Interpersonal Violence at Lepenski Vir Mesolithic/Neolithic Complex of the Iron Gates Gorge (Serbia-Romania)

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KEY WORDS prehistoric violence; prehistoric trauma; Mesolithic/Neolithic transition

ABSTRACT The Mesolithic populations of the Danube River's Iron Gates Gorge (Serbia/Romania) spanned over 1,500 years (from before 7000 BC to around 5500 BC) in one of the most favorable foraging environments of Europe. Over most of these 1,500 years, the dominant economy was foraging, but farming was practiced by communities in the region from around 6500 BC. This research examines individuals from four sites on the Danube (Lepenski Vir, Vlasac, Padina, and Hajdučka Vodenica) whose traumatic lesions can be most plausibly interpreted as resulting from violent interactions. Given over four hundred individuals buried at these sites (MNI = 418), the episodes of violent interactions were few and without evidence of a specific temporal pattern. They probably represent sporadic episodes of interpersonal conflict that do not support the notion of endemic warfare deemed typical of the Mesolithic, or elevated levels of interpersonal/intertribal conflict at the time of contact with farming communities. The difference in patterns of violence between the Mesolithic sites on the right bank of the Danube and a coeval site of Schela Cladovei on the left bank is explained in terms of differences in archaeological context, geographic location, and possibly specific local histories. Am J Phys Anthropol 129:339–348, 2006. © 2005 Wiley-Liss, Inc.

Few archaeological sites elicited more debate and fewer publications than Lepenski Vir and the contemporaneous Iron Gates Gorge Mesolithic sites. The transition from the Mesolithic to Neolithic and interactions between foragers and farmers are central themes in this debate. While artifact typology played a major role in determining Lepenski Vir culture as Epipaleolithic (Boroneanţ, 1973), Mesolithic (Srejović, 1972), or Neolithic (Jovanović, 1984), it is currently understood that a foraging economy and semisedentism characterize these communities even after they had (at least sporadic) contacts with farmers in the second half of the 7th millennium BC. (Radovanović, 1996a; Roksandic, 2000). To date, violent interactions in the region have been discussed only briefly, and in the context of possible conflict between foragers and farmers at the site of Schela Cladovei, on the left bank of the Danube (Boroneanţ et al., 1999).

In an attempt to distinguish between individual acts of interpersonal violence and possible warfare, we examine the available evidence for violent interactions from the six sites on the right bank of the Danube, and compare our data with published evidence from the coeval site of Schela Cladovei (Fig. 1). Violent interactions are examined against the backdrop of availability of contact (as defined by Zvelebil, 1996a) between Mesolithic Iron Gates Gorge foragers and Neolithic farmers (Table 1). Since there is no archaeological evidence of defensive structures or armament, our interpretation is based on bioarcheological data derived from skeletal lesions associated with violent trauma, such as those described by Walker (2001).

Warfare, differentiated from homicide and execution on the basis of "social substitutability" (Kelly, 2000, p. 21) and "the interrelated concepts of injury to the group, group responsibility for the infliction of injury, and group liability with respect to retribution" (Kelly, 2000, p. 5), requires the examination of individual traumatic lesions in their archaeological context and the assessment of temporal patterns of violent trauma. Given unequal preservation and problems associated with inferring levels of violence or warfare from skeletal populations (Jackes, 2004), we restrict our interpretation to examining how well our data support two hypotheses that were proposed in the literature for the Mesolithic in general and this population in particular.

The first hypothesis proposes that the Mesolithic period was characterized by endemic violence or warfare. Based on the incidence of projectile points embedded in different skeletal elements, Vencl (1995, 1999) suggested increased levels of violence in the Mesolithic. Frayer (1997) made a similar conclusion based on the osteological evidence for a massacre from the Offnet cave, while Thorpe (2000) furthered this argument and proposed

Grant sponsor: Wenner-Gren Research; Grant number: 6250; Grant sponsor: SSHRC Postdoctoral Grant

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Received 5 May 2004; accepted 18 February 2005

DOI 10.1002/ajpa.20286
Published online 1 December 2005 in Wiley InterScience (www.interscience.wiley.com).

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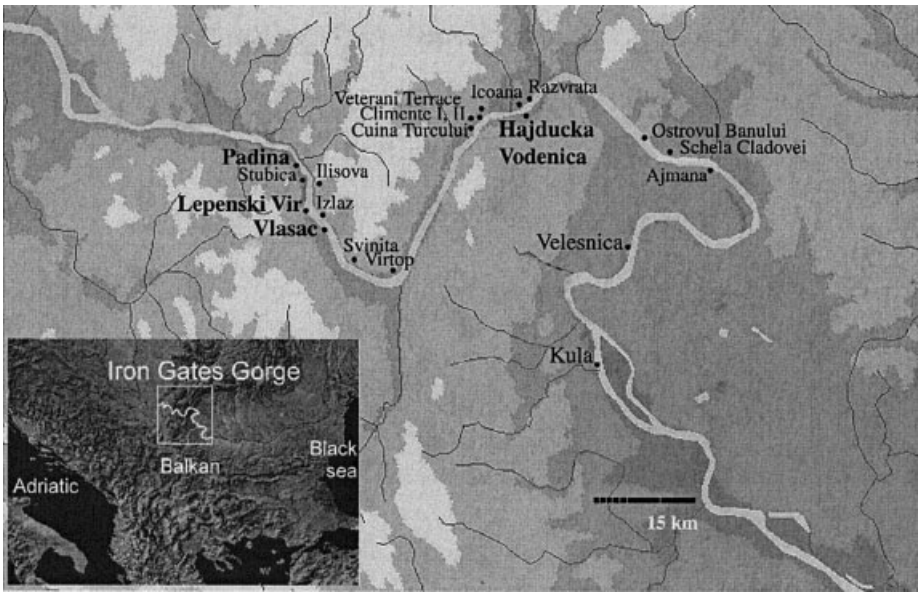

Fig. 1. Map of the region, with sites of Lepenski Vir Mesolithic/Neolithic complex.

TABLE 1. Synchronization for sites examined[1]

Period	Padina	Lepenski Vir	Vlasac	Hajtucka Vodenica	Velesnica	Ajmana	Schela Cladovei
Neolithic		IIIb			Whole	Whole	
Mesolithic/Neolithic Contact	B (III)	II/IIIa		Ib			
	B (II)	I (3)		Ia			
	B (I)	I (2)	III	Ia			II
Precontact Mesolithic	A–B	I (1)	Ib–II				II
	A/A–B	Proto LV	Ia–b	1a			
	A		Ia				I

[1] Based on Radovanović, 1996a; p 289; Radovanović and Voytek, 1997.

that violence was endemic in Mesolithic Europe. However, before these claims can be accepted, we need to examine the role of sampling bias, since, in comparison to earlier periods, a more substantial number of skeletal samples is attributed to the Mesolithic, which could result in underrepresentation of embedded projectiles and other violent injuries in Paleolithic times. We also need to examine the possibility that different tools used in combat situations by Mesolithic hunter-gatherers in comparison with previous groups could have left more physical evidence of violence, i.e., projectile points could remain in the skeleton, while a spear would be removed. In addition, given the lack of proper excavation documentation for the Offnet cave, which was excavated in the early part of the 20th century, we cannot exclude burial ritual as an explanatory mechanism for this supposed massacre.

The Iron Gates Gorge sites, with more than 400 buried individuals (MNI = 418) and long duration (8200–5500 BC), represent a good choice for testing the hypothesis of endemic violence and warfare in the Mesolithic. In order to validate the first hypothesis, the Mesolithic population of the Iron Gates Gorge should show high levels of interpersonal violence throughout the duration of this cultural group, affecting potentially any member of the community regardless of age and sex. Caution should be exercised in the strict application of the first requirement, since persons dying a violent death could be subject to a differential burial treatment, in which case only well-healed old injuries would be present in the osteological record (Jackes, 2004). We propose that a combination of healed and unhealed injuries would be sufficient to warrant the application of the first criterion. The second requirement is self-explanatory, i.e., if violence was endemic, it should be present throughout the duration of the Mesolithic. The third requirement stems from "social substitutability" (Kelly, 2000) as a crucial element in defining warfare, since violence is not directed toward any individual but toward the society as a whole.

The second hypothesis proposes that the conflict in the Iron Gates Gorge Mesolithic resulted from contact with farming communities. Based on the evidence from the site of Schela Cladovei on the left bank of the Danube, which belonged to the same Mesolithic tradition, Boroneanţ et al. (1999) suggested that the high level of violent interactions at the site could be explained by contact with advancing farmers.

In order to validate the second hypothesis, the skeletal material from the right bank of the Danube should show a marked increase in violent interactions after 6500 BC, i.e., after contact with the farming communities is either established or possible.

MATERIALS AND METHODS

The six sites from the Iron Gates Gorge Mesolithic and Early Neolithic periods examined here are situated on the right bank of the Danube (Fig. 1). The Mesolithic sites (Padina, Lepenski Vir, Vlasac, and Hajdučka Vodenica) are characterized by a relatively large number

of burials (ranging from 30 at Padina to well over 100 at Lepenski Vir) and houses of the Mesolithic Lepenski Vir type. On a fertile plain outside the gorge, Ajmana and Velesnica are two Early Neolithic sites contemporaneous with the Early Neolithic component of Lepenski Vir. The first four localities were recovered from salvage excavations in the late 1960s and early 1970s (Jovanović, 1966a,b, 1967, 1968, 1969, 1970, 1974; Srejović, 1966, 1968, 1969, 1971, 1972), while the two sites downstream from the Gorges were excavated in the 1980s (Radosavljević- Krunić, 1986; Stalio, 1986; Vasić, 1986; Živanović, 1986). Previous analyses of human skeletal remains were oriented toward understanding population characteristics of individual sites within the paradigm of "anthropotypology" (Mikić, 1980, 1988; Nemeskeri and Szathmary, 1978a–c; Živanović, 1975). The first overall study concerned only two aspects of population biology (Roksandic, 1999, 2000). Paleopathological analysis is available only for Vlasac (Nemeskeri and Lengyel, 1978). Only traumatic lesions that could be accurately interpreted as bearing evidence of violent interactions are presented here. They are compared to the published evidence of violent interactions from the coeval site of Schela Cladovei (Boroneanţ et al., 1999; Nicolaescu-Plopsor and Boroneanţ, 1976; Vencl, 1995, 1999). An attempt is made to integrate this data set into the larger picture of the Mesolithic and Neolithic populations in the Iron Gates Gorge.

Table 1 provides the summary of site sequences and chronology for the area. During the Mesolithic proper (from 7500–6500 BC), the population of the Iron Gates Gorge is characterized by a sedentary or semisedentary pattern of mobility and a foraging subsistence. During the Contact period (beginning after 6500 BC), we find evidence of contact and interaction with farming communities in the region, but no change in the pattern of mobility or subsistence (Radovanović and Voytek, 1997; Zvelebil, 1996a). The Neolithic (regardless of the dates associated with individual sites) is distinguished on the basis of increased reliance on domesticates, though hunting remains important.

The Iron Gates Gorge skeletal series

Iron Gates Gorge Mesolithic burial practices include cremation, primary inhumation, secondary interment, removal and reorganization of body parts within primary burials, and reburial of skulls and fragmentary remains. Given the diverse burial practices and complex stratigraphy of the sites, coupled with the excessive speed of excavations and inadequate curation of the collection, it is not surprising that individuals from this group show extreme variability in terms of preservation, with potentially strong effects on reported frequencies of any condition examined.

The most straightforward approach was to rely on the archaeological determination of burials as separate entities, and to determine the minimal number of individuals (MNI) for each of these burial units following established procedures (Lyman, 1994). Apart from burials sensu stricto, there were two more categories of bones recovered from the site: "extra individuals" from within the burial units, and "scattered human remains" from nonburial contexts. These "extra individuals" were, because of the patterning of their occurrence, incorporated into the MNI of individual graves. Since "scattered" bones could have, at least theoretically, belonged to any of the buried individuals, they were not included in the MNI count (for further description of procedures for MNI assessment, see Roksandic, 2000).

Whenever possible, sex determination was based on pelvic bones and followed standard procedures (Bruzek, 2002; Buikstra and Ubelaker, 1994; Phenice, 1969). In all other cases, postcranial robusticity provided more accurate results than skull morphology. Adult ages were assigned to four categories: "young adult" (YA), "fully adult" (FA), "mature adult" (MA), and "senile adult" (SA), based on all available age indicators. This approach was deemed optimal, since restricting age assessment to a set of preselected criteria would have greatly reduced the number of possible observations (Roksandic and Arbeev, 2002; Roksandic and Love, 2000).

In total, 263 adults of both sexes were considered. The remaining 155 immature individuals were not considered because of the lack of macroscopically identifiable traumatic conditions that may be associated with violent interactions.

Discerning trauma and violence in the skeletal record

Violence can be traced in skeletal remains from archaeological sites if it involves skeletal trauma. In order to assess injuries correctly, it is necessary to distinguish between premortem, postmortem, and perimortem conditions. Evidence of healing is the best indicator that a traumatic lesion occurred premortem (Aufderheide and Rodriguez-Martin, 1998, p. 23). Similarly, postmortem fractures occurring on dry bone are relatively easy to recognize (Berryman and Haun, 1996). Because bone needs at least 2 weeks of survival to show signs of healing (Mann and Murphy, 1990), and remains somewhat plastic up to 2 months after death, perimortem fractures are very difficult to interpret: a blunt-force impact on the skull resulting in a depressed fracture could easily be the cause of death and therefore a premortem trauma, or a postmortem intentional or ritual breakage of the skull, or even the result of rough handling of the body after death (Walker, 2001). The accidental breakage of long bone shafts soon after death (due to sediment collapsing within the grave or similar causes) can be misinterpreted as premortem trauma. Careful excavation and recording of the exact position of every bone fragment can clarify the issue in many cases (Duday, 1987; Duday et al., 1990; Roksandic, 2002), but since such documentation does not exist for the assemblage in question, it was necessary to rely on circumstantial evidence, positioning of the trauma, type of fracture, and experience (following Maples, 1986).

All evidence of bone fractures was carefully examined for signs of posttraumatic healing. Cases where breakage was clearly postmortem were excluded from further consideration. Most lesions that were associated with violence showed clear signs of healing. Perimortem trauma was considered only if the position of the injury was concordant with violent encounters.

Reporting the prevalence of violent trauma follows the archaeological classification of the sites into three periods: Precontact or the Mesolithic proper, Contact or Mesolithic/Neolithic period, and Neolithic period (for detailed definitions of these periods, see Roksandic, 2000, p. 24). Since unequal preservation of skeletal parts has the potential to underestimate any pathological condition (Roberts and Manchester, 1995), the frequencies for the

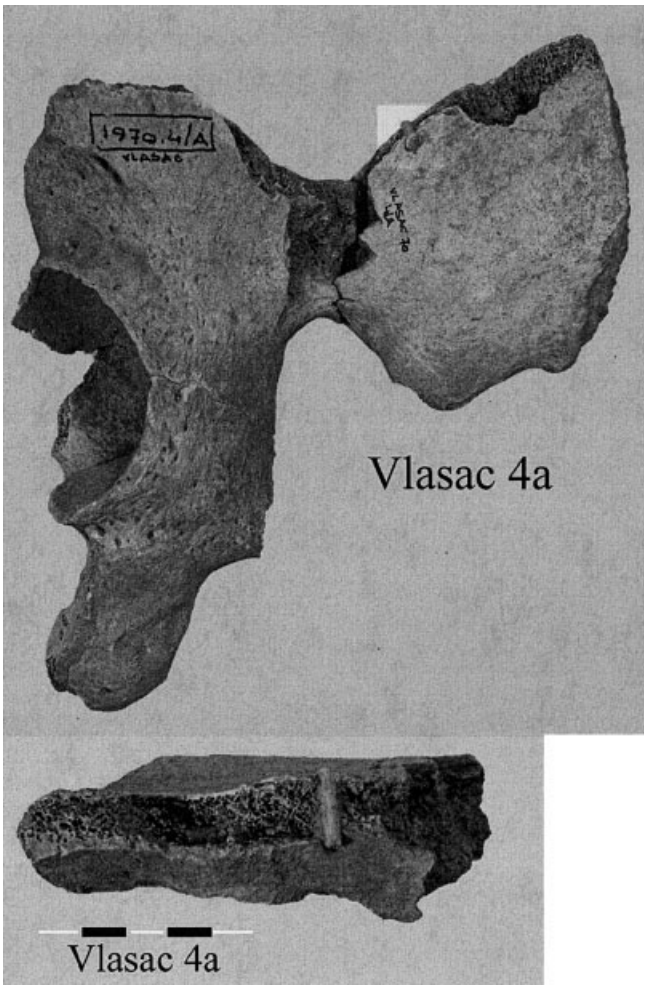

Fig. 2. Reconstructed left coxal of Vlasac 4a, with embedded projectile point highlighted. Inset: Cranial aspect of coxal, with projectile point traversing the bone. Scale is in cm.

six sites on the right bank of the Danube were calculated by skeletal element. However, element counts were not available for the site of Schela Cladovei, and comparisons between sites had to be reported per MNI.

RESULTS

Vlasac 4a: projectile point injury

The individual (Figs. 2, 3) is a young male, 18 ± 3 years old. A ^{14}C date of 7500–6500 BC and dietary data (Grupe et al., 2003, their Table 1a)[1] place him in the Mesolithic Precontact period.

Reconstruction of the pelvic bones revealed an embedded bone projectile in the iliac fossa of the left coxal (Fig. 2). The projectile point might have been shot at high velocity (as an arrow or dart) from the posterolateral direction. It penetrated the gluteus maximus and medius and both laminae of the ilium (Fig. 3b). Subsequently, the tip and lower portion were broken off, leaving a 12-mm-long embedded portion, 4 mm in diameter at the point of penetration and 3 mm at the point of exit. It is impossible to ascertain whether the breakage happened during the impact or postmortem. No microtrauma that could indicate a failed attempt to remove the projectile from the bone in vivo could be observed, suggesting a postmortem scenario for the breakage; alternatively, the microtrauma could have been obliterated by posttraumatic bone remodeling.

Whether we interpret the above evidence as indicating temporary posttraumatic survival or not, several possible explanations can be offered for this injury: 1) hunting accident, 2) homicide, 3) execution, or 4) warfare (including feuding). Given the position of the impact (lateral and posterior in the lower part of the body), execution would be the least likely scenario. A hunting accident, homicide, or warfare are equally likely, as they could all result from an ambush; the age and sex of the victim are compatible with all three. While hunting accidents were probably not very common, they cannot be excluded. Homicide from an ambush seems to be the most likely explanation, but whether it is an individual act of violence or evidence of warfare cannot be deduced from a single case.

Vlasac 51a: parry fracture of the right ulna with pseudoarticulation

The skeleton Vlasac 51 (Fig. 4) is a relatively well-preserved, fully mature female. The ^{14}C date of 7600–7080 BC calibrated (2σ) (OxA-5822, Bonsall et al., 2000, p. 123, their Table 3) and an "early diet type" (Radovanović, 2000) indicate the Precontact Mesolithic age.

The lower third of the right ulnar shaft displays a nonunited transverse fracture (Fig. 4), with surfaces remodeled into a pseudoarticulation, induced by lack of immobilization during callus formation. The compact bone lining the involved ends shows areas of pitting and an irregular surface. There are no pathological changes on the right radius or any other element of this skeleton.

The type of fracture suggests a direct trauma that could have resulted from a blunt object breaking the bone in a defense movement of the arm raised to protect the head. Smith (1996, p. 84) cautioned that in cases where potentially corroborative craniofacial injury data are lacking, a violent etiology for midshaft ulna fractures is less likely, and lists a number of possible causes for this type of forearm fracture: accident, stress or fatigue, or an underlying pathological condition, in addition to interpersonal violence. However, successful fending of a blow could prevent cranial trauma. Therefore, violence should be considered a possible explanation for this injury.

Vlasac 82a: depressed fracture on the frontal bone

The individual is most probably a mature or senile male. As no absolute date or isotope values are reported, the burial is assigned to the Precontact Mesolithic period, based on the site stratigraphy (Radovanović, 1996b).

On the right side of the frontal bone, between the coronal suture and the frontal protuberance, there is a large (45 ± 25 mm), ellipsoid, fully healed depressed injury.

[1] Grupe et al. (2003, their Table 1a) reported the calibrated ^{14}C age as 7600–6500 BC, without any further details on specimen laboratory identification numbers and methods of calibration, and isotope values within the range of those reported for Mesolithic Vlasac by Bonsall et al. (1997, p. 72), concordant with the "early diet type" of Radovanovic (2000), in which most of the protein was obtained from aquatic food sources.

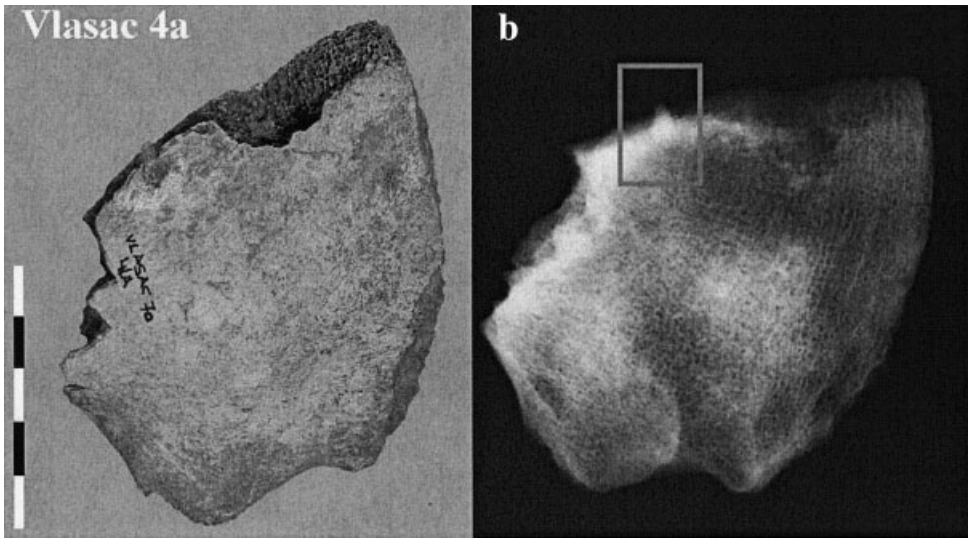

Fig. 3. **a**: Fragment of Vlasac 4a ilium in anatomical position. Scale is in cm. **b**: Radiograph of the feature, with projectile bone highlighted.

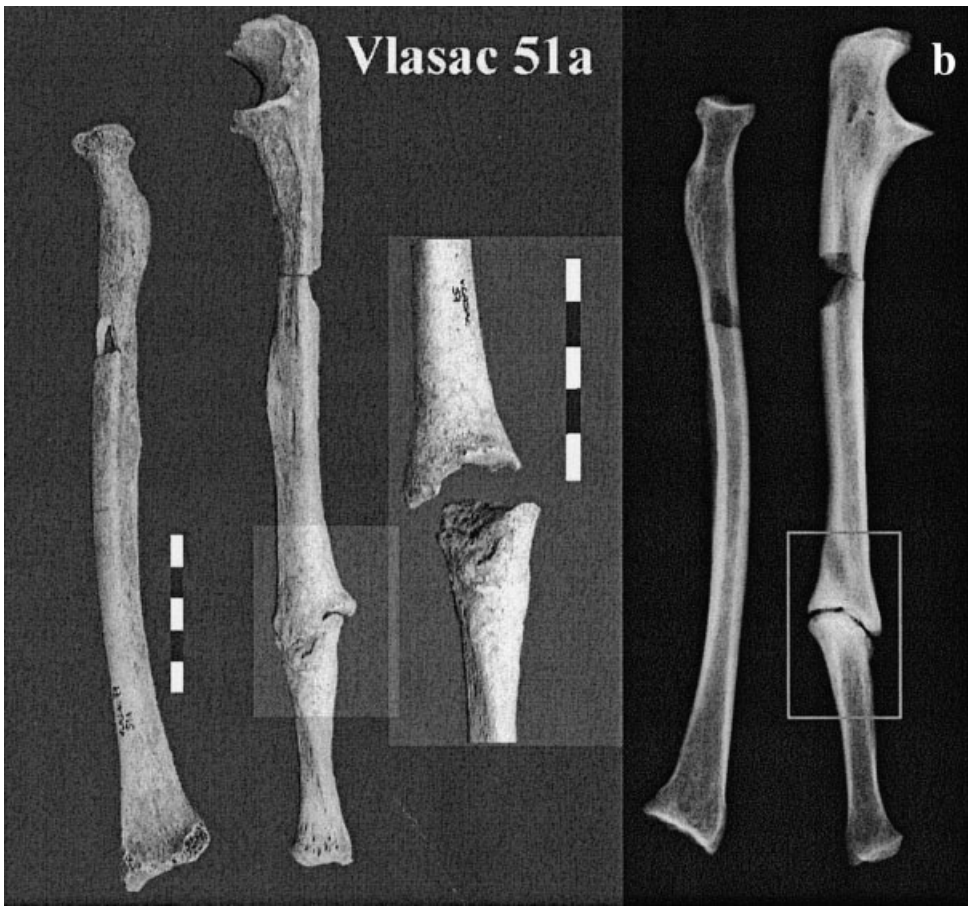

Fig. 4. Vlasac 51a **a**: Radius and ulna, with pseudoarticulation of right ulna highlighted and in detail. Scale is in cm. **b**: Radiograph of pseudoarticulation.

The base of the lesion is rough, without evidence of change in bone structure, and the medial margin is prominent. In axial projection, there is a well-defined area of radiopacity with increased bone density, probably resulting from a posttraumatic calcified intraosseous hematoma. In addition, marked surface porosity is seen on the parietal bones along the sagittal suture. The type of force needed to create this pattern of fracture suggests a blow to the head by a hard, blunt object from an oblique superior direction.

Lepenski Vir 69: repeated depressed fractures on the frontal bone

Field documentation and published photographs (Radovanović, 1996b, p. 172, Fig. 4.2; Srejović, 1969, p. 161, Fig. 64) reveal a particularly well-preserved and complete skeleton. However, only the skull and two femora could be found during our 1998 analysis, probably due to inadequate collection practices in the field. The individual was male, of a mature adult age. Both the

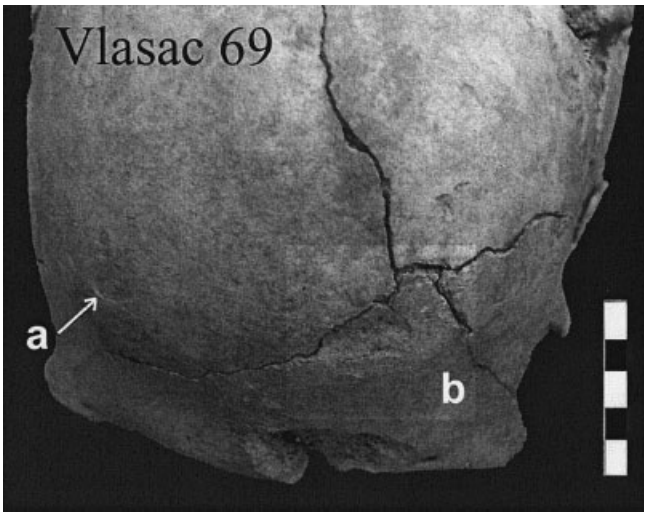

Fig. 5. Vlasac 69. Evidence of (**a**) small healed depressed fracture and (**b**) perimortmem blunt-force trauma on frontal bone. Scale is in cm.

7000 BC ^{14}C date (calibrated) reported by Grupe et al. (2003, their Table 3a) and the isotope data (Bonsall et al., 1997, p. 64–65, their Tables 3 and 4) indicate the Precontact Mesolithic period.

Two healed depressed fractures are observed. The first, on the frontal squama approximately 15 mm anterior to bregma, is a deep oval depression (35 × 24 mm), with smooth walls and rounded edges. The other, located in the region of the right frontal eminence, is a shallow irregular depression (14 × 7 mm) with a prominent lower edge. In addition, in the region of the coronal suture of the right parietal and frontal bone, there is an ellipsoid defect (35 × 12 mm) that lacks the characteristic concentric fracture and beveling typical of fresh bone breakage (Berryman and Haun, 1996), and was likely damage to the dry bone because of the irregular and sinuous aspect of some of the issuing cracks (Botella et al., 2000, p. 93).

Vlasac 69: repeated depressed fractures on the frontal bone

The skull and postcranial bones (Figs. 5, 6) indicate a mature adult male. Since no absolute age is reported, the designation as Mesolithic/Neolithic period is based on archaeological data (Radovanović, 1996b). Dietary data, however, suggest an "early diet type," indicating Precontact times.

A healed depressed fracture (Fig. 5a) is observable in the area of the right frontal eminence. It is small and shallow (8 × 6mm), with a prominent lower edge. The unhealed injury (15 × 9 mm, with several thin fissures on its lower margin) is situated on the left half of the frontal bone, in the area of the frontal eminence (Fig. 5b). The position of the fracture is concordant with interpersonal violence, and suggests that force was applied from an antero-superior direction with a blunt instrument. The prominent radiating fractures in the area should be considered a perimortem, or more likely, a postmortem trauma. The only other pathology observed on elements associated with this skull is the eburnation of the proximal humerus.

Lepenski Vir 20: blunt impact with a conical object

The field drawing of the burial (Roksandic, 2004, p. 63, Fig. 10) shows a nearly complete postcranial skeleton. However, only the skull was found during the 1998 analysis. The individual (Figs. 7, 8) was probably a mature adult male. No absolute dates or dietary information exist for this burial. Archeological data suggest either Mesolithic/Neolithic (Lepenski Vir II) or Neolithic (Lepenski Vir IIIa) provenance, both of which fall within the period when contact with farming communities became possible (sensu Zvelebil, 1996b).

The skull is almost complete, with fragments of the base and right frontal bone adjacent to the lesion missing. The injury is a fully healed depression of the frontal squama in the area of the right frontal protuberance (22 × 24 mm). The fracture is pyramidal in shape, with smooth walls and poorly defined rounded margins. The adjacent annular zone of bone is sclerotic. The impact is much deeper and narrower, and appears to have been produced by an object with a conical sharp end.

DISCUSSION

In total, six skeletons excavated on the right bank of the Iron Gates Gorge exhibit traces of *probable* violent trauma (Table 2). While violence is the most likely cause in the case of the five men, the parry fracture recorded in the female individual is concordant with either accident or violence. There are two injuries that could have been lethal: Vlasac 69 could have died of an unhealed cranial trauma, and Vlasac 4a from the consequences of projectile penetration shortly after the incident. This allows us to argue that there is no differential burial treatment of the victims of violence and that the frequency is, at least in that respect, a realistic estimate of frequency of violent interactions. Cranial depressed fractures are consistent with "face to face" fighting: all are on the frontal bone, with definite side preference: the four healed impacts are on the right side of the skull, and the one unhealed injury is on the left. Two skulls have multiple impacts of which at least one is healed, further confirming a violent etiology (Judd, 2002).

These six violent injuries are recorded on the 263 (2.3%) individuals examined (Table 3): 1/86 ulnas (1.2%), 1/52 coxae (1.9%), and 4/109 skulls (3.7%). The difference in frequencies per MNI and per element is not significant (chi-square = 1.4009, distribution not significant, P is less than or equal to 1), allowing us to consider frequencies per individual when those per element are not available.

Frequencies for the two postcranial injuries are not conclusive, and cannot be compared between periods, as only one injury is present per bone type. Four of the 109 (3.7%) sufficiently preserved skulls show evidence of blunt-force trauma. Two skulls belong to the Precontact Mesolithic period (2/42 or 4.7%), and the remaining two to the Postcontact Mesolithic/Neolithic or Neolithic periods (2/59 or 3.4%). It was not possible to assign period affiliation to a further eight skulls. The difference between the Pre- and Postcontact periods is not significant (chi-square = 0.1214, P is less than or equal to 1).

With such low frequencies in the series, we cannot claim that the material meets the first criterion of elevated level of interpersonal violence. When injuries are

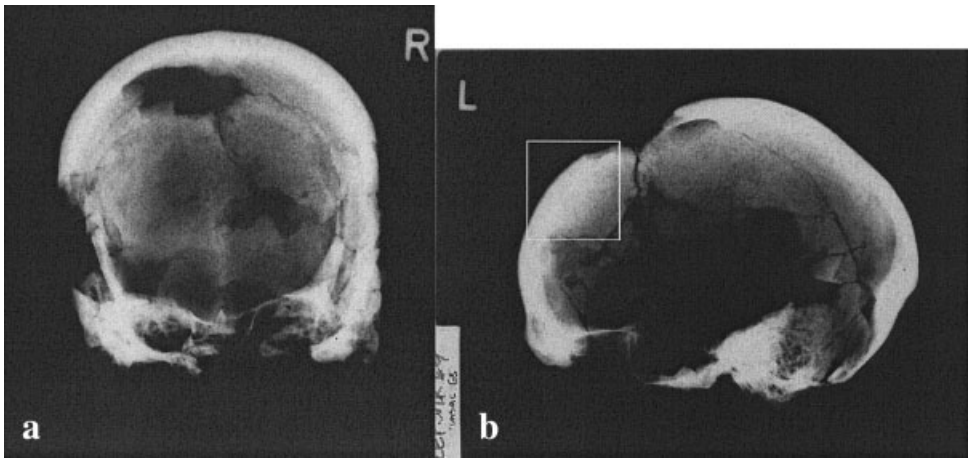

Fig. 6. Vlasac 69. Radiographs: **a**: Frontal. **b**: Lateral.

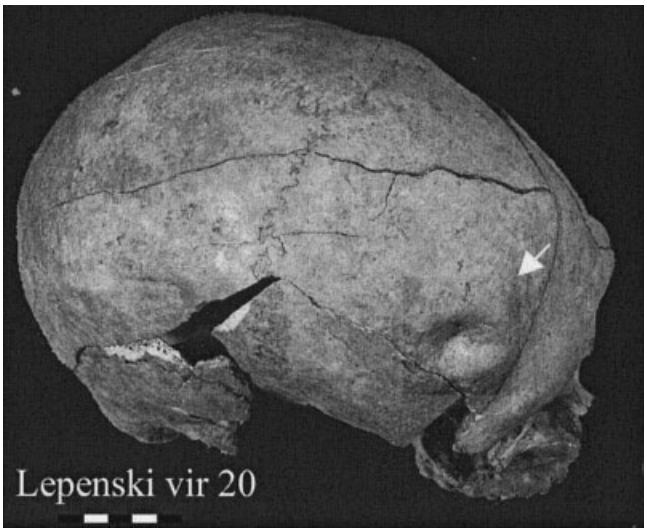

Fig. 7. Lepenski vir 20. Arrow points to depressed frontal impact produced with conical object. Scale is in cm.

examined by element and sex combined, the picture is different: all four are recorded on the 42 preserved male skulls, raising the frequency to 9.5% and indicating that interpersonal conflict was not as rare as overall frequencies suggest, at least not among men.

Given the low overall frequencies and small number of injuries, the second criterion (of relatively equal distribution of injuries over the duration of the Mesolithic) cannot be evaluated, and to further elucidate the question of endemic warfare, we have to turn to the third criterion. Out of six individuals with violent injuries, five are men (83.3%), and only one is a woman. At least one individual is concordant with *social substitutability* as the principal determinant of warfare. As in the case of the second criterion, low prevalence makes it impossible to *ascertain* that the third criterion is not met, since low frequency of females and lack of children with violent injuries could be the result of overall low frequency, in which case warfare cannot be excluded. On the other hand, the one female in the sample could be interpreted as a result of individual interpersonal or domestic violence, nonindicative of warfare. The already-mentioned elevated frequencies of skull injuries in men strongly suggest that violence was indeed a "male business" at these sites.

Low overall frequencies and low prevalence of violent injuries in females suggest that the first hypothesis of endemic warfare in the Mesolithic is not supported by the Iron Gates Gorge evidence.

Four of six individuals with violent injuries (66%) are from the Precontact period in the Iron Gates Gorges (Table 3). The remaining two are individuals with ambiguous chronological designations, Vlasac 69 showing "early diet type" isotope values, and Lepenski Vir 20 with no data. Therefore, the criterion for establishing contact with farmers as causal factor for warfare in the region is not substantiated by sites on the right bank of the Danube. In order to evaluate this question for the whole region in the Mesolithic/Neolithic context, we scrutinize the evidence from Schela Cladovei.

The site of Schela Cladovei, situated on the left bank of the Danube, in the fertile floodplain downstream from the Gorges, shows a very different picture from the rest of the sites of the Lepenski Vir complex. Out of the total of 57 individuals excavated in two field campaigns, McSweeney et al. (2000) reported five individuals (four males and one female) with possibly fatal and multiple projectile wounds, and 14 individuals with evidence of other violent trauma (19/57 or 33.3%).

Seven well-documented cases considered here come from 28 individuals in the meticulously excavated Area III (7/28 or 25%): two skulls (female 42 and male 48) show evidence of blunt-force trauma; two individuals, one male (46) and one female (49), had "parry" fractures; and three had embedded projectiles: bone projectiles in male individuals 48 and 50, and a flint projectile in individual 47 for whom the sex was not reported (Boroneanţ et al., 1999, p. 389). In terms of dietary information, they all form a tight cluster, interpreted by Bonsall et al. (1997) as predominantly aquatic, indicating the Precontact Mesolithic period. ^{14}C dates are more ambiguous, as they fall between 7450–6439 BC calibrated (2σ) when corrected for freshwater reservoir effect (Bonsall et al., 2000, p. 123, their Table 3), concordant both with the Precontact Mesolithic and the beginning of possible contact with the Neolithic.

Table 4 summarizes the differences between Schella Cladovei Area III and Vlasac and Lepenski Vir in terms of prevalence of different types of injury. As many as 7 of 28 individuals at Schela Cladovei Area III (25%) show one or more violent injuries, compared to 4 of 118 (3.4%)

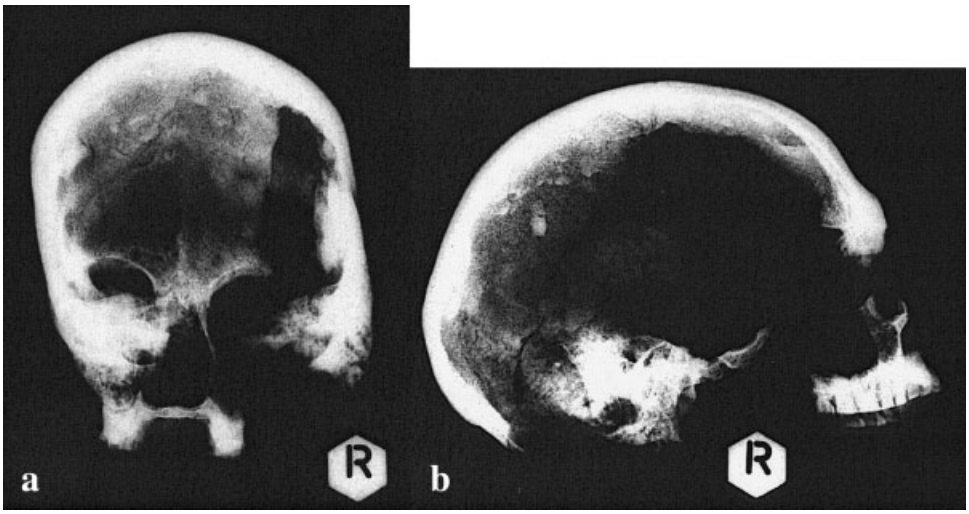

Fig. 8. Lepenski Vir 20. Radiographs: **a**: Frontal. **b**: Lateral.

TABLE 2. All recorded incidences of skeletal trauma possibly caused by violence in Iron Gates Gorge sample[1]

Site	Burial	Period	^{14}C BC cal	Diet	Sex	Age	Trauma
Vlasac	82a	M	No data	No	m	MA/SA	Frontal (R)
Lvir	69	M	7000[a]	Early	m?	MA/SA	Frontal, healed (R, L) perimortem (R)
Vlasac	51a	M	7600–7080 (2σ)	Early	f	FA	Ulna parry fracture (R)
Vlasac	4a	M	7600–6500[b]	Early	m	YA	Projectile point in the ilium (R)
Vlasac	69	M/N	No data	Early	m?	MA	Frontal, healed (R) perimortem (L)
Lvir	20	M/N/N	No data	No	m?	MA	Frontal, deep conical (R)

[1] Burial, number assigned to burial by excavators; Lvir, Lepinski Vir; M, Mesolithic; M/N, Mesolithic in contact with Neolithic; N, Neolithic; ^{14}C, radiocarbon date where available.
[a] From Bonsall et al. (1997, 2000);
[b] From Grupe et al. (2003). Diet: Early, predominantly aquatic; Late, large portion of terrestrial (Radovanovic, 2000). m or f, male or female assigned based on pelvic remains; m?/f?, male or female assigned based on postcranial robusticity; YA, young adult; FA, fully adult; MA, mature adult; SA, senile adult. Trauma refers to position and type of traumatic lesion. R, right; L, left.

TABLE 3. Skeletal elements affected by violent injuries[1]

	Skull					Ulna					Pelvis				
Site	Total	VT	%	M	F	Total	VT	%	M	F	Total	VT	%	M	F
Precontact	**42**	**2**	**4.8**	**19**	**22**	**33**	**1**	**3.0**	**13**	**18**	**20**	**1**	**5.0**	**8**	**11**
L Vir	4	1	25.0	4	0	1	0	0.0	1	0	1	0	0.0	1	0
Vlasac	31	1	3.2	14	16	28	1	3.6	10	16	19	1	5.3	7	11
Padina	7	0	0.0	1	6	4	0	0.0	2	2	0	0	0.0	0	0
Postcontact	**59**	**2**	**3.4**	**23**	**33**	**41**	**0**	**0.0**	**19**	**21**	**30**	**0**	**0.0**	**16**	**14**
L Vir	19	1	5.3	6	10	9			4	4	3			1	2
Vlasac	17	1	5.9	6	10	14			5	9	8			3	5
Padina	9			3	5	6			3	3	6			4	2
H. Vod.	6			6	3	4			4	0	5			5	0
Ajmana	5			2	2	5			3	2	5			3	2
Velesnica	3			0	3	3			0	3	3			0	3
Not known	8					12					0				
Total	**109**	**4**	**3.7**	**42**	**55**	**86**	**1**	**1.2**	**32**	**30**	**50**	**1**	**2.0**	**24**	**25**

[1] Breakdown by Precontact Mesolithic and Postcontact Mesolithic/Neolithic and Neolithic periods. Cumulative values for Precontact and Postcontact are in bold. VT, violent trauma; M, male; F, female; L Vir, Lepinski Vir; H. Vod., Haducka Vodenica.

for Vlasac and 2 of 103 (1.9%) for Lepenski Vir. The distribution is significant (chi-square = 25.4606, P is less than or equal to 0.001). A further look at the breakdown per type of injury shows a persistent difference between the left and the right banks for both projectile points and "parry" fractures. Blunt-force trauma of the skull shows relatively similar frequencies for all three sites, with one important difference: it is present in both men and women at Schela Cladovei, and only in men at the other two sites. The significant difference in both the prevalence and pattern of injuries between Schela Cladovei and sites in the Iron Gates Gorge suggests different archaeological contexts and behaviors associated with violence.

Schela Cladovei III material is restricted in time; the dates form a tight cluster, further corroborated by relatively uniform burial practices. Concordant with the pattern of injuries, they could represent either a single episode of group violence, or a series of related events. Given the number of females involved, it is reasonable to suggest that the whole group was targeted. This meets the criterion of *substitutability* of an individual, a crucial

TABLE 4. Comparison between three sites for violent injuries per type of injury[1]

Site	Projectiles/per individual	%	Parry fracture/per element	%	Skull fractures/per element	%	All injuries/per individual	%
Schela Cladovei Area III	3/28	10.7	2/28[2]	7.1	2/28	7.1	7/28	25.0
Vlasac	1/118	0.8	1/42	2.3	2/48	4.2	4/118	3.4
Lepenski Vir	0/103	0.0	0/10	0.0	2/31	6.4	2/103	1.9

[1] Schela Cladovei data are restricted to the Area III, for which numbers for different types of injury are reported by Boroneant et al. (1999).
[2] No data on number of skulls or ulnae in Schela Cladovei were reported. Accordingly, frequencies could be even more elevated if reported by element. Site photos suggest relatively complete skeletons.

condition in identification of warfare as defined by Kelly (2000). Warfare (and raid as part of it) is a likely explanation for this site. The episode of war is, however, not associated with contact with farmers. The dates do not fall clearly after 6500 BC, and the dietary information suggests that the crucial change between Precontact and Postcontact diet type did not take place. Accordingly, while the site meets a criterion for warfare, it does not clearly fall in the Postcontact period and cannot be used to support the second hypothesis.

On the basis of the evidence presented above, violent interactions at sites on the right bank of the Danube in the Gorges could be explained as a series of unrelated and diachronous episodes. These incidents could have as easily happened within the community as with members of other groups. The episode of violent conflict concordant with our definition of warfare at Schela Cladovei remains isolated and is not related to contact with farmers.

CONCLUSIONS

Violent interactions in the Iron Gates Gorge Mesolithic and Mesolithic/Neolithic Contact periods are confirmed by a restricted number of skeletal elements with traumatic injuries for which violence is a likely etiology. There is an important difference in the pattern of violence between the right bank of the Danube in the Gorges area and the floodplain on left bank downstream from the Gorges. When viewed separately, the Gorges area shows sporadic violence and does not support the first hypothesis of endemic warfare in the Mesolithic. Not only is there very little evidence for violence, but most of it is nonlethal (ritualized?) face-to-face conflict among men (Walker, 1989). While no trend toward increase or decrease can be discerned, given the restricted numbers of individuals with trauma, it is apparent that violence on the right bank is not associated with contact with farmers.

Schela Cladovei follows a different pattern, with a high level of violence and involvement of both sexes. The individuals form a tight cluster in terms of ^{14}C dates, dietary information, and burial ritual. Mesolithic-type diet and dates, which are borderline between the Precontact and Contact periods, indicate that contact with Early Neolithic cultures farther south in the Balkans was (if at all possible) on a small scale. Large displacement of farming communities that would shrink the territory of Mesolithic peoples and cause stress is unlikely at this early stage. The "causae belli" most often evoked (decrease in territory under pressure from Neolithic communities in the region, increase in population, and other stresses associated with contact with farmers) can therefore be excluded as explanatory mechanisms for these violent interactions.

Based on the presented evidence, warfare cannot be ascertained on the right bank of the Iron Gates Gorge. If there indeed was organized violence and warfare, as suggested by the Schela Cladovei data, it is localized and temporarily restricted, countering the notion of endemic warfare. Conflicts caused by advancing Neolithic farmers can be excluded on the basis of the evidence presented here, since most of the violent interactions happened during Precontact or early Contact times.

ACKNOWLEDGMENTS

Analysis and presentation were funded by an SSHRC Postdoctoral Fellowship to M.R. We thank Charlotte Roberts, Susan Pfeiffer, and the anonymous reviewers for their extensive and thoughtful comments, Julija Kelecevic for help during data collection, and the University of Belgrade and Institute of Archaeology for logistic support during data collection.

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