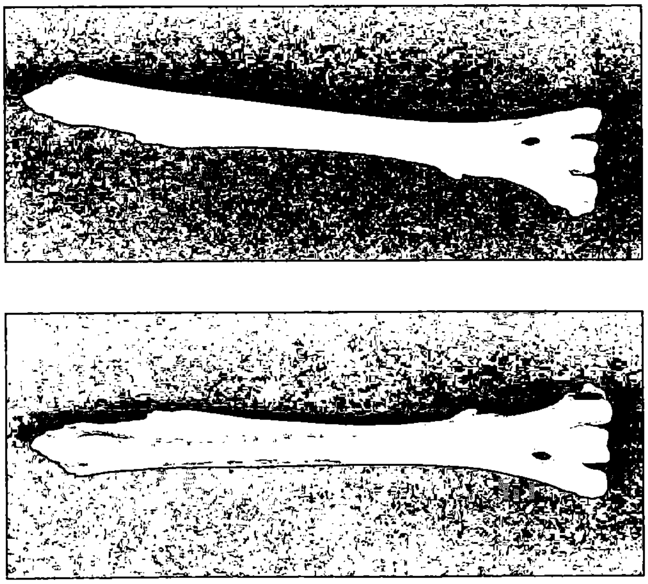

Figure 4. Distal tarsometatarsus of Spotted eagle, *Aquila clanga* (above: dorsal view; below: ventral view).

Much the same reasoning applies to the data on seasonality. Of the three most abundant taxa, only the lesser White-fronted goose is a wintering species (Table 5; Harrison 1982). Thus, based upon phenological patterns exhibited by birds today (Burton 1995), the most one can say is that some winter bird-hunting took place

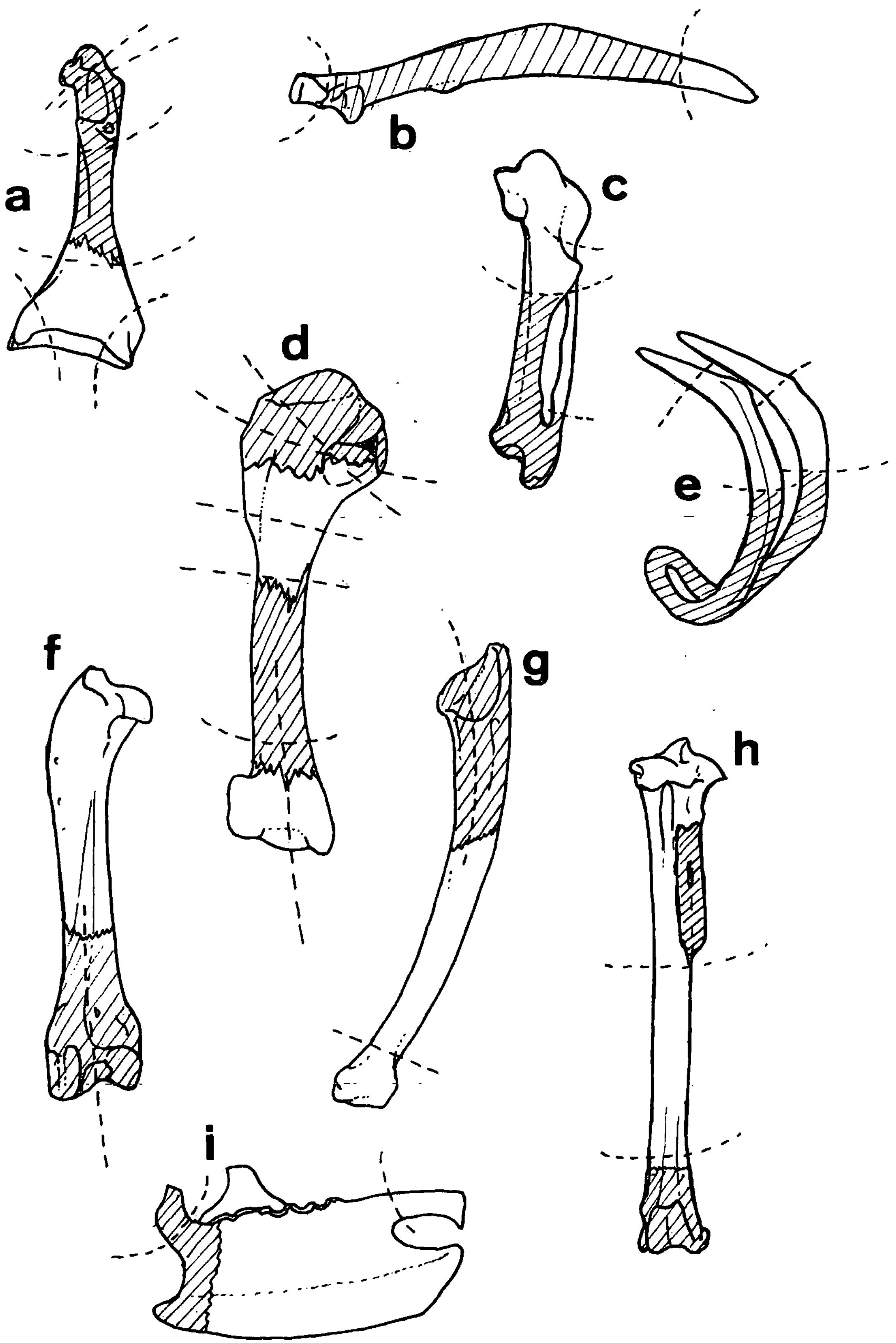

Figure 5. Fracture patterns for selected bone categories. Dashed lines indicate fracture lines or planes or both. Striped areas define characteristic bone portions at Velikent (a: coracoid; b: scapula; c: carpometacarpus; d: humerus; e: furcula; f: femur; g: ulna; h: tibiotarsus; i: sternum).

Table 5. Selected biological features and zooarchaeological record of the Velikent avifaunas in neighboring areas of the East-European Steppes. Status codes (Daghestan today): breeding (B), wintering (W), transit (T), resident (R); Abundance codes: frequent (N), regular (R), infrequent (I); Phenology codes: January (J), February (F), March (M), April (A), May (Y), August (G), September (S), October (O), November (N), December (D), Summer (SU); Biotope codes: Marshes/aquatic (MA), Steppe/open (SO), Indifferent (IN); Food codes: plants (P), carrion (C), predator (D), omnivorous (O), small invertebrates (S), fish (F); Nesting codes: ground (G), reeds (R), burrows and ruins (B), cliffs (C), trees (T), buildings (H); Limiting factors of populations' codes: human activities (H), storms (R), brackish water (W), snow level in winter (S), winter temperature (T), nesting places (N), water availability (A), carrion (C), prey (P); Archaeological record codes: Early Holocene (EH), Iron Age (IA), forest steppe (FS), open steppe (S). Don steppe record comes from a single A.D. 900-1200 site; data taken from. Nikol'skii 1891/1892, Silant'ev 1898, Dement'ev 1951, Voinstvenskii 1967, Harrison 1982, Jonsson 1992 and Boev 1993.

| | | | | | | | | Crimea | | | Ukraine(s) | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Code | Status | Abundance | Phenology | Biotope | Food | Nesting | Limiting | EH | IAFS | IAS | EH | IA | Don(s) |
| 1 | T,B,W | R | M-S | MA | S,F | R,T | H | | | | + | | + |
| 2 | T,B? | I | M/A-G | IN | S,F | T,H | H,N | | | | | | |
| 3 | T,B,W | R | J-D | MA | P | R | S | | | + | + | | + |
| 4 | W | I | O-A | MA | P | - | S | | | | | + | + |
| 5 | W,B | I | N/D-F/M | MA | O | R | H,R | | + | | | + | + |
| 6 | W,B? | I | N/D-M(SU) | MA | O | R | H,R | | | + | | + | + |
| 7 | T,B | R/N | M-S | MA | O | B | W | | | + | | | |
| 8 | R,T,B,W | N | J-D | MA | O | R | H | + | + | + | + | + | |
| 9 | T,B? | R | A-O | MA | S,P | | H | | | + | + | | |
| 10 | R | I | J-D | IN | C | C | C | | | | | | |
| 11 | R | I | J-D | IN | D,C | C,T | H | | | + | | + | + |
| 12 | T | I | A-S | IN | D,C,S | C | H | | | | | | |
| 13 | T,B | R | Y-S | IN | D | T | P | + | + | + | | | |
| 14 | R | I/R | J-D | SO | O | G | S | + | | | | + | |
| 15 | R,B,W | R/N | J-D | MA | P,S | R | T,N | + | | + | + | | |
| 16 | R,B,T | I | J-D | SO | O | G | S,A | + | + | + | | + | + |
| 17 | R,W | I/R | J-D | SO | O | G | S | | | + | + | | + |
| 18 | B | I/R | M-S | MA | O | G,R | H | | | | | | |
| 19 | R,B,W | I | J-D | MA | S | G,R | H | | | | | | |
| 20 | T,W | R | S-M | MA | S | - | ? | | | + | | | |
| 21 | R,B,T | R | J-D | IN | O | E | ? | + | + | + | + | + | + |

at Velikent. Most of the Velikent taxa qualify for more than one phenological category, occasionally all four (Table 5; Dement'ev 1951; Harrison 1982; Jonsson 1992). Velikent being a permanent settlement, one could most parsimoniously expect bird hunting to have taken place throughout the year, although perhaps shifting to those taxa (and products) that happened to be more accessible or sought-after at a particular time of the year.

Today quite a few of the Velikent taxa are recorded as infrequent species (Table 5). This includes the Great bustard, swans, and large preybirds whose hunting has been amply documented since Paleolithic times (Dement'ev 1951; Nikol'skii 1891/1892; Silant'ev 1898; Voinstvenskii 1967). Still, abundances of large preybirds might have always been low, with exceptions like the Griffon vulture, so the decline might have more to do with changes in stockbreeding practices and availability of carcasses than with active human interference. There is fairly good correspondence between abundance of a particular taxon at Velikent and the zooarchaeological record of species in neighboring steppe areas (Table 5). Additionally, species previously unrecorded in Russian and Ukrainian sites are also infrequent at Velikent.

Concerning the much debated issue of

synanthropization, our data are limited. The first synanthopic birds in eastern Europe appeared during the Bronze Age, becoming a typical feature of the agrarian landscapes (Boev 1993; Iankov 1983; Doncev and Iankov 1989). The earliest synanthropes are seasonal (AI, at Velikent exemplified by the Mute swan and the Grey heron) and passive (AII, represented at our site by the coot and pheasant). Later to appear were the synurbanists, of which at Velikent we have the crow, an example of an initial synurbanist (BI), and the White stork (BIII), with no representatives from the intermediate group of advanced synurbanists (BII). If avian colonization of human settlements took place in a gradual way, the absence of advanced synurbanists is a bit disturbing, although this might be resolved should the *C. corone/C. frugilegus* humerus and ulna from DAV95-IIC turn out to belong to a rook (Tables 2 and 3). Still, if aquatic birds had been transported to the site, proof for synanthropization would vanish for the incipient stages of colonization. As things stand now, the discussion centers upon the largely arbitrary issue of trying to grant an unequivocal status to a few species represented by too few bones. From our standpoint, Velikent's avifaunas are far too early and much too displaced to the north to guarantee such an assignal. Thus, our wish is to leave the issue open for the moment until further, more reliable information becomes available.

## CONCLUSIONS

As stated in the introduction, the faunal analyses at Velikent were undertaken with the specific aims first, to prove the existence of a continuous occupation of the settlement throughout the early/middle Bronze Age and second, to assess the peculiarities of the subsistence strategy, in particular in relation to the exploitation of resources from the Caspian Sea. Bird bones, indeed, have been documented in all the excavation units thus far, although often in such low numbers that, except for DAV'95IIC where they span the whole sequence, one is not able to either prove or disprove the first aim. As for the second, the comparatively low NISPs of waterfowl and other aquatic taxa contrast with the dominance of Great bustard in all samples. Whether such a phenomenon is a result of the manual recovery technique practiced remains to be seen, although both the dominance of terrestrial mammals and the small number of fish and seal bones indicate that the Caspian Sea was not by any means the basis of the animal economy at the site, which was one of production based preferentially on domestic stock.

Table 6. Abundance spectra of the avifaunas from Velikent expressed as NISPs (n = 140), MNIs (n = 101), and number of taxa (n = 25).

| NISP | % NISP | MNI | % NMI | No. TAXA | % No. TAXA |
|---|---|---|---|---|---|
| Marsh/Aquatic | | | | | |
| 49 | 35 | 33 | 33 | 14 | 56 |
| Steppe, Open | | | | | |
| 71 | 50.7 | 50 | 50 | 3 | 12 |
| Indifferent, Other | | | | | |
| 20 | 14.3 | 18 | 18 | 8 | 32 |

Still, even at this incipient stage, a series of hypotheses that merit further analysis have been formulated. Thus, the inference that the taphocenoses are mainly, but not exclusively, a product of human activity, that there might have been a differential treatment of groups (i.e., signatures of fire preferentially concentrated on the waterfowl) and that in the east European steppe Velikent might harbor the earliest proofs for the existence of synanthropic taxa should be explored in detail in order to refine aspects of this secondary resource procurement strategy. Matters dealing with seasonality, the assignal of taxa/remains to specific taphonomic and synanthropic groups, and secular trends in taxonomic diversity will require both an enlarged and more reliable database in which patterns are not under permanent suspicion of being distorted by partial recovery of remains.

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