ABSTRACT: Based on the results of the vertebrate fauna research from 10 Neolithic archaeological sites in Vojvodina (Serbia), two of which belong to Kőrös culture, 7 to Starčevo culture, and one to Vinča culture, the proportional contribution of domestic and wild animals was analysed. These sites were approximately dated between 6000 and 3200 BC. The smallest proportion of domestic animals was recorded at the sites of Golokut-Vizić and Nosa Biserna Obala, while the biggest one at the sites of Prosine- Pećinci, Zlatara-Ruma and Kudoš-Šašinci. A small proportion of domestic animals at Nosa Biserna Obala shows that the animal husbandry was only just at the beginning, and a high proportion of wild animals testifies about the importance of hunting in economy. These are the characteristics of settlements of Kőrös culture, where goats and sheep dominate among domestic animals. Low proportion of domestic and high proportion of wild animals were recorded at the site of Golokut which, like most of the described sites in this paper, belongs to the Middle Neolithic; this is not characteristic for Starčevo culture and it testifies that hunting was much more important than animal husbandry. What is characteristic for settlements of Starčevo culture is the domination of oxen in the total vertebrate fauna and among domestic animals. At the site of Donja Branjevina-Deronje, the settlement which belongs to Starčevo culture as well, goats and sheep have the biggest proportional contribution. The only analysed settlement in this paper which belongs to the Early Neolithic (Vinča culture) is Gomolava – Hrtkovci where domestic animals dominate, oxen being the most numerous ones.

KEYWORDS: Neolithic, Vojvodina, domestic animals, wild animals

INTRODUCTION

In the territory of Vojvodina there are dozens of archaeological settlements from different periods. Archaeological researches have been conducted there
over the last eighty years during which an immense sample has been collected, predominantly consisting of bones of vertebrates (Vertebrata), seashells and snail shells (Mollusca). The paper shows data from 10 Neolithic sites, dated between 6000 and 3200 BC [Cerović et al., 1997]. These sites belong to different cultures, Kőrös being the oldest one. The sites of Nosa Biserne Obala and Ludaš Budžak were discovered in northern Vojvodina. The first site was excavated in 1957 [Bököny 1974], while archaeological digs at other sites were done in 1965 [Bököny 1974]. The next cultural layer is Starčevo and it belongs to Early and Middle Neolithic. It is widespread in Vojvodina and the majority of Neolithic sites belong to this culture. Archaeozoological researches for this period were done at the following sites: Donja Branjevina near Derojne, excavated in 1987 [Blažić 1992a], Golokut near Vizić, excavated in 1973 and 1976 [Blažić 1984], Starčevo, where vertebrate bones were first collected in 1932, and where the researches continued in the period between 1969 and 1970 [Clason 1980]. There are also 4 Neolithic sites along the highway through Srem that belong to Starčevo culture: Malo Kuvalovo-Krnješevci, Prosinec-Pćinci, Zlatara-Ruma and Kudoš-Šašinci [Blažić, 1992b]. The earliest cultural layer is Vinča culture and it belongs the end of the Neolithic. Multilayered archaeological site Gomolava-Hrtkovci belongs to this period as well. This site, the end of the Neolithic and the beginning of the Eneolithic, is dated between 3800 and 3400 BC [Petrović 1984]. Systematic collecting of osteological material at Gomolava started in 1971 [Clason 1979].

The main goal of archaeozoological researches is to classify remains of animals that were present in human communities, as well as to give the insight into the ratio of wild and domesticated animals, analyse the usage of animals and monitor the domestication process.

Domesticating and animal husbandry, as a mass phenomenon, are present at all Neolithic sites in Europe, and date back to circa 5000 years BC. The characteristic of the Neolithic domestic fauna is the presence of five breeding species: *Bos taurus* – ox, *Ovis aries* – sheep, *Capra hircus* – goat, *Sus scrofa domestica* – pig, and *Canis familiaris* – dog. The process of domestication and animal husbandry did not have the same direction and intensity in all Neolithic settlements. The differences identified during archaeological excavations are the result of various conditions, primarily ecological. These changes are related to the knowledge of domestication process and breeding in different cultures [Blažić 2005].

**MATERIAL AND METHODS**

The presence of domestic and wild animals is shown according to the vertebrate (Vertebrata) fauna research from 10 archaeological sites in Vojvodina from different Neolithic cultural periods [Radmanović et al., 2014]. Osteological material comes from settlements and necropolises. Determination was done by using the key Schmid [1972] and comparative osteological collections.
RESULTS AND DISCUSSIONS

The Neolithic Age – the New Stone Age – is characterised by the appearance of farming and livestock breeding, and by the intensification of the process of domestication. During the Neolithic, the diet was based on large game hunt. The process of domestication and the type of economy are characterised by specialised animal husbandry and hunting. Breeding of domestic animals and animal husbandry in early period were based on breeding goats and sheep. During the Middle Neolithic, and especially at its end, there is a change in animal husbandry, when oxen became the dominant domestic species. The role of hunting in the diet is reduced, and the most important game species are deer, wild boar and roe deer.

Table 1. Proportional contribution of domestic and wild animals (vertebrates) at Neolithic sites in Vojvodina

<table>
<thead>
<tr>
<th>Culture</th>
<th>Site</th>
<th>Author</th>
<th>% of domestic animals</th>
<th>% of wild animals</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kőrös</td>
<td>Nosa Biserna Obala</td>
<td>Bőköny 1974</td>
<td>37.29</td>
<td>62.71</td>
</tr>
<tr>
<td>Ludaš Budžak</td>
<td>Ibid.</td>
<td></td>
<td>79.08</td>
<td>20.91</td>
</tr>
<tr>
<td>Starčevo</td>
<td>Donja Branjevina</td>
<td>Blažić 1992a</td>
<td>66.36</td>
<td>33.63</td>
</tr>
<tr>
<td>Starčevo</td>
<td>Clason 1980</td>
<td></td>
<td>75.11</td>
<td>24.88</td>
</tr>
<tr>
<td>Malo Kuvalovo</td>
<td>Blažić 1992b</td>
<td></td>
<td>66.53</td>
<td>33.47</td>
</tr>
<tr>
<td>Prosine</td>
<td>Ibid.</td>
<td></td>
<td>81.20</td>
<td>18.70</td>
</tr>
<tr>
<td>Zlatara</td>
<td>Ibid.</td>
<td></td>
<td>81.10</td>
<td>18.90</td>
</tr>
<tr>
<td>Kudoš</td>
<td>Ibid.</td>
<td></td>
<td>83.30</td>
<td>16.70</td>
</tr>
<tr>
<td>Golokut</td>
<td>Blažić 1984</td>
<td></td>
<td>35.21</td>
<td>64.79</td>
</tr>
<tr>
<td>Vinča</td>
<td>Gomolava Clason 1979</td>
<td></td>
<td>62.80</td>
<td>37.20</td>
</tr>
</tbody>
</table>

Note: Kudoš – fauna consists of vertebrates and Mollusca; Gomolava – proportional contribution was calculated according to bone fragments that were determined up to the level of species.

After analysing Table 1, it can be concluded that the smallest proportion of domestic animals is at sites of Golokut (35.21%) [Blažić 1984] and Nosa Biserna Obala (37.29%) [Bőköny 1974], while the biggest one is at sites Prosine, Zlatara and Kudoš [Blažić 1992b]. A small proportion of domestic animals at Nosa Biserna Obala shows that the animal husbandry was just at the beginning, and a high proportion of wild animals testifies about the importance of hunting in economy. These are the characteristics of Kőrös culture settlements, where goats and sheep dominate among domestic animals (Table 2).

Although it belongs to Kőrös culture, the situation at the site of Ludaš Budžak is very different. There, domestic animals dominate with 79.08% when compared to the wild ones [Bőköny 1974] (Table 1). The dominant place here, both in the total vertebrate fauna and among domestic animals, occupy sheep and goats (Table 2).
Table 2. Proportional contribution of domesticated animals at the Neolithic sites in Vojvodina

<table>
<thead>
<tr>
<th>Species</th>
<th>Nosabisa-Biserna obala</th>
<th>Ludaš-Budžak</th>
<th>Donja Branjevina</th>
<th>Starčevo</th>
<th>Malo Kuvalovo</th>
<th>Prosine</th>
<th>Zlatara</th>
<th>Kudoš</th>
<th>Golokut</th>
<th>Gomolava</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Bos taurus</strong></td>
<td>15.25</td>
<td>40.91</td>
<td>10.38</td>
<td>13.13</td>
<td>15.32</td>
<td>69.65</td>
<td>33.33</td>
<td>75.00</td>
<td>30.83</td>
<td>22.16</td>
</tr>
<tr>
<td><strong>Ovis/Capra</strong></td>
<td>22.03</td>
<td>59.09</td>
<td>68.12</td>
<td>16.60</td>
<td>49.52</td>
<td>74.63</td>
<td>19.29</td>
<td>25.69</td>
<td>11.00</td>
<td>10.06</td>
</tr>
<tr>
<td><strong>Ovis aries</strong></td>
<td>0.20</td>
<td>0.27</td>
<td>0.53</td>
<td>0.12</td>
<td>0.27</td>
<td>0.27</td>
<td>0.53</td>
<td>0.71</td>
<td>0.34</td>
<td>0.97</td>
</tr>
<tr>
<td><strong>Capra hircus</strong></td>
<td>0.02</td>
<td>0.03</td>
<td>0.98</td>
<td>0.80</td>
<td>2.73</td>
<td>3.63</td>
<td>8.30</td>
<td>6.20</td>
<td>1.96</td>
<td>5.57</td>
</tr>
<tr>
<td><strong>Sus scrofa domestica</strong></td>
<td>0.29</td>
<td>0.37</td>
<td>1.48</td>
<td>2.73</td>
<td>1.48</td>
<td>3.63</td>
<td>8.30</td>
<td>6.20</td>
<td>2.77</td>
<td>1.96</td>
</tr>
<tr>
<td><strong>Canis familiaris</strong></td>
<td>0.29</td>
<td>0.37</td>
<td>0.53</td>
<td>0.80</td>
<td>0.53</td>
<td>0.71</td>
<td>26.94</td>
<td>0.34</td>
<td>0.97</td>
<td>1.54</td>
</tr>
</tbody>
</table>

1. % in the total sample  
2. % in the contribution of domesticated animals
The proportional contribution of domestic and wild animals at these two sites of the Kőrös culture in Vojvodina is different when compared to the sites of Gyálarét and Rőszke-Lüdvár in Hungary, which also belong to this culture [Bököny 1974], but the above mentioned dominance of goats and sheep was also revealed in this analysis.

It has already been stated that the low percentage of domestic animals was recorded at the site of Golokut [Blazić 1984] which, like most sites described in this paper, belongs to the middle Neolithic. This ratio of domestic and wild animals is not characteristic for Starčevo culture, and it proves that hunting played a more important role than animal husbandry, which is related to the fact that Golokut was located at higher altitude in woody terrain of Fruška Gora Mt. What is characteristic for settlements of Starčevo culture is the domination of oxen in the total vertebrate fauna and among domestic animals, which is also true for this Neolithic site (Table 2).

At the sites of Donja Branjevina [Blazić 1992a], Starčevo [Clason 1980], Malo Kuvalovo, Prosine, Zlatara and Kudoš [Blazić 1992b], a high proportion of domesticated species can be observed, with the domination of oxen, excluding the first mentioned site (Tables 1 and 2). At the site of Donja Branjevina, goats and sheep have the biggest proportional contribution.

Concerning the settlements of Starčevo culture, when compared to Divostin [Bököny 1988], Anzabegovo [Bököny 1976] and Sitagroj [Bököny 1986], the sites in Vojvodina have lower proportional contribution of domestic animals and higher contribution of wild ones. The high percentage of domestic animals at these three sites points to a developed animal husbandry. However, after comparing the sites of Lepenski Vir [Bőkönyi 1969] and Padina [Clason 1980], which also belong to Starčevo culture, and given the isolation of these two sites and the fact that the population lived mainly from hunting and fishing, there is a far greater proportional contribution of domestic animals, and much smaller contribution of the wild species recorded in Vojvodina. Furthermore, it can be stated that at the sites of Starčevo, Prosine, Kudoš and Golokut, when compared to Divostin, Anzabegovo and Sitagroj, there is a greater proportional contribution of oxen as the dominant species in the total vertebrate fauna. At the sites of Anzabegovo and Sitagroj, the most numerous domestic species are sheep and goats, which did not have their wild ancestors in these areas, so we can assume that they originate from the South or South-East [Lazić 1988].

The only settlement analysed in this research which belongs to the Early Neolithic (Vinča culture) is Gomolava, where domestic animals are dominant, with oxen as the dominant species. Pigs – *Sus scrofa domestica*, sparsely present at other sites, are at the second place. In comparison to Vinča layer at the sites of Divostin [Bököny 1988], Anzabegovo [Bököny 1976], and Sitagroj [Bököny 1986], and early layers at the sites of Obre I and Obre II [Bököny 1977], Gomolava site has far greater proportional contribution of wild animals. Presence of wildlife at this site in the proportion of 37.20% corresponds to the results from the site of Crkvine in Kolubara basin [Blazić and Radmanović 2011]. On the other hand, it is lower when compared to Petnica (47.18%) [Greenfield 1986]. There is a difference in the proportional distribution of oxen, sheep and
goats between Gomolava and the above mentioned sites in the Balkan Peninsula, but the dominance of oxen is noticeable. The increase in proportional contribution of oxen can be easily tracked back from the oldest to the youngest layer of Anzabegovo settlement, which confirms that the breeding of oxen gradually became more important during the Neolithic period, even in those settlements where the bases of animal husbandry were sheep and goats. Domination of oxen, ranging between 43.68% and 72.28% among domesticated mammals at the Neolithic sites in the territory of Romania, is mentioned by Stanc et al. [2010]. Domination of oxen at the sites from this period shows the developed animal husbandry.

Bököny, 1974 gives the outline of the fauna of the Neolithic sites in the territory of Hungary, of various cultures, especially Tisa culture. The analysis of the presence of domestic animals showed a range from 25.17% at the site of Déványa-Sártó (Tisa culture) to 91.55% (Tiszavasvári-Keresztfa) which is far wider range when compared to the sites in Vojvodina. With the exception of two mentioned sites of the Kőrös culture, proportional contribution of domestic and wild animals at the other 8 sites in the territory of Hungary is close to the values recorded in Vojvodina. Both sites in Vojvodina and those in Hungary, from the Middle and Late Neolithic, show the already mentioned dominance of oxen, the proportional contribution of which displays similar values in most cases.

CONCLUSIONS

The paper shows data from 10 Neolithic sites in Vojvodina (Serbia), dated between 6000 and 3200 BC. Two sites (Nosa Biserina Obala and Ludaš Budžak) belong to the Early Neolithic (Kőrös culture); seven sites: Donja Branjevina-Deronje, Starčevo, Malo Kuvalovo-Krnješevci, Prosine-Pećinci, Zlatara-Ruma, Kudoš-Šašinci and Golokut-Vizić belong to the next layer – Starčevo culture, belonging to the Early and Middle Neolithic, while the site of Gomolava belongs to the youngest layer – Vinča culture, which covers the end of the Neolithic Age.

The smallest proportion of domestic animals was recorded at the sites of Golokut and Nosa Biserina Obala, while the biggest one at the sites of Prosine, Zlatara and Kudoš.

A small proportion of domestic animals at Nosa Biserina Obala shows that the animal husbandry was just at the beginning, and a high proportion of wild animals testifies about the importance of hunt in economy. Sheep and goats dominate among domestic animals at this site, which is a characteristic for Kőrös culture.

A small proportion of domestic, and a great proportion of wild animals registered at the site of Golokut is not characteristic for Starčevo culture. However, what is the characteristic for Starčevo culture settlements is the domination of oxen in the total vertebrate fauna and among domestic animals.

At the site of Donja Branjevina, goats and sheep have the biggest proportional contribution.
**Gomolava** is the only analysed settlement in this paper that belongs to the Early Neolithic (Vinča culture), where domestic animals are dominant, with oxen as the dominant species.

**REFERENCES**


ОДНОС ДОМАЋИХ И ДИВЉИХ ЖИВОТИЊА НА НЕОЛИТСКИМ ЛОКАЛНОСТИМА У БЕОГРАДИ (СРБИЈА)**

Дарко П. РАДМАНОВИЋ1, Десанка КОСТИЋ2, Јелена З. ЛУЈИЋ3, Светлана В. БЛАЖИЋ1

1 Музеј Војводине, Дунавска 35–37, 21000 Нови Сад, Србија
2 Универзитет у Новом Саду, Природно-математички факултет, Департман за биологију и екологију, Трг Доситеја Обрадовића 2, 21000 Нови Сад, Србија
3 Универзитет „Сент Иштван“, Факултет за пољопривреду и заштиту животне средине, Природно-математички факултет, Департман за биологију и екологију, Трг Доситеја Обрадовића 2, 21000 Нови Сад, Србија

РЕЗИМЕ: На основу резултата фаунистичких истраживања кичмена (Vertebrata) са 10 неолитских археолошких локалитета у Војводини (Србија) од којих два припадају Керешкој, седам Старчевачкој и један Винчанској култури, анализирана је заступљеност домаћих и дивљих животиња. Датовање ових налазишта процењује се на период 6000–3200. године п. н. е. Најмањи проценат домаћих животиња забележен је на локалитетима Голокут-Визић и Носа Бисерна обала, док је највећи на налазиштима Просине-Пећинци, Златара-Рума и Кудош-Шашин ци. Низак проценат домаћих животиња на Носи Бисерна обала говори да је гајење било у зачетку, а висок проценат дивљих сведочи о важној улози лова у економији. Ово су карактеристике насеља керешке културе којима се прикључује и чињеница да међу домаћим животињама доминирају овца и коза. Низак проценат домаћих, а висок проценат дивљих животиња забележен на налазишту Голокут који је као и већина описаних локалитета у овом раду, припада средњем неолиту, није карактеристичан за Старчевачку културу, а сведочи о томе да је лов имао много већи значај од гајења животиња. Оно што јесте карактеристика насеља Старчевачке културе је домнија животиња, а у неким локалитетима и осим од домаћих животиња, такође и од дивљих животиња. На градовима Доньој Брањевини и Дероња, локалитети који такође припадају Старчевачкој култури, највећи проценета домаћих животиња забележен је на јужној обали Голокут који је као и већина описаних локалитета у овом раду, припада средњем неолиту, није карактеристичан за Старчевачку културу, а у неким локалитетима и осим од домаћих животиња, такође и од дивљих животиња. На градовима Доньој Брањевини и Дероња, локалитети који такође припадају Старчевачкој култури, највећи проценета домаћих животиња забележен је на јужној обали Голокут који је као и већина описаних локалитета у овом раду, припада средњем неолиту, није карактеристичан за Старчевачку културу, а у неким локалитетима и осим од домаћих животиња, такође и од дивљих животиња.

КЉУЧНЕ РЕЧИ: неолит, Војводина, домаће животиње, дивље животиње

**НАПОМЕНА:**