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Emerging From the Deep: Human-Catfish Entanglements at Padina, Danube Gorges

Abstract: Archaeological excavations in the Danube Gorges have yielded remarkable evidence of Early Holocene hunter-fisher-gatherer lifeways within a highly specific riverscape. Through a complex interplay involving the materiality of the archaeological record (unprecedented forms of architecture and sculpture), the scientific authority of the excavator, archaeological narratives, and public discourse, the site of Lepenski Vir emerged as a focal point of this cultural phenomenon. While no less vital to our understanding of the Mesolithic-Neolithic sequences, other sites in the region have tended to meld into the holistic notion of the 'Lepenski Vir culture', despite extensive research and publication. This paper shifts the focus on the site of Padina, situated c. 5 km upstream from Lepenski Vir, with a comparable (albeit smaller-scale) material record, alongside a wealth of faunal remains. Particular attention is paid to the fish bone assemblage, considered from both a zooarchaeological and a multispecies perspective. Although humans construct narratives of their engagements with animals (*sensu* Ingold), animals afford particular ways of thinking these histories of entanglement. In this respect, fish species such as sturgeons (Acipenseridae) and kutum (*Rutilus frisii*) have figured prominently in archaeological writings on the Danube Gorges Mesolithic-Neolithic, largely due to their seasonal migrations and significance within ontological and symbolic domains. The present study, however, draws particular attention to the freshwater catfish (*Silurus glanis*), the dominant species in the Padina assemblage. By examining the species' ecology, appearance, and behaviour, as well as the distribution, modification, and contextualisation of its remains, this paper reflects on intimate interspecies knowledge, prolonged, day-to-day encounters, and negotiations with the landscape.

Keywords: Padina, Danube Gorges, Mesolithic, Early Neolithic, human-animal relations, fish remains, catfish

> "*So long as one does not, during analysis, lose sight of the animal as a whole,*
> *then beauty increases with increasing awareness of detail.*"
>
> Niko Tinbergen (*Curious Naturalists*, 1958)

Introduction

Recent narratives concerned with the past came to understand human and nonhuman actors as emerging from a complex interplay of archaeological materialities, the scientific apparatus, ontological positions, and research paradigms. Notably articulated as 'networks' (Latour 2005), 'assemblages' (Deleuze and Guattari [1987] 2005), or 'meshworks' (Ingold 2011), these interplays have also been formulated as 'historically shifting webs of interspecies dependence' (Tsing 2012), foregrounding the agency of a multitude of life-forms that bring each other into being (Haraway 2008). Informed by these recent shifts and turns in the sciences and the humanities, and with unique insights into the material traces of 2.5 million years of coexistence (Overton and Hamilakis 2013), archaeologists have also begun to view nonhuman animals in a different light. In archaeological writings, animals have come a long way from being relegated to footnotes and appendices, regarded as economic and symbolic resources, to being recognised as active participants in more-than-human, multispecies, and ontologically inclusive pasts (Hill 2013; Overton and Hamilakis 2013; Boyd 2017; Harris and Cipolla 2017, 152–170; Pilaar Birch 2018; Živaljević 2021; Hussain and Brusgaard 2024; Hussain 2025).

I have argued elsewhere (Živaljević 2023) that there are considerable differences in the ways we weave narratives on nonhuman animals in different cultural contexts – for example, in hunter-gatherer studies versus historical archaeologies. Expanding on this, I argue here that there are also different ways of writing various animal species.[1] This is certainly related to human constructions

[1] Obviously, the very concept of a species is culturally and historically situated within the framework of Linnaean taxonomy. This is not to suggest that alternative taxonomies, through which people related to and made sense of the world, did not exist in the distant or more recent past. Tim Ingold (2002, 47) recognises that "one gets to know the forest, and the plants and animals that dwell therein, in just the same way one becomes familiar with other people, by spending time with them, investing in one's relations with them the same qualities of care, feeling and attention". As argued by archaeologists concerned with both hunter-gatherer (Overton and Hamilakis 2013; Overton 2018, 2019) and post-domestication contexts (Armstrong Oma 2010; Argent 2016), this implies that people in the past came to understand various animals primarily as individuals (differing in age, sex, appearance, behaviour, etc.), rather than as generic categories of species. Furthermore, within numerous Indigenous contexts associated with hunter-fisher-gatherer traditions, the human-animal divide itself is conceived as ontologically permeable, where behavioural and bodily 'effects' possess the capacity to be disintegrated, assembled, and 'transferred' between human and nonhuman persons (e.g. Hill 2013, *and references therein*). In sum, the 'tension' between Linnaean taxonomy and relational ontologies arises from the notions of stability versus fluidity – or rather, fixed shapes and morphologies versus "situationally enacted effects" (Hussain 2025, 12). With new species continuously

of the nonhuman world and to the material evidence – or rather, specific 'zoo-materialities' (*sensu* Hussain 2025) – including the distribution of faunal remains on archaeological sites, the manners of their consumption, modification, use and deposition, and the animal-rendered material culture and representation. Nevertheless, while humans construct narratives of their engagements with animals (Ingold 1994), animals afford particular ways of thinking such histories of entanglement. Some animals are social while others are solitary; some are terrestrial, aquatic, or aerial (or shift between these domains); some are diurnal and others nocturnal; some inhabit the same environments as humans whereas others are seasonal visitors; some pose threats to humans while others are preyed upon by them. In her famous essay *Human Vulnerability and the Experience of Being Prey*, Australian ecofeminist philosopher Val Plumwood (1995) recounted how the experience of surviving a saltwater crocodile attack profoundly altered her view of the world, including human place in it. Ultimately, these webs of relations, and ways of conceptualising them, are intimately bound to the ethology, agency, and 'world-making' (*sensu* Tsing 2015) of each species.

In exploring how different species emerge within (zoo)archaeological narratives, this paper engages with the Early Holocene (Mesolithic and Early/Middle Neolithic) record from the Danube Gorges – an area that offers unique insights into hunter-fisher-gatherer entanglements with a multitude of other living beings. Certain anadromous fishes, such as members of the sturgeon family (Acipenseridae) and the cyprinid *Rutilus frisii* (commonly known as kutum, pearlfish, or vyrezub), have featured prominently in archaeological literature. This is primarily due to their particular zoomaterialities: specifically, sculpted boulders from the site of Lepenski Vir (Radovanović 1997; Borić 2005a, Bartosiewicz, Bonsall and Şişu 2008; Živaljević 2023, 2025), and bodily ornaments from the site of Vlasac (Cristiani and Borić 2012; Cristiani, Živaljević and Borić 2014; Živaljević 2017, 2025), respectively. While this paper considers all of these fish species and more, drawing on previous unpublished zooarchaeological work (Živaljević 2017), it focuses particularly on the freshwater wels catfish (or simply catfish), known in Linnaean taxonomy as *Silurus glanis*. With its high number of catfish remains – including numerous instances of their structural deposition – the site of Padina serves as the focal point of this study. By looking into catfish ecology, appearance, and behaviour, as well as the distribution, modification, and contextualisation of catfish remains, this paper reflects on intimate interspecies knowledge, prolonged day-to-day encounters, and negotiations with the landscape.

being recognised, renamed, and lumped together, perhaps some scientists would agree with the instability part. While this paper (as per zooarchaeological tradition) uses the term 'species' as a helpful analytical tool, it aims to contextualise it within a multispecies framework that foregrounds relations, acknowledging that they are always 'becoming with' (Haraway 2008) and 'co-shaping' (Overton and Hamilakis 2013).

The Danube Gorges: A Brief History of Archaeological Excavations, Interpretations, and Narratives

The Danube Gorges (or the Iron Gates) refer to four narrow gorges carved by the Danube flowing through the southern Carpathian Mountains in the North-Central Balkans. Once characterised by powerful currents, numerous whirlpools, cascades, and protruding riverine rocks – features celebrated by local fishermen and dreaded by boat crews (Petrović [1941] 1998) – this riverscape was ultimately 'pacified' by the construction of the Iron Gates dams I (1971) and II (1984). Prior to the damming and the subsequent rise in water level by up to 30 m, archaeologists conducted extensive excavations on both the right (Serbian, then Yugoslav) and left (Romanian) banks of the Danube. From the early 1960s to the early 1980s, these endeavours revealed more than 20 open-air sites and caves with remarkable evidence of Late Pleistocene–Early Holocene hunter-fisher-gatherer lifeways (**Fig. 1**) (Radovanović 1996; Bonsall 2008; Borić 2011).

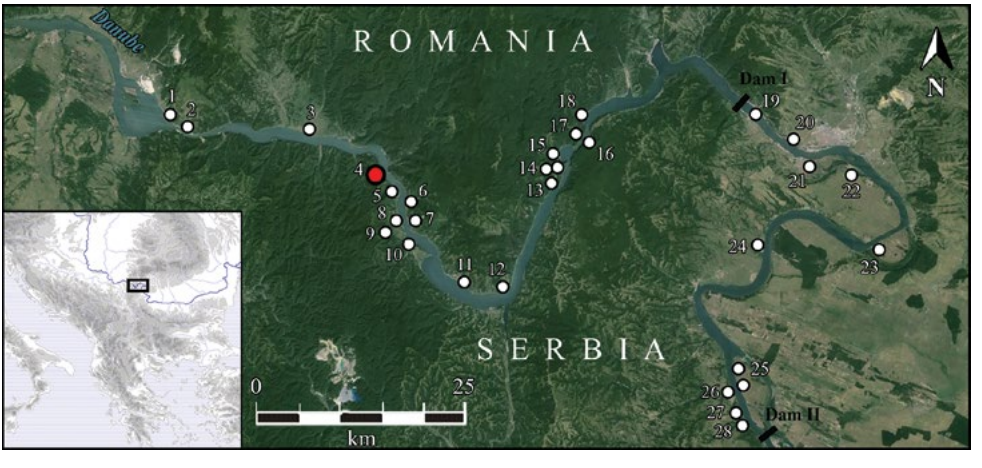


Figure 1. The Danube Gorges area with relevant Epipalaeolthic, Mesolithic, and Neolithic sites (c. 13,000–5500 cal BCE), with the location of Padina marked in red: 1. Privod; 2. Alibeg; 3. Vodneac; 4. Padina; 5. Stubica; 6. Ilişova; 7. Izlaz; 8. Lepenski Vir; 9. Aria Babi; 10. Vlasac; 11. Sviniţa; 12. Virtop; 13. Cuina Turcului; 14. Climente I & II; 15. Veterani; 16. Hajdučka Vodenica; 17. Răzvrata; 18. Icoana; 19. Ostrovul Banului; 20. Schela Cladovei; 21. Donje Butorke; 22. Ajmana; 23. Ostrovul Corbului; 24. Velesnica; 25. Ostrovul Mare; 26. Kula; 27. Knjepište; 28. Ušće Kameničkog potoka (basemap from Google Earth, modified by I. Živaljević).

Excavations and subsequent analyses have shown that the earliest traces of human presence, associated with various caves and rock shelters on the left bank of the Danube, date back to the Epipalaeolithic (c. 13,000–9500 cal BCE).

From the Early Mesolithic (c. 9500–7400 cal BCE), the riverine terraces along both banks in the Upper and Lower Gorge were utilised by local foragers, most likely for hunting and fishing activities and occasionally for burying their dead. These locations, along with several downstream terraces and islets, witnessed intense building activity, diverse mortuary practices, and a proliferation of stone, bone, and antler tools and personal ornaments during the Late Mesolithic (c. 7400–6200 cal BCE), particularly at Vlasac and Schela Cladovei. During the period coinciding with the appearance of the first farming communities in the area (c. 6200–6000/5900 cal BCE), the Lepenski Vir and Padina locales saw the emergence of complex fisher-hunter-gatherer settlements characterised by trapezoidal-base buildings and distinctive sculpted boulders. Ultimately, from c. 6000/5900 cal BCE, some of the previously unoccupied locations in the downstream area were settled by incoming farmers, while the older settlements within the gorges remained in use, witnessing new practices, beliefs, and people incorporated into the long-term traditions and worldviews of local foragers (Bonsall 2008; Borić 2011, 2019; Borić and Price 2013; Borić et al. 2014; Bonsall et al. 2015).

The discovery of Lepenski Vir in particular (excavated in 1965–1970) caused an unprecedented sensation among both the archaeological community and the public. Unique for its over 70 buildings featuring a trapezoidal base and durable reddish limestone floors, alongside numerous sculpted boulders resembling human-fishlike beings and a variety of decorated artefacts (Srejović 1969, 1972; Srejović i Babović 1983; Radovanović 1996; Borić 2005a), the site was dubbed the "concentration of creative forces" in the region (Srejović 2001, 390) and the locus of "Europe's first monumental sculpture" (Srejović 1972). A central role in the interpretation of the then established 'Lepenski Vir culture' was occupied by the site's excavator, Dragoslav Srejović, whose position rested on key elements that constitute and reinforce scientific authority: a grandiose discovery, the access to the site as a physical space, extensive institutional support, and active public engagement (Ćosić 2016, 2024).

Hence, his interpretation of the phase characterised by trapezoidal buildings and sculptures (labelled Lepenski Vir I–II) as 'Proto-Neolithic' (Srejović 1966, 1969) and ultimately as 'Mesolithic' (Srejović 1989), dominated 'research arenas' for years to come (Borić 1999, 2002, 2019; Ćosić 2024). Srejović saw it as an authentic local phenomenon stemming from long-term forager traditions (close relationships with particular locales and the river, the significance of fishing, and the continuity of certain elements in the mortuary, architectural, and symbolic domains), while treating the pottery finds from the buildings as intrusive elements associated with later, discontinuous Early Neolithic settlement (Lepenski Vir III) (Srejović 1969, 1972, 2001). Conversely, Borislav Jovanović, who excavated the nearby site of Padina (1968–1970) and discovered similar

architectural features with *in situ* pottery vessels (**Fig. 4**), situated them within an Early Neolithic cultural and chronological framework (labelled as 'phase B' in Jovanović 1968, 1969, 1971, 1974a, 1974b).

The understanding that "archaeologists produce their sites as much as 'discover' them" (Harris and Cipolla 2017, 197, *and references therein*) carries particular relevance in this context. While neither Jovanović nor Padina achieved a status comparable to Srejović and Lepenski Vir within authorised discourse (Ćosić 2024), subsequent lines of evidence – including published photographs of *in situ* pottery in Lepenski Vir buildings (Garašanin and Radovanović 2001), the reinterpretation of their stratigraphy (Borić 1999, 2002, 2019), AMS radiocarbon dating of both sites (Borić and Miracle 2004; Borić 2011; Bonsall et al. 2015), and new evidence indicating that incoming migrants inhabited the settlements alongside the local population (Borić and Price 2013; Mathieson et al. 2018) – demanded a serious reconsideration of previous narratives. Dušan Borić (1999, 2002, 2005b) argued that the understanding of the phase characterised by the construction and use of trapezoidal-base buildings (c. 6200–6000/5900 cal BCE at Lepenski Vir, and up to c. 5500 cal BCE at Padina) was impeded by rigid archaeological dichotomies between Mesolithic hunter-fisher-gatherers and Neolithic farmers. Instead, he suggested that these settlements are best understood through the lens of cultural hybridity, where innovations were organically incorporated into deep-time traditions. Thus, he designated this particular phase of the sequence as the 'Mesolithic-Neolithic Transition' or 'Transformation' (Borić 2011).

(Zoo)material Affordances and Co-Creation of Meanings

As seen from previous passages, the authority and discourse of excavators and later authors played important roles in the production of knowledge on the two sites and the Danube Gorges sequence as a whole. Nevertheless, following recent relational approaches outlined in the introduction, it came to be recognised that it is the archaeologists and sites that co-create each other (e.g., Ćosić 2024, 85–86, *and references therein*). By examining particular *material affordances* (*sensu* Ingold 2011), it becomes apparent that the archaeological records from Lepenski Vir and Padina afforded comparable, yet distinctive means of engagement. While both sites yielded evidence of complex architecture, Lepenski Vir was exceptional for its settlement size and durable reddish limestone building floors, whereas the fewer buildings uncovered at Padina featured floors made of compact clay. Similarly, boulders were discovered within the buildings at both sites, but those from Lepenski Vir were far more numerous and exhibited significant diversity in their manipulation and ornamentation (ranging from vaguely ichthyomorphic to elaborately executed, with human or fishlike

features). In contrast, the boulders from Padina were predominantly aniconic or displayed only minor surface modifications, such as wavy lines.

Consequently, it was precisely the representational boulders that afforded Lepenski Vir a prominent place within regional and European prehistory. Here, it is worth exploring their relation to specific animals, and engaging with their zoomaterial affordances. Characterised by large, downturned mouths, some of these sculptures have been interpreted as representations of sturgeon, most notably the beluga (*Huso huso*) (Radovanović 1997). This species is renowned for its formidable size, with the largest specimens from Lepenski Vir estimated to have exceeded 5 m in total length (Živaljević et al. 2021), and even larger individuals have been recorded in historical times (Bartosiewicz and Bonsall 2004; Kottelat and Freyhof 2007, 58–59; Bartosiewicz, Bonsall and Şişu 2008). Other impressive traits of the beluga sturgeon and other members of the Acipenseridae family (the Danube sturgeon *Acipenser gueldenstaedtii*, fringebarbel sturgeon *Acipenser nudiventris*, and starry sturgeon *Acipenser stellatus*) were their long seasonal migrations from the Black Sea to the Danube, taking place each spring and autumn prior to the construction of the Iron Gates dams (Ristić 1977; Kottelat and Freyhof 2007; Bartosiewicz, Bonsall and Şişu 2008). Strong whirlpools in the Upper and Lower Gorge channelled the movement of the migrating fish, prompting the development of specific whirlpool fishing techniques over the last few centuries, and likely earlier (Petrović [1941] (1998)). The striking overlap between the more recent lucrative fishing spots and the locations of the Mesolithic and Early Neolithic settlements (Srejović 1969, 148–149; Borić 2002, 153, 157) reinforced the hypothesis that the Early Holocene foragers frequented and eventually settled in the Danube Gorges primarily for this purpose (Radovanović 1996).

Beyond settlement locations, several authors have linked specific ways of treating the dead to the biannual sturgeon run. Some of the Early Mesolithic burials at Padina, Lepenski Vir and Vlasac contained bodies placed in a seated position with their legs crossed, facing the Danube, as if "enjoying the view and following the rite of passage" (Borić 1999, 61). Ivana Radovanović (1997) related the Late Mesolithic and Transitional phase practice of positioning the dead in an extended supine position, parallel to the river and oriented downstream, to the downstream voyage of sturgeons returning to the Black Sea and to concepts of life and rebirth upon their return to the Danube Gorges the following spring. Similarly, focusing on the varying degree of manipulation of the sculpted boulders and their occasional association with human burials at Lepenski Vir, Borić interpreted them as volatile bodies in a constant state of metamorphosis, which objectified "the movement of corporeal matter through life and death in the process of becoming" (Borić 2005a, 49).

In a similar vein, renewed interest in the site of Vlasac, particularly its complex and diverse burial record, revealed past human entanglements with another anadromous species. Here, numerous Late Mesolithic burials were accompanied by a multitude of modified cyprinid pharyngeal teeth concentrated in the shoulder, back, and head area (Srejović i Letica 1978; Borić et al. 2014), most likely parts of cloaks and headdresses (Cristiani and Borić 2012; Cristiani, Živaljević and Borić 2014). Subsequent ancient DNA analysis (Živaljević et al. 2017) has shown that they originated from kutum (*Rutilis frisii*), another species which inhabits the Black Sea and undertakes seasonal spawning migrations to rivers. During spawning, breeding males develop pearl-like keratin tubercles on the head and back, bearing a striking resemblance to the arrangement of pharyngeal teeth ornaments in human burials. Within a relational framework, the interpretation of these practices again centred on corporeal instability, with human bodies "becoming parts of new assemblages by incorporating non-human elements" (Živaljević 2025, 444).

The remains of various sturgeon species and (unmodified) kutum teeth were also recovered at Padina (**Table 1**), albeit in lower absolute and relative frequencies compared to Lepenski Vir and Vlasac, respectively (Živaljević 2017). However, the defining feature of the Padina assemblage was its exceptionally high quantity of catfish (*Silurus glanis*) remains, particularly in association with the trapezoidal-base buildings. Unlike the previously described anadromous



Figure 2. Articulated catfish vertebrae from the zone with animal bones above House 11, Sector III, Padina (photo: B. Jovanović, after Borić 2002, Fig. 5.32).

species, the catfish is a freshwater, lentic, and fairly stationary fish (Ristić 1977, 168–169, 240–241). Catfish remains, particularly large vertebrae, caught Jovanović's attention already during the excavations (**Fig. 2**) and were subsequently analysed and discussed in the archaeological literature (Clason 1980, 168; Borić 2002; Dimitrijević, Živaljević and Stefanović 2016; Živaljević 2017). Nevertheless, sharing the somewhat 'marginalised' role with its associated site, this species was notably absent from narratives of the Danube Gorges settlement pattern in relation to fishing affordances, seasonality, memory, human-animal relations, and bodily transformations. The following chapters examine the (zoo)materialities of Padina more closely, placing a particular emphasis on human-catfish relations.

Padina: The Archaeological Setting

Padina (meaning 'slope' in Serbian) is situated between two small rivers, the Kožica and Pesača, on a riverine terrace sloping towards the Danube. Bedrock ridges divided the terrace into four interconnected coves formed by the Danube, labelled Sectors I–IV during the excavations. The excavated areas in Sectors I–III revealed burials, stone constructions, semi-subterranean buildings, chipped stone, bone and antler tools, pottery, and substantial quantities of animal bones related to different phases of Early Holocene human settlement (Jovanović 1969, 1971, 1974a, 1974b). Through subsequent AMS radiocarbon dating (Whittle et al. 2002; Borić and Miracle 2004; Jovanović 2008; Borić 2011; Borić and Price 2013; Mathieson et al. 2018; Jovanović et al. 2021), Jovanović's 'phase A' was linked to the regional Early and Late Mesolithic (c. 9500–7400 cal BCE and c. 7400–6300/6200 cal BCE, respectively). The previously discussed trapezoidal-base buildings (labelled by Jovanović as 'phase B') were shown to be coeval with the larger and more complex Mesolithic-Neolithic Transition phase settlement at Lepenski Vir (c. 6200–5900 cal BCE), while also demonstrating uninterrupted continuity of occupation throughout the Early/Middle Neolithic, extending up to the mid-6th millennium cal BCE.

Sector I (675 m^2) (**Fig. 3**) encompassed the smallest cove, featuring a roughly 30-meter-long riverbank section significantly eroded by the activity of the Danube and its tributaries (Jovanović 1969, 1974a, 2008). The earliest traces of human presence in this area were dated to the Late Mesolithic, and included several burials, a rectangular stone hearth and a stone construction, alongside chipped stone, bone, and antler artefacts (Borić 2002; Borić and Miracle 2004; Jovanović 2008). Features from the Transitional-Early Neolithic phase included another three burials and three semi-subterranean trapezoidal buildings (labelled

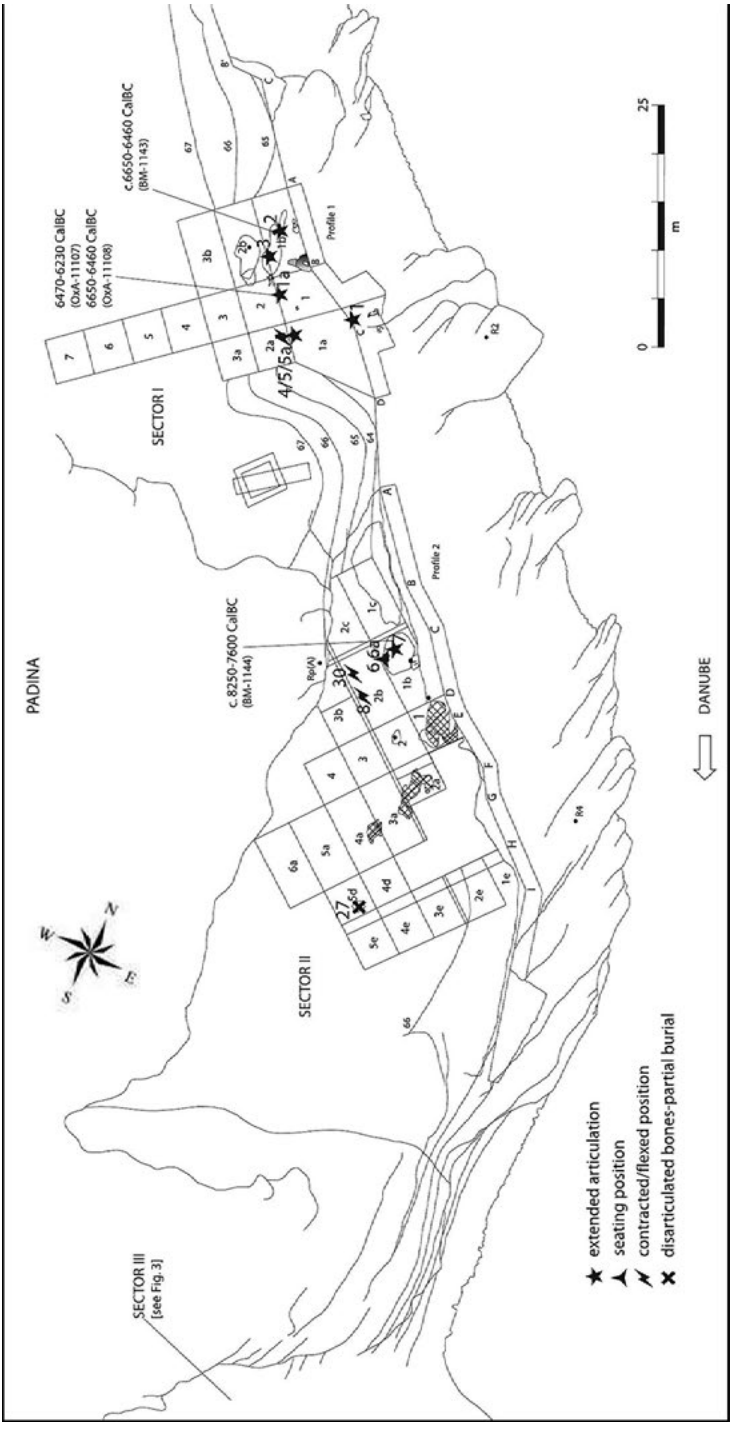


Figure 3. The plan of Sectors I and II at Padina (after Borić and Miracle 2004, Fig. 2; reproduced with permission from the authors).

Houses[2] 1–3) with clay floors and stone-lined hearths, which contained pottery fragments, chipped and polished stone and bone tools, aniconic boulders, and numerous fish bones (Jovanović 1969, 2008; Borić 2002; Borić and Price 2013). Following their destruction by a torrent wave, these buildings were not rebuilt (Jovanović 2008, 291).

The Sector II cove (650 m^2) (**Fig. 3**) and its roughly 52-meter-long riverbank were less affected by river erosion (Jovanović 1974a, 2008). An Early Mesolithic primary inhumation and a secondary skull burial were discovered in this area (Borić and Miracle 2004; Borić and Price 2013), alongside several circular and elongated stone constructions and fireplaces that formed a semi-circle along the small stream flowing through the cove (Jovanović 1974b, 2008). In certain instances, stone structures were built directly on top of older ones, 'citing' the significance of particular features and locations over time (Borić 2002, 170). Numerous chipped stone and bone tools, charred wood, and animal bones recovered from this area suggest that the structures may have been linked to activities such as wild game and fish processing, as well as wood and hide working (Jovanović 1974a, 2008; Borić 2002).

Separated from Sector II by bedrock ridges, Sector III (1100 m^2, c. 100-meter-long riverbank) was a massive fossil whirlpool containing sedimented yellow sandy loess, with steep limestone cliffs in its hinterlands (Jovanović 1969, 1971, 1974a). During the Early Mesolithic, an elongated stone construction was built in the southwestern rear area of the cove, and several burials (in extended supine, seated, and flexed positions) and disarticulated human bones were interred around the feature (**Fig. 4**) (Borić 2002; Jovanović 2008). AMS radiocarbon dating of the burials (Borić and Miracle 2004; Borić and Price 2013; Mathieson et al. 2018; Jovanović et al. 2021) showed that this location was used as a burial ground from the second half of the 10th to the beginning of the 8th millennium cal BCE, reflecting its significance in the long term. Apart from the burial ground, traces of Early Mesolithic occupation (mainly wild game remains, dated to 9296–8934 cal BCE, OxA-17144, 95% CI) were detected beneath the floor of the later House 14 (Borić 2011). Late Mesolithic occupancy was confirmed by

[2] Following the designation and labelling of the buildings at Padina and Lepenski Vir as 'houses' by their excavators, the same labelling is used in this paper to refer to numerous published works. As previously argued (Borić 2007), the use of this term does not imply that these features were exclusively dwelling spaces, nor should a clear-cut, cross-cultural dichotomy between the 'profane' and the 'sacred' be assumed. The inventory of the buildings at both Lepenski Vir and Padina included tools, manufacturing waste and food remains, but also sculpted boulders, ornamented artefacts, structurally placed animal body parts, and even human bodies or their parts, deposited simultaneously or in different episodes of the building life cycle. Thus, these architectural features are best understood as objects with complex biographies.

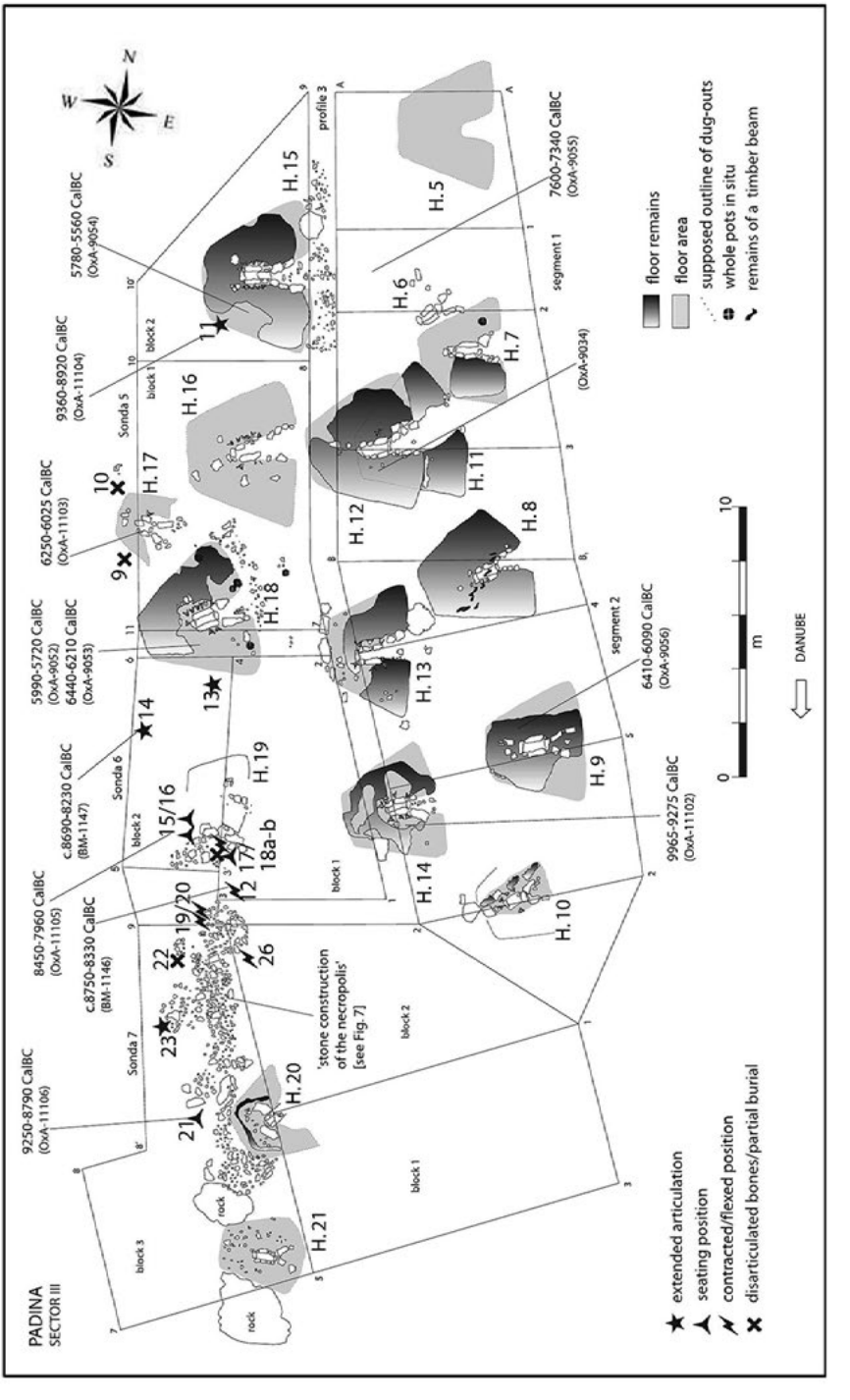


Figure 4. The plan of Sector III at Padina (after Borić and Miracle 2004, Fig. 3; reproduced with permission from the authors).

the dating of a concentration of mammal and fish bones between later Houses 5 and 6 (7590–7356 cal BCE, OxA-9055, 95% CI) and underneath the floor of House 18 (6443–6226 cal BCE, OxA-9053, 95% CI) (Whittle et al. 2002; Borić and Miracle 2004; Borić 2011). These are rare instances of undisturbed Mesolithic contexts in this part of Sector III, given that this area saw extensive building activity from c. 6300/6200 cal BCE.

The loess cover of Sector III certainly influenced the location of the Transitional-Early Neolithic settlement, as the buildings related to this phase were dug 1–1.5 m into the sloping terrace. Their wider fronts faced the Danube, whereas their rear sections were narrow, requiring deeper digging into the slope, which produced their characteristic trapezoidal shape (**Figs. 4, 5**). Most buildings featured approaching platforms leading to rectangular stone hearths, which occasionally had aniconic boulders placed behind them (Jovanović 1969, 1974b, 2008; Borić 2002).

The settlement layout consisted of buildings arranged in parallel rows that gradually moved upslope (**Figs. 4, 5**). The buildings in the lowest row (Houses 5–10) were the first to be constructed, although it remains possible that the Danube destroyed the older architectural features in the littoral zone. Over time, the buildings in the lowest row were abandoned, which coincided with the construction and occupation of buildings in the middle row (Houses 11–14) (Jovanović 1969, 1974a, 1974b, 2008). The largest portion of the faunal assemblage from

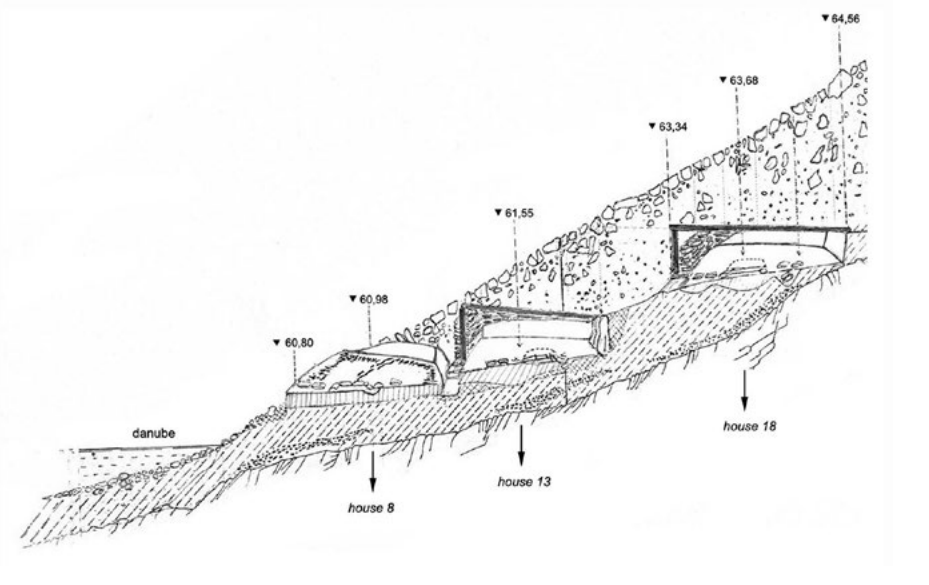


Figure 5. The cross section of Houses 8, 13 and 18, Sector III
(after Jovanović 2008, Fig. 20).

Padina was associated with the floors and infills of the buildings in the lower and middle rows, with a particular abundance of fish bones (Borić 2002; Živaljević 2017). These middens were most likely accumulated by the inhabitants of the buildings in the upper row, which were the last to be constructed and eventually abandoned (Jovanović 2008). A red deer antler from the floor of House 18 and a worked bone found underneath House 15 were dated in the ranges of 5983–5732 cal BCE (OxA-9052) and 5786–5575 cal BCE (OxA-9054) (95% CI), respectively (Whittle et al. 2002; Borić and Miracle 2004). Their Early/Middle Neolithic time span, alongside the presence of numerous pottery vessels within their otherwise 'Transitional phase' layout and furnishing, indicates that different cultural traditions "merged successfully" at Padina, lasting for several centuries in this 'hybrid' form (Borić 2011, 178, 182; Borić and Miracle 2004).

Previous Zooarchaeological Research

The dense woods in the site's hinterlands and the immediate vicinity of the river with its 'natural traps' (whirlpools and cataracts) afforded particular conditions for hunting and fishing. The numerous animal bones uncovered at Padina were originally analysed by Anneke Clason (1980), followed by several other studies: Dick Brinkhuizen's (1986) work on sturgeon bones, the contextualisation of animal remains (Borić 2002, Appendix 3), the research of Vesna Dimitrijević and Sonja Vuković (2015) on dog domestication, and the studies focusing on site seasonality (Borić 2002; Dimitrijević, Živaljević and Stefanović 2016).

Within the mammal bone assemblage, red deer (*Cervus elaphus*) were most numerous, followed by wild boar (*Sus scrofa*), roe deer (*Capreolus capreolus*), and aurochs (*Bos primigenius*), and to a lesser extent chamois (*Rupicapra rupicapra*). The remains of hedgehog (*Erinaceus europaeus*), brown hare (*Lepus capensis*), beaver (*Castor fiber*), as well as carnivores (red fox *Vulpes vulpes*, grey wolf *Canis lupus*, pine marten *Martes martes*, wild cat *Felis silvestris*, lynx *Lynx lynx*, and brown bear *Ursos arctos*) were also identified, in relatively small numbers (Clason 1980). Diachronic changes in the size and morphology of canid dental features suggest that initial experiments with dog domestication may have begun already in the Early Mesolithic, but more substantial evidence for this process comes from the Transitional-Early Neolithic phase (Dimitrijević and Vuković 2015). In addition, sporadic remains of birds (white-tailed eagle *Haliaeëtus albicilla,* greyleg goose *Anser anser,* common raven *Corvus corax,* common shelduck *Tadorna tadorna*) and pond turtle (*Emys orbicularis*) also occurred, as well as mollusc shells (river mussel *Unio crassus* and land snail *Helix* sp.). Most of these species were associated with both Mesolithic and

Transitional-Early/Middle Neolithic contexts, whereas domestic animals (cattle *Bos taurus*, sheep *Ovis aries*, goat *Capra hircus* and pig *Sus domesticus*) made an appearance in the latest phases of the Padina settlement, albeit in fairly small numbers (Clason 1980).

In terms of contextual provenance and seasonality, Mesolithic contexts in Sector I yielded red deer, roe deer, and wild boar remains, indicating human presence associated with hunting events across different seasons of the year (Borić 2002, 165–166; Dimitrijević, Živaljević and Stefanović 2016). In Sector II, red deer bones predominate (primarily from prime adults), reflecting particular Mesolithic hunting strategies (Borić 2002, 169–170). In Sector III, the deposition of various animal body parts on the floors and within infills of buildings in the lower and middle rows most likely marked the events of their abandonment. As mentioned earlier, fish bones were the most numerous, followed by various portions of dog (*Canis familiaris*) skeletons. These originated from both adult and juvenile dogs and often bore cut marks or burn traces. In addition, many of them were gnawed, indicating that other dogs had access to the abandoned buildings and that they were not immediately backfilled (Clason 1980; Borić 2002). To a lesser extent, these features also contained the remains of red deer, aurochs, wild boar, brown bear, smaller carnivores, migratory and resident birds, and pond turtle. The seasonal patterns inferred from animal bones associated with the Transitional-Early/Middle Neolithic buildings mainly point to spring, summer, and early autumn occupation, which does not exclude human presence at other times of the year (Borić 2002; Dimitrijević, Živaljević and Stefanović 2016).

The fish bone assemblage from Padina was originally analysed during the doctoral research of the author of this paper (Živaljević 2017). Since then, some of my taxonomic determinations (regarding the sturgeon remains) have been corrected or refined to the species level through mitochondrial DNA (mtDNA) analysis (Zampirolo et al. 2025). Moreover, the processes of excavation and (re)discovery are rarely limited to the site as a physical space; rather, they continue in storage spaces by going through boxes and bags containing the excavated material. More recently, an additional bag of fish bones from Padina was found at the Laboratory for Bioarchaeology of the Faculty of Philosophy in Belgrade, which had not been included in my previous study. Given that archaeofaunal remains are a part of a complex archive created during excavations and are "not a limitless resource" (Pálsdóttir et al. 2019) – especially from sites that have since been submerged underwater and which offer unique insights into Early Holocene human-nonhuman relations – this provided a welcome opportunity to revisit my past work through a multispecies lens and consider the fish faunal assemblage from Padina in its accumulated, collected, and preserved entirety.

TAXON	SECTOR I				SECTOR II				SECTOR III				TOTAL			
	NISP	%	W (g)	%	NISP	%	W (g)	%	NISP	%	W (g)	%	NISP	%	W (g)	%
Danube sturgeon (*Acipenser gueldenstaedtii*)	**2**	9.5	245.5	42.7	**3**	1.2	20.6	2.4	**14**	0.6	49.7	0.2	**19**	0.7	315.8	1.2
fringebarbel sturgeon (*Acipenser nudiventris*)	/	/	/	/	/	/	/	/	**1**	0.0	9.3	0.0	**1**	0.0	9.3	0.0
sterlet sturgeon (*Acipenser ruthenus*)	/	/	/	/	/	/	/	/	**2**	0.1	4.7	0.0	**2**	0.1	4.7	0.0
starry sturgeon (*Acipenser stellatus*)	**1**	4.8	0.7	0.1	/	/	/	/	**15**	0.6	30.4	0.1	**16**	0.6	31.1	0.1
Acipenser sp.	/	/	/	/	**1**	0.4	4.4	0.5	**12**	0.5	29.6	0.1	**13**	0.5	34.0	0.1
beluga sturgeon (*Huso huso*)	**1**	4.8	7.5	1.3	**21**	8.1	233.8	27.1	**71**	3.0	1,144.6	4.8	**93**	3.5	1,385.9	5.4
Acipenseridae indet.	**3**	14.3	16.0	2.8	**9**	3.5	40.5	4.7	**38**	1.6	97.0	0.4	**50**	1.9	153.5	0.6
common carp (*Cyprinus carpio*)	/	/	/	/	**2**	0.8	0.2	0.0	**214**	9.0	877.1	3.6	**216**	8.2	877.3	3.4
kutum (*Rutilus frisii*)	**4**	19.0	0.7	0.1	**151**	58.1	56.8	6.6	**8**	0.3	8.2	0.0	**163**	6.2	65.7	0.3
Cyprinidae indet.	**4**	19.0	8.5	1.5	**4**	1.5	1.1	0.1	**181**	7.7	346.9	1.4	**189**	7.1	356.5	1.4
catfish (*Silurus glanis*)	**5**	23.8	295.3	51.4	**59**	22.7	490.5	56.9	**1,756**	74.2	21,400.3	89.0	**1,820**	68.8	22,186.1	87.0
huchen (*Hucho hucho*)	**1**	4.8	0.5	0.1	**10**	3.8	14.3	1.7	**54**	2.3	58.6	0.2	**65**	2.5	73.4	0.3
Total identified	**21**	100.0	**574.7**	100.0	**260**	100.0	**862.2**	100.0	**2,366**	100.0	**24,056.4**	100.0	**2,647**	100.0	**25,493.3**	100.0
Pisces indet.	**2**	/	0.6	/	**17**	/	73.1	/	**374**	/	920.8	/	**393**	/	994.5	/
TOTAL	**23**	/	**575.3**	/	**277**	/	**935.3**	/	**2,740**	/	**24,977.2**	/	**3,040**	/	**26,487.8**	/

Table 1. The taxonomic composition of the fish bone assemblage from Padina, expressed in NISP (Number of Identified Specimens) and bone weight (W).

The Fish Bone Assemblage

The fish bone assemblage from Padina comprises 3,040 identified specimens (NISP), unevenly distributed among the three excavated sectors (**Table 1**). Although Jovanović (1968) reported a large number of fish bones in House 2 at Sector I, faunal remains were not systematically collected during the first excavation campaign (Borić 2002, 165), resulting in the smallest assemblage from this sector. As was standard practice at the time, all bones were collected by hand, a method that is particularly biased against minute skeletal elements and smaller-bodied fish species (Bartosiewicz and Bonsall 2004). Nevertheless, several important observations about the Padina assemblage can still be made, especially when compared with other hand-collected assemblages from the Danube Gorges.

Sector I

The small assemblage from Sector I (NISP = 23, **Table 1**) included the remains of sturgeons (Danube sturgeon, starry sturgeon, beluga), kutum, catfish, and huchen (*Hucho hucho*). Most of these specimens were associated with Transitional-Early Neolithic Houses 2 and 3, providing at least partial insight into the large piles of fish bones deposited upon the abandonment of these buildings, which had not been collected.

Sector II

Apart from starry sturgeon, all the aforementioned species as well as common carp (*Cyprinus carpio*) were identified in the larger assemblage from Sector II (NISP = 277, **Table 1**), associated with Mesolithic circular and oval stone constructions. Kutum remains were the most numerous (NISP = 151), though this was primarily due to the large number of isolated pharyngeal teeth. Meanwhile, the fairly significant number of catfish remains (NISP = 59) consisted mainly of isolated vertebrae but also included elements of the cranial skeleton. Sturgeon remains were somewhat fewer in number but originated from very large individuals (**Fig. 9**), and huchen remains were also present. A small portion of the bones (c. 4%) was burnt, such as beluga sturgeon dentary bones and some of the huchen and catfish vertebrae. As previously mentioned, the stone constructions uncovered at this sector may have been linked to wild game and fish processing activities (Borić 2002), also indicated by a parasphenoid bone (part of the cranium) of a large catfish that bore several parallel cut marks on the ventral side (**Fig. 6a**). Nevertheless, other practices involving catfish body parts

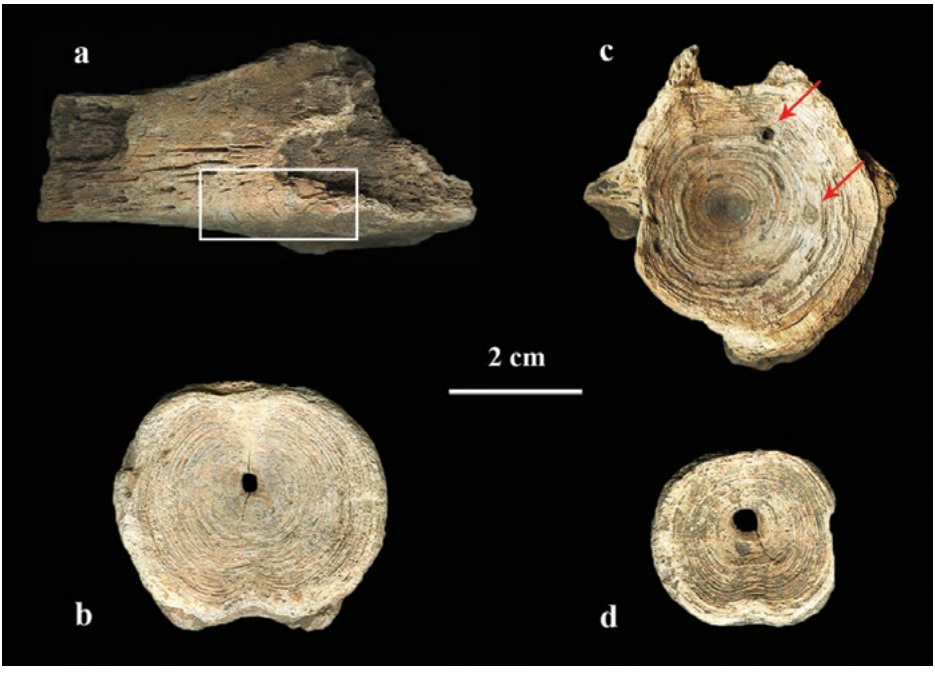


Figure 6. a) Catfish parasphenoid fragment (estimated total length (TL) = c. 2.7 m), with several diagonal parallel cut marks, from the stone construction and fireplace, Trench 2, Block 1b, Sector II; b) perforated catfish vertebra from the stone construction and fireplace, Trench 2, Block 1b, Sector II (TL = c. 2.2 m); c) catfish vertebra with carnivore tooth marks, layer above the lower row of buildings, Sector III; d) perforated catfish vertebra found in the vicinity of House 18, Sector III (TL = c. 1.7 m). Size estimations following Radu (2003) (photo: I. Živaljević).

were also taking place, as evidenced by two perforated vertebrae (one of them shown in **Fig. 6b**), possibly worn as pendants.

Sector III

Sector III yielded the largest collection of fish bones (NISP = 2,740, **Table 1**), accounting for 90.1% of the entire Padina assemblage. The vast majority originated from the Transitional-Early/Middle Neolithic settlement, but a certain amount (NISP = 144) could be linked to previous Mesolithic occupation. Unmodified catfish vertebrae and kutum pharyngeal teeth occasionally occurred in Early Mesolithic burials associated with the elongated stone construction, but it remains unclear whether they were intentionally deposited in relation to the human bodies. While the Early Mesolithic context beneath the later House 14 yielded no fish bones, they were present in the two dated Late Mesolithic

contexts, especially in the midden between later Houses 5 and 6 (NISP = 67). The majority of the fish remains from the midden belonged to catfish (from a minimum of seven individuals), while the remaining portion included bones of various sturgeons (including exceptionally large belugas), carp, and huchen. Albeit few, these contexts indicate the increasing significance of fishing over time, particularly of catfish and sturgeon.

These trends, implied by few preserved Late Mesolithic contexts, eventually peaked during the Transitional-Early/Middle Neolithic phase. Large quantities of fish bones (occasionally in c. 30-centimetre-thick piles) were found in contexts related to the occupation and abandonment of trapezoidal-base buildings at Sector III (NISP = 2,586). A small number of bones were burnt (c. 2%), mainly associated with the floor level at House 21 and the infills of Houses 5 and 12. Butchery marks were noted on several specimens from the infills of Houses 6,

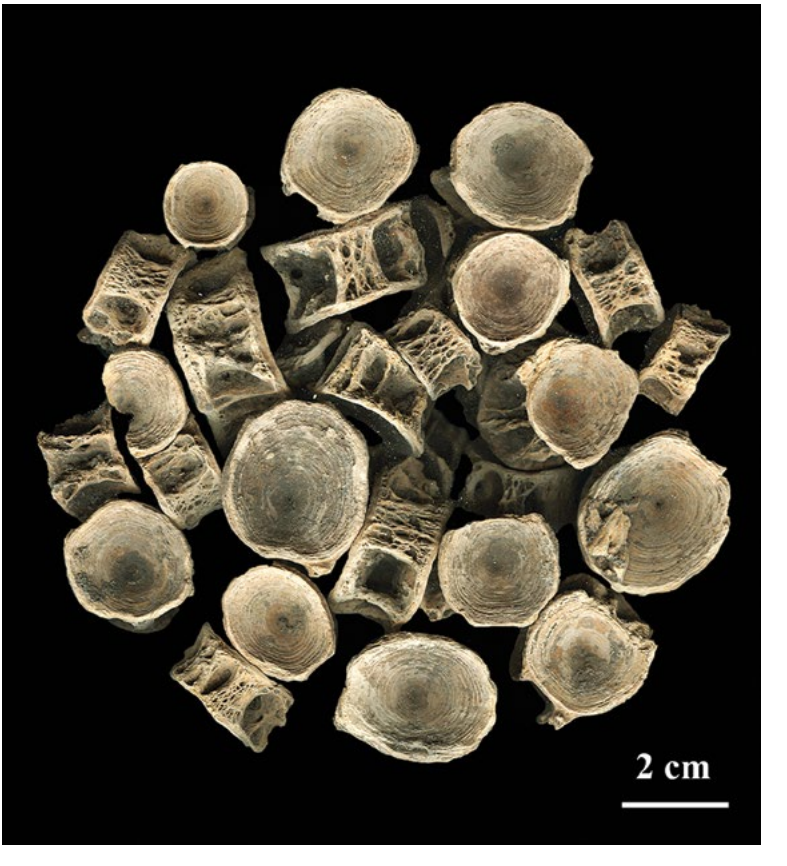


Figure 7. Selected catfish vertebrae from the infill of House 12 (photo: I. Živaljević).

12, 13 and 14, namely cranial and dentary bones of large beluga sturgeons and cranial and pectoral skeleton elements of large catfish.

The most striking feature of the assemblage associated with the trapezoidal buildings is the absolute prevalence of catfish remains (NISP = 1,673, **Fig. 8**). Other fish taxa included cyprinids (especially carp), various sturgeon species (especially the beluga), and huchen. Catfishes were represented by neurocranium, branchiocranium, and pectoral skeleton elements, as well as numerous abdominal and caudal vertebrae, indicating that processing took place within the settlement. On occasion, some of the skeletal elements found in the buildings or in their vicinity were articulated, mainly the vertebrae from large individuals (**Fig. 2**). While catfish bones were recovered from all buildings, they were particularly abundant within the infill of House 6 (NISP = 644) in the lower row, and in contexts associated with House 12 (the floor level and several episodes of backfilling) (NISP = 769) in the middle row (**Figs. 4, 7**). Bones from these two buildings were often stuck together, indicating that they were still sticky when deposited, most likely shortly after processing and/or consumption. A fairly significant number bore traces of carnivore gnawing (**Fig. 6c**), indicating that dogs had access to these abandoned features prior to their backfilling.

As mentioned, the deposition of thick piles of fish bones and various dog body parts within the abandoned buildings of the lower and middle rows can be linked to several backfilling events that coincided with the occupation of the buildings in the upper row (**Fig. 4**). As demonstrated by AMS radiocarbon dating, Houses 15 and 18 in the upper row were the last to be constructed and ultimately abandoned (Whittle et al. 2002; Borić and Miracle 2004; Jovanović 2008), marking the end of life in the settlement. These two buildings contained pottery, including items of household inventory *in situ* (whole pots, stone tools) on the floor of House 18. This particular occurrence is thought to reflect sudden or unprepared abandonment (Jovanović 1969, 2008; Borić 2002). In addition, a negligible quantity of mammal bones (belonging to dogs, red deer, small carnivores, and possibly domestic ruminants) was recovered within these two buildings (Borić 2002, Appendix 3). A small number of fish bones (namely catfish vertebrae and sturgeon pectoral spines) related to these buildings were also found, including a perforated catfish vertebra in the vicinity of House 18 (**Fig. 6d**).

General patterns and observations

When fish remains from all three sectors at Padina are observed through a temporal lens, interesting patterns emerge (**Fig. 8**). Given the relatively small number of radiocarbon-dated contexts containing faunal remains linked to the Early or Late Mesolithic phase, all fish remains attributed to Mesolithic occupation (c. 9500–6300/6200 cal BCE) – based on available dates and contextual

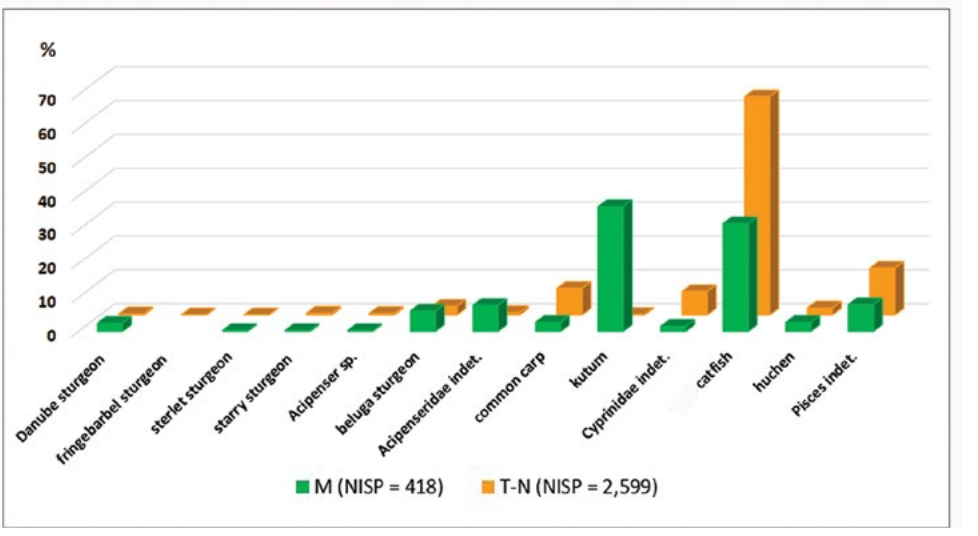


Figure 8. The taxonomic composition of the fish bone assemblages from Padina related to Mesolithic (M) and Transitional-Early/Middle Neolithic (T-N) phases. NISP = the number of identified specimens, which could be attributed to a particular phase.

provenance – were grouped together. Meanwhile, in line with previous discussions regarding the intricacies of forager-farmer interactions and the specific merging of cultural traditions witnessed at Padina, all assemblages associated with trapezoidal-base buildings at Sectors I and III were ascribed to the Transitional-Early/Middle Neolithic phase (c. 6300/6200–5500 cal BCE) (*see also* Živaljević 2017, Prilog II).

Both assemblages show similarities in terms of ichthyofaunal diversity (with most species occurring in both phases) but display significant differences in sample size and the frequency of certain species (**Fig. 8**). The contexts from Sectors II and III ascribed to the Early Mesolithic indicate a greater reliance on mammal (red deer, wild boar, roe deer) hunting, whereas fish remains (mainly isolated kutum teeth and catfish and beluga sturgeon bones) were fewer in number. However, in a few preserved Late Mesolithic contexts in Sector III, both mammal and fish remains occurred in significant quantities. The latter mainly originated from catfish, followed by sturgeons, carp and other cyprinids, and huchen. Albeit few, these contexts indicate a gradual shift to aquatic food sources (also attested by stable isotope analysis of human and animal remains from Padina, e.g. Borić et al. 2004; Borić and Miracle 2004; Borić and Price 2013; Jovanović et al. 2019, 2021) and the increased role of fishing, particularly of catfish and sturgeon.

Ultimately, the much larger sample from the Transitional-Early/Middle Neolithic phase reflects further development and intensification of these practices,

prolonged human presence on the Padina riverine terrace, and the establishment of a settlement within a riverscape which offered unique fishing conditions. Although the contexts associated with trapezoidal-base buildings yielded remains of a variety of species (carp and other cyprinids, beluga sturgeon, starry sturgeon, Danube sturgeon and huchen), these assemblages are characterised by the absolute dominance of catfish, surpassing all other fish and mammal taxa combined.

As mentioned, hand collection of animal bones undoubtedly obscured the contribution of smaller fish, as seen in water-sieved and flotated samples from other Danube Gorges sites, such as the more recent excavations at Schela Cladovei (Bartosiewicz et al. 2001) and Vlasac (Borić et al. 2014; Živaljević 2017). Notably, the majority of fish bones recovered from Padina originate from large species and exceptionally large individuals (**Fig. 9**)[3]. Based on 396 measured elements (following Radu 2003), the total length (TL) of catfish ranges between c. 0.8 and 2.8 m, with a median length of c. 1.7 m. For the Danube sturgeon, a smaller sample of measurable elements (6) yielded TL ranges between c. 0.8 and 1.7 m, with a median of c. 1.2 m (after Živaljević et al. 2021). The median TL of the beluga was c. 2.9 m, calculated from 44 measured elements (*cf*. Živaljević et al. 2021), with estimates ranging from c. 1 m to an impressive c. 5-meter-long specimen, represented by a dentary bone from a Late Mesolithic context in Sector III. Even the medium-sized fishes such as carp and sterlet (*Acipenser ruthenus*) were represented by fairly large individuals, with median TL of c. 76 cm and c. 91 cm, respectively.

While exceptionally large, sturgeons tend to be underrepresented in zooarchaeological assemblages due to their partly cartilaginous skeleton, meaning only a few bony elements of the neurocranium, branchiocranium, pectoral skeleton, and bony scutes are likely to survive in the archaeological record (Brinkhuizen 1986; Bartosiewicz, Bonsall and Şişu 2008). Nevertheless, other quantification parameters consistently point to the prevalence of catfish at Padina. In terms of the presence/absence criteria, it is noteworthy that catfish occur in the majority (c. 71%) of all contexts containing fish remains, greatly surpassing both cartilaginous and bony fishes – for comparison, beluga and carp occur in c. 33% and 13% contexts, respectively. The minimum number of individuals (MNI) for catfish is also remarkably high in a number of contexts. For example, the large assemblage from the infill of House 6 yielded bones from a minimum of 34 catfish, whereas the MNI of carp, beluga, and starry sturgeon was 7, 4, and 3, respectively.

[3] A detailed list of all measured elements, values, and size estimations is provided in: Živaljević, I. 2026. Fish Bone Measurements from the Mesolithic-Neolithic site of Padina, Danube Gorges [Dataset]. Zenodo. https://doi.org/10.5281/zenodo.22896918.

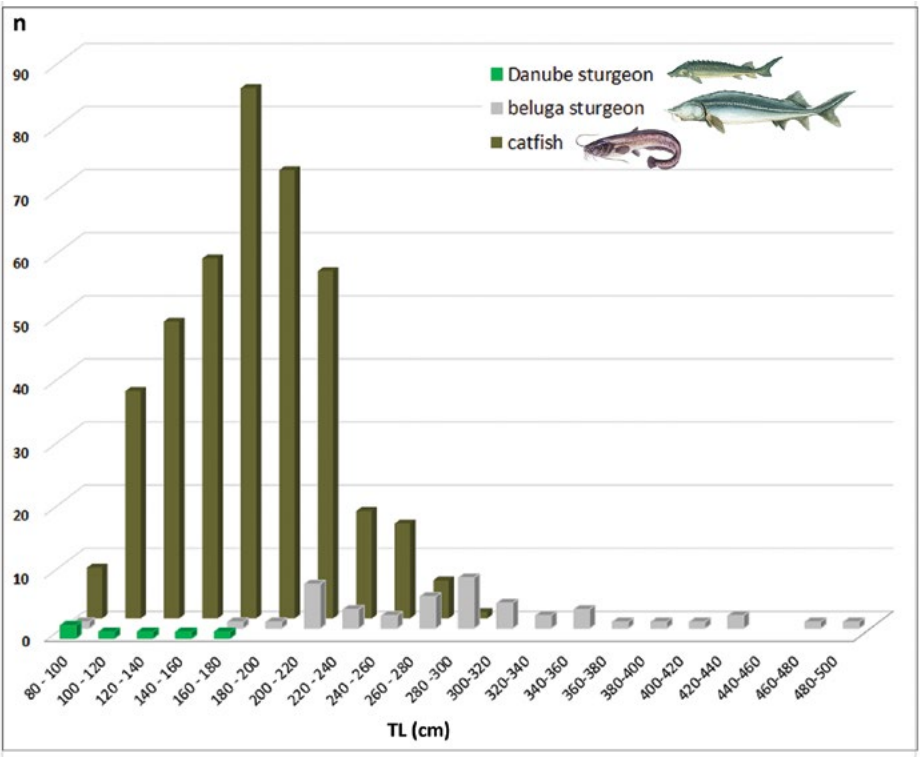


Figure 9. Size estimations of large fish species from Padina. n = the number of measured elements used in size reconstruction; TL = fish total length (size estimations of Danube sturgeon and beluga sturgeon following measurements and regression equations in Živaljević et al. 2021, and size estimations of catfish following measurements and regression equations in Radu 2003). The detailed list of measured elements, values, and size estimations is available at https://doi.org/10.5281/zenodo.22896918

Perhaps most importantly, when compared to the hand-collected assemblage from Lepenski Vir – situated within the same Upper Gorge riverscape and with comparable archaeological record – other clear inter-settlement differences emerge. Despite taphonomic loss, sturgeon remains at Lepenski Vir constitute 18.2% (NISP = 254) of all fish taxa identified to the species, genus, or family level, whereas catfish remains amount to 14.8% (NISP = 206) (Živaljević 2017). As previously noted, Lepenski Vir is the only site where human-sturgeon relations were particularly articulated and materialised by means of sculpted boulders. Perhaps, through the structured deposition of a large number of catfish remains, the inhabitants of Padina were enacting their own human-fish entanglements. The zoomaterial record from Padina is exceptional in that regard, a theme discussed further below.

The Catfish Within a Wider Archaeological Context

A variety of factors affecting the state and taxonomic composition of faunal assemblages from the Danube Gorges – including the accelerated pace of the rescue excavations, rudimentary excavation and collection methods, chronological and contextual provenance, taphonomic loss, curation issues, and the marginalisation of animal bones in favour of 'spectacular' finds – have been described in detail (Borić 2002; Bartosiewicz and Bonsall 2004; Bartosiewicz, Bonsall and Şişu 2008; Dimitrijević 2008; Živaljević 2017). Nevertheless, because the vast majority of animal remains were collected by hand, some comparisons with Padina are possible.

While catfish appears as a regular component in all Danube Gorges assemblages (Bartosiewicz and Bonsall 2004; Dinu 2010; Živaljević 2017), it occurs in significantly lower absolute or relative frequencies at other sites (*see* Nalbant 1970; Bökönyi 1972, 1992; Haimovici 1987; Bartosiewicz et al. 2001; Bălăşescu, Boroneanț and Radu 2017; Bălăşescu et al. 2021; Živaljević 2017; Živaljević, Dimitrijević and Stefanović 2017). A substantial number of catfish bones (NISP = 2,283) was reported within the large faunal assemblage from the 1970–1971 excavations of Vlasac; however, their number was notably secondary to that of cyprinids (NISP = 6,782) (Bökönyi 1978). Furthermore, as previously discussed, at Lepenski Vir – the site most similar to Padina in terms of the natural setting and archaeological record – catfish remains were outnumbered by both cyprinids and sturgeons (Živaljević 2017). While specific, comparable finds do exist at other sites – such as the numerous articulated vertebrae of a large catfish (c. 2.6 m TL) from Middle Mesolithic Icoana (Bălăşescu et al. 2021) and two perforated vertebrae from Epipalaeolithic and Early Neolithic layers at Cuina Turcului (Mărgărit, Boroneanț and Bonsall 2020) – Padina remains exceptional regarding the sheer number of catfish bones and the distinctive manner of their deposition.

Beyond the Danube Gorges, other coeval sites provide compelling insights into the diversity of Early Holocene human-catfish relations. Particularly noteworthy are environments dominated by other major rivers flowing into the Black Sea. For instance, significant quantities of catfish remains have been documented in Late Mesolithic and Early Neolithic (c. 7300–5500 cal BCE) contexts in the Dnipro–Don interfluve – such as at the Surskyi and Shulaiv sites in Ukraine and Rakushechny Yar in Russia (Kovalchuk et al. 2018; Zabilska-Kunek 2019) – prompting researchers to classify some of these populations as 'catfish-oriented' fishers (Radchenko et al. 2020; Radchenko 2022). In these regions, fish resembling catfish often appear in portable and parietal art, and were occasionally even 'recognised' in specific features of the landscape.

Such was the case with the natural protrusion at the sandstone rock outcrop of Kamyana Mohyla on the bank of the Molochna River, which was modified into the likeness of a catfish head and embellished with engravings (Radchenko et al. 2020; Radchenko 2022).

Relational approaches to materials, forms, and beings are particularly instructive when exploring such occurrences. As Chantal Conneller (2011, 47) notes, forms "emerge through particular surface effects – shapes, visual qualities or textures – that permit them to resemble other things"; and yet, these other 'things' – in this case, animals – need to be intimately known in order to be recognised (Conneller 2011, 36). Returning to the zoomaterial record from Padina, the numerous contexts containing catfish remains, which grew increasingly abundant over time, stemmed from experiences of the river and fish rhythms, repeated encounters, and a gradually unfolding body of interspecies knowledge. Hence, the following chapters cease to consider catfish solely as a sum of its parts. Rather, in pursuit of the intricacies of interspecies dependence, they aim not to 'lose sight of it as a whole' (*sensu* Tinbergen [1958] 1968).

The Catfish Through an Ethological, Relational, and Multispecies Lens

Derived from the Latin adjective *lentus* (meaning 'slow', 'sluggish', or 'motionless'), the previously mentioned ecological term 'lentic' refers to still or slow-moving freshwater habitats and the organisms that dwell therein. Within the Danube ecosystem, the catfish (**Fig. 10**) is a typical representative of such environments, favouring backwaters and deeper river sections. The body of the catfish is elongated, scaleless, and sluggish, with colouration ranging from dark grey to greenish grey. Its head is large and flat, with long sensitive barbels for locating food, and its mouth is lined with hundreds of small, bristle-like teeth, used to grip slippery prey. It is also known for its exceptional longevity – living up to 80 years – and its formidable size, which typically reaches up to 2 m and 80 kg. However, even larger individuals, up to 4 m and 300 kg, have been reported (Ristić 1977, 240–249; Kottelat and Freyhof 2007, 340–341). Hence, the size estimates from Padina (**Fig. 9**) suggest that the catfishes caught by Mesolithic-Neolithic fishers were as large as some of the largest specimens documented in more recent times. Serbian mathematician and master fisherman Mihailo Petrović ([1940] 1998, 42) noted that the late 19th– and early 20th-century Danube fishermen had their own folk 'taxonomies', according to which only individuals exceeding 40 kg truly earned the title of a 'proper' catfish (**Fig. 11**).



Figure 10. Catfish (*Silurus glanis*) (by ZiskoW – Own work, CC BY-SA 4.0, https://commons.wikimedia.org/w/index.php?curid=48380470).



Figure 11. Serbian mathematician and master fisherman Mihailo Petrović 'Alas' with a catfish weighing 124 kg, caught in 1913. (SASA Archive 14188/28).

The catfish is quite ravenous, preying on smaller fish (like cyprinids), but it is also known to consume crayfish, frogs, waterfowl, and water voles (Ristić 1977; Kottelat and Freyhof 2007). Some 19th-century authors even mention cases of them preying on dogs or young children (Kišpatić 1893, 59; Dinu 2010, 304). As a bottom feeder, the catfish typically lurks in the depths near submerged trees, root systems, dense aquatic vegetation, and rocky bottom structures. At night, however, it also feeds on smaller fish swimming closer to the surface. As it sucks in its prey, it produces a distinct cracking sound that can be heard from the riverbank at night. In more recent times, such sounds were simulated by the Danube fishermen by rhythmically striking the water's surface with a wooden tool called 'bućka' (clonk) to lure the catfish, known for its sensitive hearing (Petrović [1940] 1998, [1941] 1998; Ristić 1977).

As previously mentioned, the catfish is a fairly stationary fish that rarely leaves its immediate environs. Indeed, projects monitoring the Danube ichthyofauna once tracked an individual specimen that had not moved from the marking site for 255 days (Ristić 1977, 168). However, during the spawning season and with elevated water levels, the catfishes undertake vertical migration, ascending from the depths to the floodplain zone. Generally solitary, they form smaller groups of similarly sized individuals during this time. Spawning occurs in the floodplain zone, usually in summer, when water temperatures exceed 20°C. The males fight aggressively to ward off other males from their nests, which they build from aquatic plants, or dig shallow depressions in the river substrate (Petrović [1940] 1998, [1941] 1998; Ristić 1977; Kottelat and Freyhof 2007). The summer months coincide with the most intensive catfish fishing season, usually involving the 'bućka' technique and nets cast from boats. When caught, the catfish can put up quite a fight, splashing about, biting, and tearing nets (Petrović [1940] 1998, [1941] 1998; Ristić 1977).

Being both predator and prey, the catfish forms a vibrant thread within various webs of interspecies dependence, which also have their own, shifting histories (*sensu* Tsing 2012). In their exploration of Early-Mid Holocene non-human animals in Northern Europe as 'history-making agents', Shumon Hussain and Nathalie Brusgaard (2024) emphasised the long-term effects of beaver ecosystem alteration, which elicited widespread multispecies responses. Estimated to have outnumbered early post-glacial human foragers, beavers created unique environmental niches for other species, including humans and catfish. Their imprints on the landscape include dam, channel and lodge building which cause shifts from lotic (moving water) to lentic (still or slow moving water) fish communities. In a chain of cascading effects, such transformed environments subsequently attracted other piscivorous fish, waterfowl, otters, and humans. Notably, zooarchaeological records from various regions in Northern Europe reflect a clear shift from the Early Mesolithic (c. 9000–7000 cal BCE) mono-

specific fish assemblages to more diverse assemblages dated to the Middle/Late Mesolithic and the Early Neolithic (c. 7000–4000 cal BCE), enriched in lentic, bottom-feeding fish communities. From c. 6000 cal BCE, the catfish emerges as a regular component in faunal assemblages, indicating that beaver co-created aquatic landscapes with nutrient-rich ecology had become established. Benefiting from these conditions, the fast-growing, predatory catfish can further shape freshwater ecologies and significantly alter the trophic chain, through its own 'history-making' projects (Hussain and Brusgaard 2024, *and references therein*).

Shifts in fishing practices also brought about new multispecies gatherings and associations. Focusing on the entanglements of humans, nonhumans, technology, and cosmology in the context of Middle Mesolithic (c. 8300–6300 cal BCE) Southern Scandinavia, Anja Mansrud and Per Persson (Mansrud 2017; Mansrud and Persson 2018) pointed out how successful fishing requires specialised fishing equipment, and is therefore equally dependent on ungulate (roe deer, red deer, and elk) hunting and the collection of shed antler as key sources of raw material. Proposing that fishhooks made from ungulate bones and antler could have retained some of the 'essences' of the animal from which they originated, Mansrud (2017) approached these artefacts as focal points enchaining different beings, environments, and materials. While bone hooks or harpoons were seldom found at the Danube Gorges sites, certain animal-rendered artefacts – such as ungulate bone awls and wild boar tusk scrapers most likely used in net weaving and fish processing (Srejović i Letica 1978; Borić 2002; Mărgărit and Boroneanț 2017; Mărgărit, Boroneanț and Bonsall 2017) – allow for similar reflections on terrestrial and aquatic animal gatherings.

The archaeological, zooarchaeological, and isotopic record from Padina provides further insight into various transfigurations and associations of the aquatic and the terrestrial, within the very bodies of humans and animals. Alongside ample zooarchaeological and isotopic evidence of an increasing role of fish in the human diet, marked by elevated $\delta^{15}N$ and $\delta^{13}C$ values in human bone collagen, stable isotope analyses have also shown comparable isotopic enrichments in dog bones (Borić and Miracle 2004; Borić et al. 2004; Jovanović et al. 2019). Similar fish-related dietary signatures indicate food sharing between humans and dogs, and/or that dogs roamed freely around the settlement and consumed leftover fish. In some instances, as suggested by skinning and butchery marks, humans may have consumed dogs as well (Clason 1980; *see also* Dimitrijević 2008). Thus, the association of large catfish bone piles and dog remains (some bearing traces of burning and butchery) within abandoned buildings, further scavenged and gnawed by living dogs, could have enacted a continuous flow of 'essences' between humans and nonhumans, and between the terrestrial and the aquatic domains.

Human-Catfish Entanglements and Negotiations with the Landscape

During their initial, sporadic visits to the Padina river terrace, hunter-gatherer groups gradually uncovered a vibrant riverscape with its own associated beings and rhythms. Shifting between seasons of freezing and slow water movement, thawing, flooding, and pulsing with life during dramatic catfish spawning in the shallows or migratory sturgeon runs, the Danube itself constituted a 'dynamic assemblage' (Živaljević 2025, after Edgeworth 2011).

Over time, through prolonged dwelling, fishing, setting traps, watching the water splash during spawning, and listening to characteristic cracking sounds at night, humans developed an intimate understanding of various river beings. Yet, the opportunities for interspecies encounters extended beyond these 'contact zones'. Osteological analyses (Villotte, Stefanović and Knüsel 2014) revealed specific bone anomalies in the ear canal (external auditory exostoses) in a significant number of human skeletons from the Danube Gorges, a trait particularly frequent in the Padina and Vlasac samples. Such bone growths develop through repeated exposure to cold water, especially submersion of the head. Swimming and diving afforded humans unique bodily and sensory experiences, which have no parallel on dry land (Hewes 1948), as well as unique opportunities to encounter various fish species in their own habitat.

Some of these encounters – particularly with stationary freshwater catfish – were likely more common than those with migratory sturgeons or kutum, which entered the Danube during seasonally restricted windows of time. However, given its preference for deep, secluded areas at the river bottom, the catfish would still not have been easily spotted, encountered, or caught at all times. Perhaps, on a calm night, its cracking sounds could be heard near the water surface. Much like the sturgeon and kutum, human-catfish entanglements also unfolded in seasonal rhythms, peaking during the summer spawning season, when water levels rose and catfish ascended from the depths to the floodplain zone.

While fluctuating water levels signalled the onset of the catfish fishing season, they were not without their challenges. Just as human spaces were carved into the sloping terrace, the river also found ways to 'reassert itself' (Edgeworth 2011, 20) – overflowing its banks, losing shape, and redefining the boundaries of human space. As noted by the excavator of Padina (Jovanović 2008), numerous flooding episodes were indicated by damaged, redeposited, and washed-out architectural materials, as well as layers of alluvial mud and sand interlaced with occupational deposits in the lowermost sections of the coves. Humans responded by gradually relocating the settlement upslope, while the abandoned buildings in the lower rows remained in use, serving primarily as places where the last inhabitants of Padina accumulated large piles of catfish and other fish

bones. Perhaps, these features may have been understood as liminal spaces, situationally claimed by humans or the river, or the fish bones may have been deposited as an act of 'giving back'.

Numerous cultural contexts associated with hunter-fisher-gather traditions and particular relational ontologies offer insights into the plethora of ways animals were treated after death. Proper treatment was paramount because animal remains were considered to possess lingering sentience, and/or because such practices were observed by their living kin. Such practices often involved the structured deposition of animal bones within particular features of the landscape, which were conceptualised as boundaries or contact zones bridging human and nonhuman realms (Hill 2013, *and references therein*). For instance, the Squamish people of British Columbia would carefully collect all salmon bones after a meal and throw them into the sea, so that the fish may live again (Carlsson 2008, 257–259). Similarly, the Yupi'k of Southwest Alaska curated and arranged white whale skulls near a prominent whaling spot, so that the whales could see them, ensure that the proper rites were being observed, and continue giving themselves to humans (Hill 2013). On the Torres Strait islands, mounds composed of dugong cranial elements (particularly isolated ear bones) were constructed near large natural boulders resembling these marine mammals. The mounds were suggested to have mediated sensory communication with the dugongs, known for their keen hearing (McNiven 2010; Skelly et al. 2011). Such places, then, constituted important thresholds or meeting points between various kinds of persons, facilitating a continuous engagement in life and death. In some societies, such as the Siberian Khanty, the rivers themselves were considered animate entities imbued with local spirit protectors or master-deities. Maintaining good relations with the spirits was of critical importance, and involved treating them with respect and regularly bringing gifts (Jordan 2003). Still, as often pointed out (e.g. Warren 2021; Živaljević 2023), one needs to bear in mind that there is no single, universal hunter-fisher-gatherer way of relating to the environment, nor do these accounts provide direct analogies for the past. Rather, they reveal the diversity of human engagement with aquatic landscapes and animals that live therein, offering new possibilities for thinking about humans, nonhumans, and features of the world in a relational, mutually constitutive, and 'ontologically inclusive' manner.

Conclusions

Given the specific circumstances surrounding the discovery and excavation of the Danube Gorges sites, and the underlying, deeply entrenched Nature-Culture dualisms, it is hardly surprising that animal bones received little initial

attention compared with 'spectacular' finds, such as the Lepenski Vir sculpted boulders. However, as research paradigms and frameworks shifted over time, and as recognition grew of the significance of certain species in representational media and personal adornment, researchers began to study them in their own right.

Nor is it surprising that animals in archaeological contexts are often conceived as a sum of their parts, rather than living, breathing, sentient beings, capable of engaging in mutually constitutive relations with humans and one another. Faced with large piles of animal bone fragments, zooarchaeologists can easily lose sight of the 'animal as a whole'. And yet, in the Danube Gorges Mesolithic-Neolithic, continuous engagement and dwelling in a shared landscape deeply entangled both living humans and animals and their disintegrated body parts, often reassembled into new associations.

The spatial patterning of the Danube Gorges sites, the orientation of architectural features and burials, the structured deposition of fish bones, and fish-related imagery and material culture all reflect close, intimate relationships with the aquatic domain and its various inhabitants. However, as this paper shows, these associations assumed specific forms at each individual site. Unstable bodily boundaries and human-sturgeon entanglements were vividly enacted through the Lepenski Vir boulders, whereas at Vlasac, humans performed particular piscine qualities by 'borrowing' kutum pharyngeal teeth and incorporating them into their clothing. At Padina, the large piles of catfish remains within abandoned buildings in the lowermost portions of the settlement possibly mediated specific communicative relationships between humans, catfish, and the river. Unlike the anadromous sturgeons and kutum, the catfish would not have been experienced as arriving from afar, but as *emerging from the deep*. Consequently, although all three sites were situated within the same Upper Gorge riverscape, these zoomaterial remnants allow for a plethora of possible past 'taxonomies', location-specific associations and multispecies gatherings.

By engaging with the intricacies of human-animal relations, noticing details as Niko Tinbergen ((1958) 1968) would have us, and recognising the 'history-making' (Hussain and Brusgaard 2024) and 'world-making' (Tsing 2015) capacities of each species, we may begin to develop richer, and more complex, multispecies archaeologies (Pilaar Birch 2018). Ultimately, it is not only archaeologists and sites that co-shape each other and produce knowledge; rather, in their interplay with particular animals and their ways of being in the world (*sensu* Ingold 2002, 2011), specific narratives come to unfold. In that sense, long-gone sturgeons, kutum, and catfish, intrinsically interwoven with 'their' respective sites and humans, still continue to participate in the creation of meanings.

Izjava

Potvrđujem da je podneti članak rezultat originalnog i nezavisnog akademskog rada autorke, zasnovanog na mom sopstvenom intelektualnom naporu, analizi i interpretaciji. Tokom pripreme ovog rukopisa, autorka nije koristila AI alatke za prevod na engleski ili za pomoć pri uređivanju radi poboljšanja gramatike i čitljivosti.

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Iz dubina: isprepletanost ljudi i riba na Padini u Đerdapu

Arheološka istraživanja u Đerdapu, sprovedena 1960-ih, 70-ih i 80-ih, iznedrila su mnoštvo dokaza o životu ranoholocenskih lovaca-ribolovaca-sakupljača u okviru specifičnog rečnog pejzaža. Usled do tada nepoznatih oblika arhitekture i skulpture, naučnog autoriteta istraživača, specifičnih arheoloških narativa i javnog diskursa, lokalitet Lepenski Vir se etablirao kao fokalna tačka ovog kulturnog fenomena. Iako su i drugi lokaliteti u Đerdapu bili intenzivno istraživani i publikovani, te ništa manje relevantni za razumevanje mezolitsko-neolitskih sekvenci, imali su tendenciju da se utope u sveobuhvatni pojam „kulture Lepenskog Vira". U žiži ovog rada je lokalitet Padina, koji se nalazi na oko 5 km uzvodno od Lepenskog Vira i na kome su otkriveni slični oblici materijalne kulture (doduše, u manjem obimu), kao i mnoštvo životinjskih kostiju. Poseban fokus je na ostacima riba s Padine, razmatranim iz arheozoološke i multispecijske perspektive. Dok su ljudi ti koji konstruišu narative o odnosima sa životinjama (*sensu* Ingold), životinje takođe imaju svoju dejstvenost i omogućavaju specifična promišljanja istorija multispecijskih isprepletanosti. U tom smislu, određene riblje vrste poput jesetri (porodica Acipenseridae) i kutuma

(*Rutilus frisii*) bile su posebno zastupljene u arheološkim narativima o mezolitu i ranom neolitu Đerdapa, prvenstveno zbog svojih sezonskih migracija u Dunav i značaja na ontološkom i simboličkom planu. Ova studija, pak, posebno centralizuje slatkovodnog, rečnog soma (*Silurus glanis*), najzastupljeniju vrstu u faunističkom asemblažu s Padine. Kroz analizu distribucije kostiju soma, njihovu modifikaciju i kontekstualizaciju, kao i kroz posmatranje ekoloških i etoloških specifičnosti ove vrste, rad promišlja prirodu odnosa između različitih vrsta, međusobno poznavanje, učestale susrete i interakcije s pejzažom.

Ključne reči: Padina, Đerdap, mezolit, rani neolit, ljudsko-životinjski odnosi, ostaci riba, som

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