

## Archaeozoological research on red deer (*Cervus elaphus L.*) from Croatian archaeological sites

Tajana Trbojević Vukičević<sup>1\*</sup>, Tatjana Tušek<sup>2</sup>, Krešimir Babić<sup>1</sup>,  
and Vesna Gjurčević Kantura<sup>1</sup>

<sup>1</sup>Department of Anatomy, Histology and Embryology, Veterinary Faculty, University of Zagreb, Croatia

<sup>2</sup>Agricultural College Križevci, Croatia

---

**TRBOJEVIĆ VUKIČEVIĆ, T., T. TUŠEK, K. BABIĆ, V. GJURČEVIĆ KANTURA:**  
Archaeozoological research on red deer (*Cervus elaphus L.*) from Croatian archaeological  
sites. *Vet. arhiv* 76, S221-S228, 2006.

### ABSTRACT

Some archaeozoological analyses that were made at the Department of Anatomy, Histology and Embryology, Veterinary Faculty, University of Zagreb from 1996-2005 are presented. The abundance of red deer bones among the osteological material from archaeological sites suggests that the species was an important game animal and that prehistoric people were keen red deer hunters. Even though the red deer were hunted primarily for meat in all periods, their skin was probably used to make clothes and their bones and antlers were used as raw material for the production of agricultural and household tools.

**Key words:** archaeozoology, red deer, archaeological sites, Croatia

---

### Introduction

In the Republic of Croatia, the study of faunal remains from archaeological sites, that is archaeozoological analysis, has been conducted systematically since 1996 at the Department of Anatomy, Histology and Embryology, Veterinary Faculty, University of Zagreb. Thanks to collaboration with archeologists dealing with excavations at numerous sites throughout Croatia, we are able to analyse a huge amount of animal osteological material. Among the animal remains from archaeological sites bones of red deer (*Cervus elaphus L.*) almost always play an important role. Red deer hunting has been a part of human life from prehistoric times through the Middle Ages until nowadays.

---

\* Contact address:

Dr. Tajana Trbojević Vukičević, Department of Anatomy, Histology and Embryology, Veterinary Faculty University of Zagreb, Heinzelova 55, 10 000 Zagreb, Croatia, Phone: + 385 1 2390 225; E-mail: tajana@gef.hr

## Materials and methods

This overview presents some archaeozoological analyses that were made at the Department of Anatomy, Histology and Embryology, Veterinary Faculty, University of Zagreb from 1996 to 2005.

Standard archaeozoological analysis (REITZ and WING, 1999) provides primary data, including identification of skeletal elements and their taxonomic determination, quantification of specimens present (Number of Identified Specimen [NISP] and Minimal Number of Individuals [MNI]), estimation of sex and age (on the basis of epiphyseal fusion, tooth eruption and replacement sequences, and tooth wear), bone size measurements (after VON DEN DRIESCH, 1976), determination of specimen weight, and recording of modifications and pathologies on the animal remains. Secondary data are often derived from primary data mathematically. These include estimates of body dimension (wither height, body mass), construction of age classes and sex ratios, estimates of diet and taphonomic modifications (influence of ancient man, environment and recent man on faunal remains).

## Results and discussion

*Red deer (*Cervus elaphus* L.) at Vučedol archaeological site.* The first and most comprehensive studies on animal osteological remains were made at the archaeological site Vučedol. Situated at the right bank of the Danube River on a loess plateau, Vučedol was an ideal place for living for prehistoric humans. The most recognizable prehistoric layers from the Eneolithic period (3 500 – 2 200 BC.) are Baden, Kostolac and Vučedol. Thirteen animal genera and 18 animal species were determined at Vučedol, of which the red deer (*Cervus elaphus* L.) is the most common wild animal (JURIŠIĆ, 1988; HINCAK, 1995; KUŽIR, 2002).

One of the major findings at Vučedol is a red deer ritual burial (Fig.1) at the central part of the site – Gradac, which was first reported by SCHMIDT (1945) in his popular work «Die Burg Vučedol».

HINCAK (1995) studied 2336 osteological specimens of higher vertebrates from Vučedol. Red deer remains comprise 11.7% of the 1302 fragments that were taxonomically determined, respectively in the Baden layer 12.9%, in the Kostolac layer 18.2% and in the Vučedol layer 16.0%. The MNI of red deer in the Baden layer is 3, in Kostolac also 3, and in Vučedol 7. Among the finds is a primitive hoe made from a red deer antler tip (Fig. 2.).



Fig. 1. Red deer ritual burial at Gradac – Vučedol. (From: SCHMIDT, 1945)



Fig. 2. Primitive hoe from red deer antler tip. (From: HINCAK, 1995).

The Eneolithic red deer were larger and had bigger antlers than their recent co-species, but were not different in their overall morphology (HINCAK, 1995). Red deer (*Cervus elaphus* L.) humeral bone fragments from the Vučedol site were also studied (MIHELIĆ et al., 1998) with the conclusion that they are bigger and more rugged than recent red deer humeral bones. Osteometric acetabular values show certain differences between Eneolithic and recent deer which provided evidence that the Vučedol deer was larger than the recent one (TRBOJEVIĆ et al., 1998). TUŠEK et al. (1998) found that deer from the same geographical localities, separated in time by thousands of years, display marked differences in the proportion of their antlers, with a reducing tendency towards functional size in recent deer.

The most detailed study on red deer at Vučedol was carried out by TUŠEK (2000). Based on morphological criteria 379 of 10 000 bones analysed were identified as red deer remains. MNIs of *Cervus elaphus* for the different Eneolithic layers were as follows: Baden culture layer – 5, Kostolac culture layer – 6, Vučedol culture layer – 16 and Vučedol archaeological site – 17. Based on the height of the ventro-medial edge of the acetabulum, it was concluded that 2 acetabula belonged to calves, 5 to hinds and 3 to stags. Using crown height of the mandibular cheek teeth as diagnostic criterion, the age span of the individuals was assessed as 8 – 10 years. Based on the dimensions of the elements of the stylopodium, zeugopodium and metapodium, the average weight of the Eneolithic red deer mixed sample (males and females) was calculated as 346 kg.

5 000 years of chemical and mechanical influences of Vukovar loess, in which the Vučedol red deer remains were buried, was examined by chemical analysis of the mineral composition of bones and teeth. Higher resistance of teeth to the process of fossilization has been determined. Due to the process of fossilization and recrystallization, bones lost calcium, magnesium, magnesium phosphate and calcium carbonate. Teeth lacked only magnesium and magnesium phosphate (TUŠEK, 2000).

Geographical representation and the feeding selective adaptability of the Eneolithic deer, link them with Pliocene Russian deer, while morphological similarities and structure of the metapodial bones link them to recent European red deer (*Cervus elaphus* L.).

According to a study on the faunal remains from the Baden cultural period from the Vučedol site (KUŽIR, 2002), 15% of the bones belong to red deer (5 skull bones and 33 limb bones, mostly radius and tibia). The MNI for red deer was 5 individuals. Age was estimated for 3 mandibles: one belonged to an individual aged 5-12 months, the second to an individual of 12-24 months, and the third to an animal older than 27 months.

*Reddeer (*Cervus elaphus* L.) from other Croatian archaeological sites.* Archaeological research at the prehistoric settlement site of Galovo in Slavonski Brod commenced in

1997. The site was occupied by early Neolithic populations from the early Linear A phase of the Starčevo culture (MINICHREITER, 2004). Of 803 animal bones excavated in 1997, 15.4% belong to red deer (TRBOJEVIĆ VUKIČEVIC and BABIĆ, 1999). Further systematic archaeozoological research in the 1998-2004 period gave a similar result; of 473 faunal remain, 15.9% belong to red deer.

Archaeozoolocal research at the medieval site Tvrđava – Podgrađe near Knin showed that of 645 fragments of bones, teeth and horns only 2% belonged to *Cervus elaphus*. However, it is clear that the red deer was used as a game animal at that time (ŠTILINOVIĆ, 2004).

From protective exploration at old Dubrovnik port, a large amount of archaeological materials and animal bones were examined (RADIĆ-ROSSI, 2005). Archaeozoological analysis of 389 faunal remains showed that 3.9% of the bones (mostly antlers) belonged to red deer. Two of these antlers would be of great trophy value nowadays.

In one antler (Fig. 3) the upper of the two tines is most probably the bay tine emanating rather deep from the antler shaft (although it is possible that the two brow tines are present, which grow up in different directions, an anomaly that was caused by some kind of trauma).



Fig. 3. Red deer antler from old Dubrovnik port.

At the Viničica – Josipdol archaeological site about 770 osteological fragments were excavated in 2002 and 2003, but only 360 were in a condition allowing archaeozoological analysis. Just 7.2% of the fragments belong to red deer. Numerous cut marks and

disarticulation traces on the bones lead to the conclusion that the deer were used for complementing meat diet. All of the red deer antler fragments have been sawed and used as tools.

Vela Spila is a prehistoric cave-site, situated above the city of Vela Luka, on the island of Korčula. Archaeologists observed traces of human occupation from the Paleolithic, Mesolithic and Neolithic, through to the Copper and Early Bronze ages. In the Paleolithic layer, red deer bone fragments were dominant, together with bird remains. Numerous deer bones were found on the Mesolithic and Neolithic layers, however, the most frequent bones were those of small ruminants (goats and sheep). Red deer osteological remains were present in the Eneolithic layer too. Contrary to those of birds, most of the mammal bones were damaged, indicating that bone marrow was extracted and used for food (KUŽIR et al., 2005).

## Conclusion

The data presented in this paper suggest that in prehistoric times red deer were hunted for meat, their skin was probably used to make clothes and their bones and antlers to make agricultural and household tools. In historic times hunting was an important part of social life and red deer were used primarily for food, and sometimes their antlers were used for making tools.

## References

- HINCAK, Z. (1995): Higher Vertebrates of Vučedol (Vukovar, Hrvatska). Graduation thesis. Faculty of Science, University of Zagreb, Zagreb, Croatia.
- JURIŠIĆ, M. (1988): Hunting and animal husbandry of Vučedol cultural complex at North parts of Yugoslavia. MS Thesis. Faculty of Humanities and Social Sciences, University of Zagreb, Zagreb, Hrvatska.
- KUŽIR, S. (2002): Archaeozoological analysis of Baden culture animal bones and teeth from Vučedol site. MS Thesis, Faculty of Veterinary Medicine, University of Zagreb, Zagreb, Hrvatska.
- KUŽIR, S., K. BABIĆ, Z. KOZARIĆ (2005): Animal bones from Vela Spila on the island of Korčula, Croatia. In: Vela spila – a stratified prehistoric site Vela Luka – Island of Korčula (Croatia). (Čečuk, B., D. Radić, Eds.). Centar za kulturu «Vela Luka», Vela Luka, Hrvatska.
- MIHELIĆ, D., Z. HINCAK, A. SLAVICA, K. BABIĆ, S. SISTIG, T. TRBOJEVIĆ, S. KUŽIR (1998): Comparative description of humeral bones of Aeneolithic (3500-2400 B.C.) and recent deer (*Cervus elaphus* L.). In: Advances in Deer Biology (Zomborsky, Z., Ed.), Proceedings of the 4th International Deer Biology Congress. Pannon University of Agriculture, Faculty of Animal Science, Kaposvar, Hungary, pp. 368-370.

- MINICHREITER, K. (2004): Workshop of Clay Objects and Fabric in the Starčevo Culture Settlement at the Galovo in Slavonski Brod. Prilozi Instituta za arheologiju u Zagrebu, vol 21/2004., Zagreb, pp. 5-18.
- RADIĆ-ROSSI, I. (2005): Rescue submarine excavation at Dubrovnik port. Obavijesti Hrvatskog arheološkog društva 2, year XXXVII, Zagreb. p. 16.
- REITZ, E. J., E. S. WING (1999): Zooarchaeology. Cambridge University Press, Cambridge, UK.
- SCHMIDT, R. R. (1945): Die Burg Vučedol. Kroatisches Archäologisches Staatmuseum, Zagreb, Kroatien.
- ŠTILINOVIĆ, A. (2004): Researching of an animal remains from Medieval archaeological site Tvrđava – Podgrade (Knin). Student work. Faculty of Veterinary Medicine, University of Zagreb, Zagreb, Croatia.
- TRBOJEVIĆ, T., S. KUŽIR, K. BABIĆ, D. MIHELIĆ (1998): Morphometrical analysis of Eneolithic (3500-2400 B.C.) deer acetabula from the Vučedol archaeological site (Vukovar, Croatia). In: Advances in Deer Biology (Zomborsky, Z., Ed.), Proceedings of the 4th International Deer Biology Congress. Pannon University of Agriculture, Faculty of Animal Science, Kaposvar, Hungary, pp. 365-367.
- TRBOJEVIĆ VUKIČEVIC, T., K. BABIĆ (1999): Analysis of animal remains excavated 1997 at the archaeological site Ciglana – Slavonski Brod. Obavijesti Hrvatskog arheološkog društva 3, year XXXI, Zagreb. pp. 63-70.
- TUŠEK, T., K. BABIĆ, L. FIRŠT-GODEK, Z. JANICKI (1998): A comparative survey of trophy characteristics in prehistoric and recent deer. In: Advances in Deer Biology (Zomborsky, Z., Ed.), Proceedings of the 4th International Deer Biology Congress. Pannon University of Agriculture, Faculty of Animal Science, Kaposvar, Hungary, pp. 371-373.
- TUŠEK, T. (2000): Morphological and morphometrical indicators in determining deer bones from Eneolithic remains of Vučedol culture. Dissertation. Faculty of Veterinary Medicine, University of Zagreb, Zagreb, Croatia.
- VON DEN DRIESCH, A. (1976): A Guide to the Measurement of Animal Bones from Archaeological Sites. Peabody Museum Bulletin 1, Peabody Museum of Archaeology and Ethnology, Harvard University, UK.

Received: 15 August 2005

Accepted: 4 April 2006

---

**TRBOJEVIĆ VUKIČEVIC, T., T. TUŠEK, K. BABIĆ, V. GJURČEVIĆ KANTURA: Arheozoološka istraživanja populacije jelena običnoga (*Cervus elaphus* L.) s arheoloških nalazišta na području Hrvatske. Vet. arhiv 76, S221-S228, 2006.**

**SAŽETAK**

U radu je dan prikaz nekih arheozooloških analiza obavljenih između 1996. i 2005. godine na Zavodu za anatomiјu, histologiju i embriologiju Veterinarskoga fakulteta Sveučilišta u Zagrebu. Među mnoštvom

osteološkog materijala podrijetlom od životinja s arheoloških nalazišta u Hrvatskoj, ostaci jelena običnog (*Cervus elaphus* L.) važan su dokaz njihovog lova, odnosno udjela u životu i kulturi od pretpovijesnih vremena do danas. Iako je u svim razdobljima jelen obični lovljen prvenstveno radi mesa, poznato je da je najvjerojatnije njihova koža rabljena za izradu odjeće, crijeva za šivanje, a kosti i rogovi za izradu ratarskih i kućanskih alata.

**Ključne riječi:** arheozologija, jelen obični, arheološka nalazišta, Hrvatska

---