11. OSTANKI VELIKIH SESALCEV IZ DIVJIH BAB I STRATIGRAFIJA, TAKSONOMIJA IN BIOMETRIJA

BORUT TOŠKAN

Izvleček

V mlajšepleistocenskih (OIS 3 in OIS 5) plasteh paleolitskega jamskega najdišča Divje babe I je bilo (ob najdbah jamskega medveda) najdenih še 995 ostankov velikih sesalcev iz vsaj 20 različnih vrst: *Lepus timidus* seu *europaeus*, *Marmota marmota*, *Ursus arctos*, *Canis lupus*, *Vulpes vulpes*, *Alopex lagopus*, *Mustela putorius*, *Martes martes*, *Lutra lutra*, *Felis silvestris*, *Lynx lynx*, *Panthera pardus*, *Panthera spelaea*, *Sus scrofa*, *Cervus elaphus*, *Alces alces*, *Capreolus capreolus*, *Rupicapra rupicapra*, *Capra ibex* in *Mammuthus primigenius* seu *Dicerorhinus* seu *Coleodonta*. Število in mesto pojavljanja urezov, zasekanin, odtisov zob in sledi udarcev s kamnitim orodjem na dolgih kosteh kopitarjev kaže, da so bili za nastanek tafocenoze v jami odgovorni tako paleolitski človek kot tudi zveri. Zdi se, da so bila trupla jelenov, gamsov, kozorogov in srn običajno najprej dostopna človeku, njemu nezanimive odpadke (predvsem gre tu za z maščobo prepojene fragmente spongiozne kosti ob epifizah) pa naj bi naknadno uživale še zveri. Malo verjetno je, da bi bili ljudje pri iskanju mrhovine uspešnejši od volkov, medvedov, jamskih levov, leopardov in risov, zato naj bi glavnina kosti kopitarjev v Divjih babah I predstavljala ostanek človekovega plena.

Med večletnimi izkopavanji na najdišču Divje babe I (zahodna Slovenija, 450 m n. m. v.) je bilo poleg drugega zbrano tudi mnogo ostankov velikih sesalcev. Po pričakovanju (Miracle 1991) jih velika večina pripada jamskemu medvedu (*Ursus spelaeus*) in ti so bili v preteklosti že predmet več preliminarnih raziskav (npr. Turk *et al.* 1988–1989; 1990; 1992; Turk, Dirjec 1989; 1991; Debeljak 1996; 2002a). Drugače je z najdbami drugih velikih sesalcev, ki jim je bilo doslej namenjeno zelo malo pozornosti (glej npr. Turk, Dirjec 1997b). V nadaljevanju tako najprej podajam taksonomski pregled sesalske makrofavne, sledijo pa še ugotovitve o značilnostih nekdanjega okolja ter o vlogi posameznih dejavnikov akumulacije pri nastajanju preučevane tafocenoze.

METODE

Obravnavano gradivo je bilo zbrano v dveh zaporednih fazah izkopavanj, pri katerih so bile uporabljene različne terenske tehnike in metode. V prvem obdobju (tj. med letoma 1980 in 1986) so na konvencionalen način raziskali vhodni del jame, pri čemer sedimenta niso spirali skozi sito. Posamezne najdbe so dokumentirali vertikalno po plasteh, ki so jim sledili med približno meter oddaljenimi sosednjimi profili. Z začetkom druge faze izkopavanj (obdobje med letoma 1989 in 1999), ko so raziskali osrednji in notranji del jame, se je metodologija bistveno spremenila. V globino so odtlej kopali po horizontalnih izkopih (režnjih) debeline 12 cm, pri čemer so osnovno območno enoto predstavljali kvadri 1 x 1 x 0,12 m. Od leta 1990 naprej so bile vse odkopane usedline sprane in pregledane na sitih s premerom odprtin 10 mm, 3 mm in 0,5 mm. Podrobnejše podatke o najdišču in metodologiji terenskega raziskovanja podaja Turk (poglavje 1 v tem zborniku). Najstarejše izkopane plasti (tj. pl. 21 do 26) naj bi nastale v riško-würmskem interglacialu (OIS 5e), plasti 12 do 20 so domnevno nastale v zgodnjem glacialu (OIS 5a-5d), večina preo-stalih (tj. 2 do 11) pa v t. i. interpleniglacialu oz. srednjem virmu-würmu (OIS 3); plast 1 je holocenska (OIS 1). Starost najstarejših preučenih sedimentov je ocenjena na več kot 115.000 let pred sedanjostjo (p.s.), tistih iz plasti 2 pa na približno 40.000 let p.s. (Turk *et al.* 2001a; poglavje 1 v tem zborniku).

Pri determinaciji mi je bilo v pomoč fosilno in recentno gradivo iz Slovenije (zbirki Inštituta za arheologijo ZRC SAZU ter Katedre za paleontologijo NTF Univerze v Ljubljani) in Hrvaške (zbirka Zavoda za geologijo in paleontologijo kvartarja iz Zagreba). Pri sistematskem razvrščanju sem se držal sistema, kot ga podajata Guérin, Patou-Mathis (1996). Starostno strukturo živali sem ocenjeval z analizo obrabe žvekalne površine kočnikov. Merjene dimenzije so povzete po Torresu (1988; dimenzije medvedje lobanje) in Von Drieschevi (1976; preostale dimenzije); metrični podatki so podani v *prilogi 11.1*. Pri iskanju urezov, zasekanin, sledi udarcev z orodjem in odtisov zverskih zob sem uporabljal stereomikroskop (15x povečava) in močan vir svetlobe (prim. Blumenschine *et al.* 1996).

Kot kazalec abundance sem uporabil najmanjše število določenih ostankov (*Number of Identified Specimens*; NISP), saj je število najdb razmeroma skromno.

V čeljustnice vključene zobe sem obravnaval kot izolirane (npr. primerek mandibule z ohranjenim M_1 sem upošteval kot NISP = 2). S tem sem zmanjšal moteč vpliv različne intenzivnosti razpadanja ostankov v različnih obdobjih würma. Pri analizi zastopanosti posameznih anatomskih regij uplenjenih in/ali poginulih živali sem število ostankov izrazil z najmanjšim številom skeletnih elementov (*Minimum Number of Elements*; MNE). Ta prikaže abundanco najštevilčnejšega dela posameznega skeletnega elementa danega taksona v obravnavanem vzorcu (npr. proksimalna epifiza stegnenice volka). Če se takšen element v skeletu živali pojavlja v paru (npr. kosti okončin), predstavlja MNE vsoto vseh levih in desnih fragmentov (Stiner 1994). Zob pri ugotavljanju najmanjšega števila elementov nisem upošteval. Zaradi večje trdnosti namreč ti praviloma bistveno bolj kot kosti kljubujejo različnim destruktivnim poodložitvenim dejavnikom (Lyman 1999).

Pri statistični obdelavi sem uporabljal neparametrične teste (npr. Spearmanov R koeficient korelacije, χ^2-test, Mann-Whitney U test; StatSoft, Inc. 2001), saj porazdelitev analiziranih metričnih podatkov praviloma odstopa od normalne. Statistična obdelava je bila narejena s programskim paketom StatSoft 2001, STATISTICA za Windows, verzija 6.0.

Vse kostne najdbe iz Divjih bab I hrani Narodni muzej Slovenije v Ljubljani.

TAKSONOMIJA

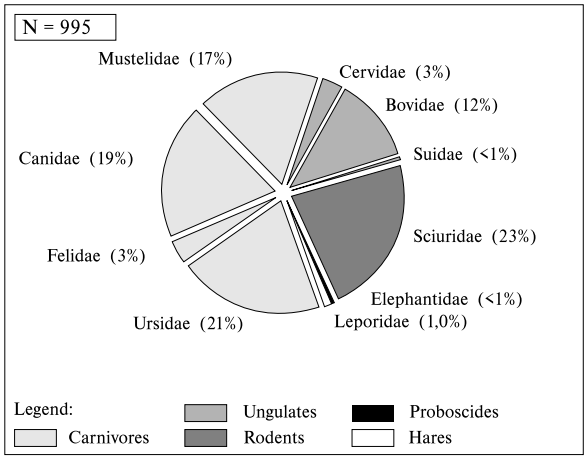
Ob najdbah jamskega medveda je bilo do nivoja rodu mogoče določiti še 995 ostankov velikih sesalcev, ki sem jih pripisal 20 vrstam iz 10 družin (*sl. 11.1*). Večina jih območje Slovenije naseljuje še danes, čeprav nekatere le zaradi ponovnega vnosa po predhodnem lokalnem izumrtju (npr. *Capra ibex*, *Lynx lynx*, *Marmota marmota*). Od skupno petih vrst, ki jih danes na Slovenskem ne najdemo več, sta ob koncu pleistocena globalno izumrli dve (*Mammuthus primigenius* (?) in *Panthera spelea*). Preostale tri (*Alces alces*, *Alopex lagopus* in *Panthera pardus*) so se umaknile drugam.

Red: Zajci in žvižgači (Lagomorpha)
Družina: Zajci in kunci (Leporidae)

Lepus timidus / europaeus

Gradivo: sklop plasti 2–5: ulna, vertebra lumbalis, ossa coxae (2x);[1] plast 6: dens; plast 8: phalanges (2x); plast 13: humerus; plast 2–11/12: astragalus; plast 12–22: metapodium.

[1] Ledveno vretence in oba fragmenta medenice (po en levi in en desni) izhajajo iz istega kvadrata in izkopa, zato gre verjetno za ostanke iste živali.



Sl. 11.1: Deleži posameznih družin velikih sesalcev, zastopanih v Divjih babah I. Najdbe jamskega medveda (*Ursus spelaeus*) niso vključene.
Fig. 11.1: Shares of individual families of large mammals represented at Divje babe I. Finds of cave bear (*Ursus spelaeus*) are not included.

Ločevanje med poljskim zajcem (*Lepus europaeus* Pallas, 1778) in planinskim zajcem (*Lepus timidus* Linnaeus, 1758) je težavno. Zanesljivo specifično determinacijo naj bi dopuščal le desni zgornji sekalec (Rakovec 1961; Malez 1963; Kryštufek 1991), ki pa ga v tukaj obravnavanem vzorcu ni. Vrsti naj bi bilo mogoče razlikovati tudi na podlagi razvitosti postero-lingvalne skleninske pentlje drugih zgornjih predmeljakov (Chaline 1966), vendar je edini razpoložljivi P^2 iz Divjih bab I na tem delu poškodovan. Neuporabni so tudi metrični podatki, saj sta obe razpoložljivi dolgi kosti fragmentirani. Največja širina distalne epifize nadlahtnice iz plasti 13 (inv. št. D. b. 1303) se z 12 mm sicer uvršča znotraj variacijske širine za recentne poljske zajce z območja nekdanje Sovjetske zveze (razpon: 7,5–15 mm; N ni naveden; Gromova 1950), vendar pa hkrati ne odstopa niti od vrednosti iste dimenzije pri fosilnih planinskih zajcih z južne Moravske (razpon: 11–13 mm; N = 22; Rakovec 1959).

Najdbe rodu *Lepus* iz Divjih bab I izvirajo iz plasti 2 do 13, ki so domnevno nastale v OIS 3. Takrat naj bi bila klima hladna in kot taka primernejša za planinskega zajca. Danes namreč največji del areala omenjene vrste prekrivata tundra in tajga[2] (Lequatre 1994), medtem ko poljski zajec preferira polja, travnike in pašnike (Kryštufek 1991). Poleg tega so iz paleolitskih najdišč na Slovenskem ostanki vrste *L. europaeus* znani le iz Potočke zijalke (Brodar, S. in M. 1983), medtem ko naj bi bila vrsta *L. timidus* v istem obdobju splošno razširjena (Rakovec 1959; 1961; 1962-63; 1973; Osole 1976).

[2] V Alpah obsega areal vrste *L. timidus* planinske pašnike, ruševje in visoka barja (Kryštufek 1991).

Red: Glodalci (Rodentia)
Družina: Veverice (Sciuridae)

Marmota marmota (Linnaeus, 1758)

Gradivo: Alpski svizec je v vzorcu iz Divjih bab I zastopan z 234 ostanki. Celoten seznam najdb po plasteh in skeletnih elementih je podan v *prilogi 11.2A*.

V würmu sta Evropo naseljevali dve alopatrični vrsti svizca: alpski svizec in bobak (*M. bobac* Müller, 1776). Na osnovi števila korenin četrtih spodnjih predmeljakov in barve sekalcev sem vse primerke iz Divjih bab I pripisal k vrsti *M. marmota* (Rakovec 1935; Chaline 1966); vsi razpoložljivi P_4 imajo namreč po tri korenine (in ne le dve kot pri *M. bobac*), pa tudi sekalci so intenzivno oranžno obarvani (pri bobaku so znatno svetlejši). Isti vrsti so bile pripisane tudi najdbe svizcev z drugih paleolitskih najdišč Slovenije, SV Italije, JV Avstrije, Z Madžarske, Hrvaške ter Bosne in Hercegovine (Rakovec 1973; Jánossy 1986; Malez 1986a; Bon *et al.* 1991; Fladerer 2000; Toškan 2004).

Recentni alpski svizci naseljujejo odprte planinske travnike. V zemljo si kopljejo rove, v katerih prenočujejo, prezimijo in se skrivajo pred plenilci. Zato se lahko naselijo le tam, kjer so tla vsaj tri metre globoka ali pa je vsaj toliko nanosov (Kryštufek 1991). Kot je razvidno iz *tabele 11.14* so najdbe svizcev v Divjih babah I najštevilčnejše v plasteh 2-5. Čeprav so te nastale pred globoko zamrznitvijo tal v predelu za jamskim vhodom,[3] pa svizčevih najdb v jami ni utemeljeno povezovati z nezmožnostjo kopanja rovov na planem. Res je, da si recentni svizci zatočišče včasih iščejo tudi v skalnih razpokah in podzemnih votlinah (Turk *et al.* 1996); to ne nazadnje dokazujejo tudi fosilni rovi v nekaterih mlajšepleistocenskih jamskih najdiščih (npr. Pohar 1989; Pohar, Brodar 2000). Res je tudi, da v zimskih rovih med pet- do šestmesečnim hiberniranjem pogine razmeroma veliko število živali (Kryštufek 1991). Ker pa vodijo ti rovi pri recentnih alpskih svizcih v globino vsaj 2 do 3 m (Vidic 1994), predstavljajo najdbe omenjene vrste v Divjih babah I najverjetneje predvsem ostanek plena človeka in/ali manjših zveri (npr. lisice, risa, kune).[4] Večina svizčevih ostankov namreč izvira iz zgornjega enega metra sedimenta (tj. sklop plasti 2 do 5), kar je za zimske rove preplitvo.

Red: Zveri (Carnivora)

Zveri so v vzorcu iz Divjih bab I zastopane z 12 vrstami iz štirih družin. 14 ostankov (predvsem prstnice, sekalci, zapestne in nartne kosti) je bilo mogoče določiti le do nivoja redu. Preostale najdbe podrobneje predstavljam v nadaljevanju.

Družina: Medvedi (Ursidae)

Ursus spelaeus Rosenmüller, 1794

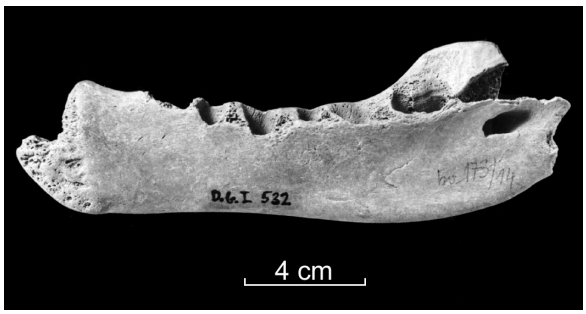
V Divjih babah I predstavljajo ostanki jamskega medveda daleč največji delež najdb velikih sesalcev (>99 % NISP), zato so v zborniku obravnavani ločeno (glej poglavja 12, 15–18 v tem zborniku).

Ursus arctos Linnaeus, 1758

Gradivo: Rjavi medved je v vzorcu iz Divjih bab I zastopan s 192 ostanki. Celoten seznam najdb po plasteh in skeletnih elementih je podan v *prilogi 11.2B*.

Fosilne najdbe rjavega medveda nastopajo običajno skupaj z najdbami jamskega medveda, vendar praviloma v veliko manjšem številu. Nesorazmerje v deležih obeh vrst je najverjetneje posledica manjše navezanosti rjavega medveda na hiberniranje v jamah (Couturier 1954; Argant 1996a). Rod *Ursus* izkazuje veliko morfološko variabilnost (Kryštufek 1991), zato je determinacija pogosto problematična. Kar tretjino od skupno 191 medvedjih kosti in zob iz Divjih bab I sem tako k vrsti *U. arctos* pripisal le pogojno. Večinoma gre za izolirane predmeljake, saj se ti pri vrsti *U. spelaeus* pojavljajo le izjemoma (Ewer 1973; Torres 1988). Manj problematična je določitev meljakov, kjer so razlike med vrstama večje (*tab. 11.1*).

Zanimiva je najdba lobanje iz plasti 6 (inv. št. D. b. 1606a), saj je skoraj nepoškodovana (glej poglavje 15 v tem zborniku, *sl. 15.4b*). V velikosti nekoliko presega mlajšepleistocenske primerke z Iberskega polotoka (*pril. 11.1C*; glej Torres 1988). Posebno obravnavo zasluži spodnja čeljustnica iz plasti 14 (inv. št. D. b. 532). Gre za poškodovan primerek, od katerega je ohranjeno le spodnječeljustnično telo (*corpus mandi-*



Sl. 11.2: Medvedja spodnja čeljustnica iz plasti 14 (inv. št. D.b. 532). Fotografija: T. Lauko.
Fig. 11.2: Lower jaw of a bear from Layer 14 (inv. no. D.b. 532). Photograph T. Lauko.

[3] To dokazujeta krioturbacija in soliflukcija dela usedlin (Turk 1997).

[4] Možnost, da bi bili zimski rovi v jami plitvejši od tistih na planem, se glede na etologijo recentnih alpskih svizcev in geološko sestavo sklopa plasti 2 do 5 ne zdi verjetna (F. Frey-Roos, ustno poročilo).

Tab. 11.1: Opisna statistika za dolžino in širino meljakov rjavega medveda (*Ursus* cf. *arctos*) iz Divjih bab I ter ustrezne mere rjavega in jamskega medveda z nekaterih drugih paleolitskih najdišč Slovenije, Španije in Francije. Podani so povprečje (x), velikost vzorca (N) in variacijska širina (min-max). Identifikacija vzorcev: D. b. I – Divje babe I (podatki za jamskega medveda so povzeti po Debeljak (2002b)), MOKR. J. – Mokriška jama v Savinjski dolini (Rakovec 1967), ESP – več pleistocenskih najdišč Španije (Torres 1988), FRA – več pleistocenskih najdišč SV Francije (Argant 1991). Vsi primerki so datirani v OIS 3. Vse mere so v mm.

Tab. 11.1: Descriptive statistics for the length and breadth of molars of brown bear (*Ursus* cf. *arctos*) from Divje babe I and corresponding measurements of brown and cave bear from some other Palaeolithic sites in Slovenia, Spain and France. Shown are the average (x), size of sample (N) and range (min-max). Identification of samples: D. b. I – Divje babe I (data for cave bear are taken from Debeljak (2002b)), MOKR. J. – Mokriška jama in the Savinja valley (Rakovec 1967), ESP – a number of Pleistocene sites in Spain (Torres 1988), FRA – a number of Pleistocene sites in south-east France (Argant 1991). All specimens are dated to OIS 3. All measurements are in mm.

Tooth	**Dimension**	**D.b. I** *U.* **cf.** *arctos*		**D.b. I** *U. spelaeus* x (N) min-max	**MOKR. J.** *U spelaeus* min-max	**ESP** *U. spelaeus* x (N) min-max	**ESP** *U. arctos* x (N) min-max	**FRA** *U. arctos* x (N) min-max
M^1	Length	24.0 D.b.1861		28.8 (464) 24.7–33.9	25.7–33.2	28.9 (411) 23.2–33.3	22.1 (47) 19.4–24.4	25.0 (16) 22.3–29.0
	Breadth	16.0 D.b.1861		19.7 (464) 16.6–23.1	16.8–22.8	19.9 (376) 15.9–25.0	16.6 (45) 13.6–19.7	–
M^2	Length	35.0 D.b.1457		44.1 (261) 38.3–49.7	40.8–53.0	45.2 (409) 38.0–53.3	35.2 (53) 28.0–41.7	38.4 (15) 36.0–41.0
	Breadth	22.0 D.b.1457		23.2 (261) 19.8–27.0	20.8–27.0	23.2 (447) 19.2–28.5	18.6 (51) 16.3–21.5	–
M_2	Length	26.0 D.b.111	24.0 D.b.571	30.8 (399) 26.6–34.4	27.8–35.6	30.4 (624) 24.1–35.8	24.5 (40) 21.2–29.2	27.7 (13) 25.5–29.8
	Breadth	14.0 D.b.111	14.5 D.b.571	18.7 (399) 15.2–22.0	15.7–21.9	18.5 (587) 14.3–22.0	15.1 (40) 12.2–18.6	–
M_3	Length	23.0 D.b.2540		26.6 (280) 20.7–33.2	22.7–31.2	26.5 (502) 20.6–32.8	20.9 (38) 16.3–24.6	22.5 (16) 20.5–25.7
	Breadth	18.0 D.b.2540		18.9 (280) 16.1–22.9	16.2–21.4	18.3 (451) 13.8–22.5	12.3 (34) 12.0–16.0	–

bulae) z alveolarnim delom. Zobje manjkajo, po alveolah sodeč pa sta imela podočnik in tretji spodnji meljak že izoblikovani korenini. Morfološko je mandibula med rjavim in jamskim medvedom (*sl. 11.2*). S slednjim jo družita odsotnost alveole prvega predmeljaka ter izbočena spodnji rob in labialna stena spodnječeljustničnega telesa. Po drugi strani vitek distalni del spodnječeljustničnega telesa, ki je povezan z gracilno grajenim podočnikom, obravnavani primerek povezuje z rjavim medvedom (Torres 1988; Capasso Barbato *et al*. 1990). Alveolarna dolžina P_4-M_3 znaša 97,3 mm, kar najdbo umešča znotraj variacijske širine primerkov vrste *U. spelaeus* iz Mokriške jame v Savinjskih Alpah (Rakovec 1967).

V Sloveniji so najstarejši ostanki rjavega medveda znani iz Jame pod Herkovimi pečmi na Kozjaku (würm I; Pohar 1981), vrsta pa je zastopana tudi v favni številnih drugih mlajšepleistocenskih najdišč v regiji (Toškan 2004). Upoštevaje razpoložljive ESR-datacije (Turk *et al.* 2001a; poglavje 6 v tem zborniku) lahko primerke iz najglobljih plasti Divjih bab I uvrstim ob bok tistim iz Jame pod Herkovimi pečmi kot najstarejše doslej znane ostanke rjavega medveda na Slovenskem.

Družina: Psi (Canidae)

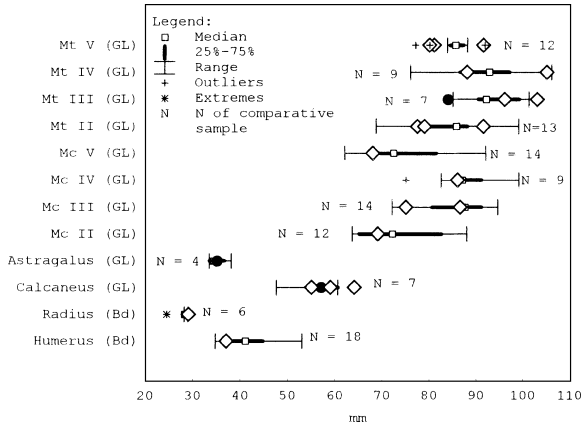
Canis lupus Linnaeus, 1758

Gradivo: Volk je v vzorcu iz Divjih bab I zastopan s 167 ostanki. Celoten seznam najdb po plasteh in skeletnih elementih je podan v *prilogi 11.2C*.

Volk je zastopan v favni večine slovenskih paleolitskih najdišč (Toškan 2004), čeprav praviloma le s skromnim številom ostankov. V primeru Divjih bab I pa ni tako, saj vrsta po številu najdb zaostaja le za medvedom in svizcem. Determinacija v splošnem ni bila problematična. Izjemo predstavljajo le nekateri manjši in dokaj fragmentirani ostanki (predvsem prstnice), čeprav tudi ti izkazujejo značilno kanidno morfologijo. V tem smislu velja omeniti še podočnika iz plasti 5 do 6 (inv. št. D. b. 95; *sl. 11.3*) in 17a (inv. št. D. b. 476). Zoba se morfološko sicer ne razlikujeta od tistih vrste *C. lupus*, se pa po velikosti[5] oba umeščata znotraj variacijske širine fosilnih alpskih volkov (*Cuon alpinus* [Thenius 1954]). Omenjena vrsta

[5] Dimenzije: labialno-lingvalna širina: 10,2 in 12,5 mm; anteriorno-posteriorna širina: 6,5 in 7,8 mm.

Sl. 11.3: Kanidni levi spodnji podočnik (C_1) iz plasti 5 do 6 (inv. št. D. b. 95). Fotografija: T. Lauko.
Fig. 11.3: Canid left lower canine (C_1) from layers 5 to 6 (inv. no. D. b. 95). Photograph T. Lauko.



Sl. 11.4: Mere izmerljivih ostankov volka (*Canis lupus*) iz Divjih bab I (● – ostanki iz OIS 5a–5d; ◇ – ostanki iz OIS 3). Za primerjavo so navedene meritve fosilnih volkov z več zgornjepleistocenskih evropskih najdišč. Legenda: Mc – metacarpus, Mt – metatarsus, Bd – največja širina distalne epifize, GL – največja dolžina. Podatki za primerjalni vzorec so povzeti po naslednjih avtorjih: Musil (1960), Malez (1963), Rakovec (1965), Bonifay (1966a), Pohar (1981), Castaños (1987), Argant (1991) in Münzel *et al.* (1994). Vse mere so v mm.
Fig. 11.4: Measurements of measurable remains of wolf (*Canis lupus*) from Divje babe I (● – remains from OIS 5a–5d; ◇– remains from OIS 3). Measurements of wolf remains from a number of Early Pleistocene European sites are stated for comparison. Legend: Mc – metacarpus, Mt – metatarsus, Bd – breadth of distal end, GL – greatest length. Data for comparison are taken from the following authors: Musil (1960), Malez (1963), Rakovec (1965), Bonifay (1966a), Pohar (1981), Castaños (1987), Argant (1991) and Münzel *et al.* (1994). All measurements are in mm.

je zastopana v moustérienskih plasteh Apnarjeve jame pri Celju (Malez, Turk 1991) ter v več mlajšepleistocenskih najdiščih na Avstrijskem, Madžarskem in Hrvaškem (Malez 1965; 1986a; Mottl 1975; Jánossy 1986).

Velikost volkov naj bi se v zahodni Evropi razmeroma enakomerno povečevala od konca predzadnjega glaciala (= riss) pa vse tja do nastopa holocena (Crégut-Bonnoure 1996a). Ali lahko podoben trend pričakujemo tudi za območje južno od alpske poledenitve, je le na podlagi najdb iz Divjih bab I nemogoče reči. Iz maloštevilnih metričnih podatkov namreč izhaja le to, da se tukaj obravnavani ostanki umeščajo znotraj variacijske širine fosilnih primerkov iste vrste iz srednje Evrope (*sl. 11.4*). Fosilni volkovi iz Divjih bab I sicer presegajo recentne primerke z območja nekdanje Sovjetske zveze (Gromova 1950; 1960).

Vulpes vulpes (Linnaeus, 1758)

Gradivo: sklop plasti 2–5: dentes (C_1 in M_1); plast 16: dens (P_2), ulna; plast neznana: mandibula.

Navadna lisica je v vzorcu iz Divjih bab I zastopana s skromnim številom ostankov, kar je sicer značilno za večino sočasnih najdišč v regiji (Toškan 2004). Ker je razlikovanje med navadno in polarno lisico (*Alopex lagopus*) le na osnovi morfologije izoliranih zob težavno (npr. Rakovec 1959; Poplin 1976; Altuna 2004), sem pri določevanju izhajal predvsem iz metričnih podatkov (*tab. 11.2*). Specifična determinacija nekaterih najdb ostaja kljub temu vprašljiva, saj vrsta *V. vulpes* izkazuje veliko variabilnost v velikosti posameznih skeletnih elementov (Kryštufek 1991; Crégut-Bonnoure 1996a). Zaradi nepopolne ohranjenosti je do neke mere vprašljiva tudi določitev obeh zob iz sklopa plasti 2 do 5. Prvi spodnji meljak (inv. št. D. b. 1462) sem tako pripisal k vrsti *V. vulpes* navkljub temu, da se po svoji dolžini uvršča znotraj (na zgornjo mejo) variacijske širine za fosilne in recentne polarne lisice iz Evrope (Poplin 1976). Zaradi fragmentiranosti mezialnega dela je bilo namreč dejansko največjo dolžino zoba nemogoče izmeriti, zgoraj omenjena meritev pa predstavlja le njen nekoliko podcenjeni približek. Podobno velja za podočnik iz istega sklopa plasti (inv. št. D. b. 458), ki ima že nekoliko zbrušeno konico krone.

Manj problematična je determinacija komolčnice in spodnje čeljustnice. Pri vrsti *V. vulpes* leži namreč bradna odprtina (*foramen mentale*) na mandibuli pod prvim spodnjim predmeljakom (kar velja tudi za primerek iz Divjih bab I), medtem ko je pri vrsti *A. lagopus* ta po-

Tab. 11.2: Opisna statistika za mere izoliranih zob lisice (*Vulpes* cf. *vulpes*) iz Divjih bab I. Navedeni so tudi primerjalni podatki za vrsti *V. vulpes* in *A. lagopus*. Podani so povprečje (x), velikost vzorca (N) in variacijska širina (min-max). Primerjalni podatki so povzeti po naslednjih avtorjih: Rakovec (1961; dimenzije zgornjepleistocenskih P_2 iz Evrope), Poplin (1976; dimenzije recentnih C_1) ter Castaños (1987; dimenzije zgornjepleistocenskih M_1 iz Španije). Zvezda (*) označuje primerke z obrušeno oz. poškodovano krono. Vse mere so v mm.
Tab. 11.2: Descriptive statistics for measurements of teeth of fox (*Vulpes* cf. *vulpes*) from Divje babe I. Comparative data for *V. vulpes* and *A. lagopus* are also shown. Given are the average (x), size of sample (N) and range (min-max). Comparative data are taken from the following authors: Rakovec (1961; dimensions of Upper Pleistocene P_2 from Europe), Poplin (1976; dimensions of recent C_1) and Castaños (1987; dimensions of Upper Pleistocene M_1 from Spain). Asterisk (*) denotes specimens with worn or damaged crown. All measurements are in mm.

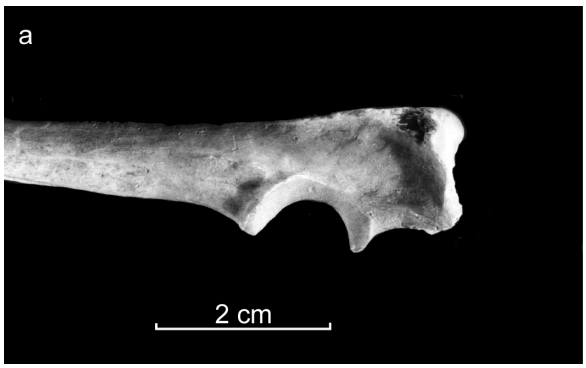
Tooth	**Dimension**	**Divje babe I** *V.* **cf.** ***vulpes***	**Recent** ***V. vulpes***	**Recent** ***A. lagopus***	**Europe** ***V. vulpes***	**Europe** ***A. lagopus***
			x **min–max**	**x** **min–max**	**(N)** **min–max**	**(N)** **min–max**
C_1	Crown height on buccal side	15.0*	17.0 16.0–20.0	13.0 12.0–14.0	–	–
P_2	Length	9.0	–	–	(11) 7.5–9.0	(8) 7.0–8.3
	Breadth	3.0	–	–	(11) 2.9–3.3	(7) 3.0–3.1
M_1	Length	–	–	–	(26) 14.3–17.6	(35) 13.0–15.5
	Breadth	6.0	–	–	(23) 5.8–7.2	(33) 4.7–6.4

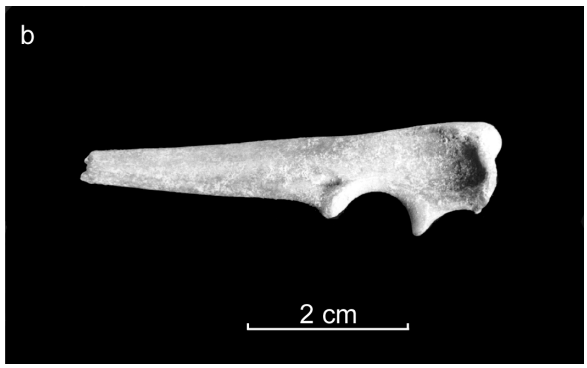
maknjena nekoliko posteriorno, tj. pod korenino drugega predmeljaka (Poplin 1976). Podobno velja za komolčnico iz plasti 16 (inv. št. D. b. 457). Ta je namreč zaradi manj izraženih mišičnih narastišč (prim. Malez 1963) ter sedlaste depresije med kljukico (*olecranon*) in posteriornim delom kljukičinega podaljška (*processus olecrani*; prim. Beneš 1975) prav tako bliže navadni lisici (*sl. 11.5a*). To potrjuje tudi njena velikost (*tab. 11.3*).

Alopex lagopus (Linnaeus, 1758)

Gradivo: plast 6-7: dens (C_1); plast 8: mandibula, dentes (I_3, P_2, P_4), vertebrae (3x), ulna, metacarpus, phalanx II (2x), ossa coxae, calcaneus.

Polarna lisica je v vzorcu zastopana s 14 najdbami. Z izjemo petnice so bili vsi ostanki iz plasti 8 najdeni blizu skupaj, zato jih je verjetno utemeljeno pripisati istemu osebku. Determinacija spodnje čeljustnice (inv. št. D. b. 2039) temelji na legi bradne odprtine (*foramen mentale*; *sl. 11.6*), razmeroma malo ukrivljenem bazalnem robu spodnječeljustničnega telesa (*corpus mandibulae*) ter sami velikosti primerka (Poplin 1976; Argant 1991). Prav tako ni vprašljiva determinacija komolčnice (inv. št. D. b. 2040; *sl. 11.5b*), saj ta ne dosega niti dimenzij recentnih polarnih lisic (*tab. 11.3*). Skromna je tudi velikost predmeljakov (dolžina P_2: 8,0 mm), zato sem navedene lisičje ostanke pripisal razmeroma majhnemu osebku (samici?) vrste *A. lagopus*.



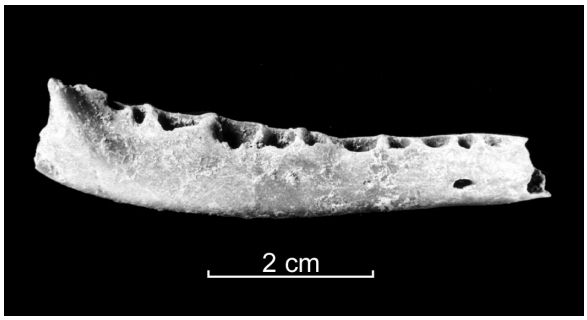


Sl. 11.5a, b: Proksimalna fragmenta komolčnic lisic iz Divjih bab I: a – *Vulpes vulpes* (D. b. 457; plast 16); b – *Alopex lagopus* (D. b. 2040; plast 8). Fotografija: T. Lauko.
Fig. 11.5a, b: Proximal fragments of ulna of fox from Divje babe I: a – *Vulpes vulpes* (D. b. 457; Layer 16); b – *Alopex lagopus* (D. b. 2040; Layer 8). Photograph T. Lauko.

Tab. 11.3: Mere komolčnice lisice (*Vulpes vulpes*) in polarne lisice (*Alopex lagopus*) iz Divjih bab I. Navedena je tudi opisna statistika za fosilne in recentne primerke obeh vrst. Primerjalni podatki so povzeti po naslednjih avtorjih: Gromova (1950; dimenzije recentnih primerkov iz nekdanje Sovjetske zveze; N ni naveden), Malez (1963; dimenzije zgornjepleistocenskih primerkov *A. lagopus* z Moravske; N = 19) ter Castaños (1987; dimenzije zgornjepleistocenskih primerkov *V. vulpes* iz Španije; N = 5). Vse mere so v mm.
Tab. 11.3: Measurements of ulna of fox (*Vulpes vulpes*) and arctic fox (*Alopex lagopus*) from Divje babe I. Descriptive statistics for fossil and recent specimens of both species are also given. Comparative data are taken from the following authors: Gromova (1950; dimensions of recent specimens from the former Soviet Union; N not stated), Malez (1963; dimensions of Upper Pleistocene specimens of *A. lagopus* from Moravia; N = 19) and Castaños (1987; dimensions of Upper Pleistocene specimens of *V. vulpes* from Spain; N = 5). All measurements are in mm.

Skeletal element	Dimension	D. babe I *V. vulpes*	D. babe I *A. lagopus*	Recent *V. vulpes*	Recent *A. lagopus*	Fossil *V. vulpes*	Fossil *A. lagopus*
Ulna	Smallest anter.-poster. breadth of *olecranion*	14.0	10.5	–	–	11.7–13.4	10.0–12.0
	Anter.-poster. breadth of *proc. coracoideus*	17.0	11.5	14.5–18.0	13.0–16.0	14.6–19.0	–
	Smallest breadth of *inc. semilunaris*	9.5	7.0	9–12.5	8.0–11.0	–	–

Determinacija podočnikov iz plasti 6-7 in petnice iz plasti 8 temelji izključno na njuni velikosti. Petnica iz plasti 8 se namreč umešča znotraj variacijske širine recentnih in fosilnih primerkov vrste *A. lagopus* (največja dolžina: 27 mm; največja širina: 11,0 mm), podočnik pa v višini krone na bukalni strani (11,5 mm) vrednosti recentnih polarnih lisic sploh ne dosega (prim. Gromova 1960; Castaños 1987; Altuna 2004).



Sl. 11.6: Spodnja čeljustnica polarne lisice (*Alopex lagopus*) iz plasti 8 (inv. št. 2039). Fotografija: T. Lauko.
Fig. 11.6: Mandible of arctic fox (*Alopex lagopus*) from Layer 8 (inv. no. 2039). Photograph T. Lauko.

Polarna lisica se v okviru evropskih mlajšepleistocenskih najdišč pojavlja sporadično. Njeni ostanki postanejo nekoliko številčnejši šele v plasteh, ki so nastale v OIS 2 (Kurtén 1968). Za razliko od ubikvistične navadne lisice je namreč vrsta *A. lagopus* tesno vezana na okolja s hladno klimo in danes naseljuje območje tundre z arktičnimi otoki (Pulliainen 1999). V najmrzlejših obdobjih würma je njen areal obsegal tudi Iberski polotok (Altuna 2004), južno Francijo (Bonifay 1971), Italijo (Bartolomei *et al.* 1992), Hrvaško (Malez 1963), Madžarsko (Jánossy 1986) in celo Bolgarijo (Wiszniowska 1982). Najdbe iz plasti 8 Divjih bab I je mogoče časovno umestiti v obdobje med 60.000 in 50.000 let p.s. (Turk *et al.* 2001a; poglavji 6 in 7 v tem zborniku), tako da predstavljajo doslej geološko najstarejši dokaz za prisotnost omenjene vrste na Slovenskem. Skupaj s tistimi iz Betalovega spodmola pri Postojni (würm II+III; Rakovec 1959) so tudi edine, ki časovno ne sodijo v OIS 2 (Toškan 2004).

Vulpes vulpes seu *Alopex lagopus*

Gradivo: plast 5: phalanx II; plast 8: dens (I^3); plast 12/13: phalanx I; plast 16: dens (I^3).

Štirih lisičjih najdb iz Divjih bab I mi ni uspelo določiti do nivoja vrste, morfološko pa sicer ne odstopajo od ustreznih elementov navadne lisice (primerjalnega gradiva za polarno lisico nisem imel na razpolago). Prstnice zaradi fragmentiranosti ni mogoče izmeriti.

Družina: Kune (Mustelidae)

Mustela putorius Linnaeus, 1758

Gradivo: Navadni dihur je v vzorcu iz Divjih bab I zastopan s 50 ostanki. Celoten seznam najdb po plasteh in skeletnih elementih je podan v *prilogi 11.2D*.

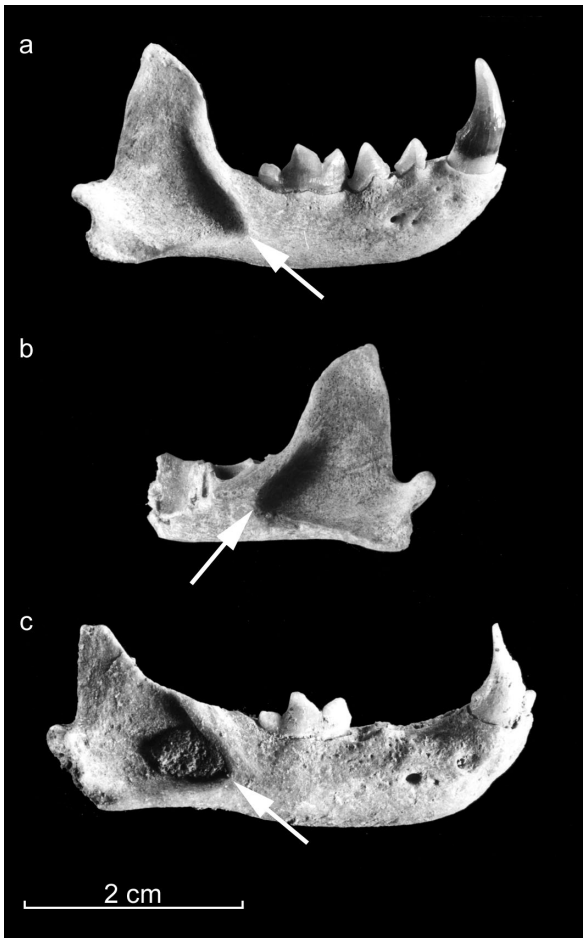
Z izjemo podočnika in metapodija so vsi ostanki iz sklopa plasti 2 do 5 verjetno pripadali istemu osebku, saj so bili najdeni blizu skupaj. Pri določevanju sem se oprl predvsem na tri spodnje čeljustnice, saj je razlikovanje med navadnim in stepskim dihurjem (*Mustela eversmanni* [Lesson, 1827]) na podlagi postkranialnih skeletnih elementov problematično (Crégut-Bonnoure 1996b). Navadni dihur naj bi se od stepskega sorodnika najbolje ločil po višini mandibule med zadnjim pred-

Tab. 11.4: Mere spodnjih čeljustnic navadnega dihurja (*Mustela putorius*) iz Divjih bab I. Navedena je tudi opisna statistika za fosilne in recentne primerke iste vrste (Malez 1963). Velikost vzorcev v izvirnem članku ni navedena. Vse mere so v mm.
Tab. 11.4: Measurements of mandibles of common polecat (*Mustela putorius*) from Divje babe I. A descriptive statistic for fossil and recent specimens of the same species is given (Malez 1963). The size of sample is not stated in the original article. All measurements are in mm.

Skeletal elememt	Dimension	Divje babe I			Europe	
		D.b.1076	D.b.1082	D.b.2510	Fossil	Recent
Mandibula	Length of P_2-M_2	–	–	20.0	17.1–21.0	–
	Height behind P_4	7.8	–	8.9	–	< 8
	Breadth under M_1	4.2	4.8	5.0	3.8–5.5	–
	Length of M_1	8.8	–	9.0	7.8–9.5	7.5–8.6
	Breadth of M_1	3.5	–	3.5	3.2–3.5	–

meljakom in prvim meljakom (Koby 1951). Medtem ko naj bi bila navedena dimenzija pri prvem namreč vedno manjša od 8 mm, se pri recentnih stepskih dihurjih giblje med 8,4 in 9,3 mm (*tab. 11.4*). Pri tem pa ne gre spregledati, da so recentni dihurji v velikosti zelo variabilni. Naletimo lahko celo na t.i. pritlikave in orjaške primerke, kar naj bi bila posledica bolj ali manj ugodnih razmer v obdobju hitre telesne rasti (Buchalczyk, Ruprecht 1977). Prav zaradi navedenega sem spodnjo čeljustnico iz plasti 8 (inv. št. D. b. 2510) pripisal k vrsti *M. putorius,* pa čeprav njena višina presega 8 mm. Ne nazadnje obravnavani primerek po nobeni od drugih merjenih dimenzij ne odstopa od fosilnih in recentnih navadnih dihurjev (*tab. 11.4*), podobnost pa je očitna tudi na morfološki ravni. Tako se jama za zunanjo žvekalko (*fossa masseterica*), ki naj bi pri stepskem dihurju segala vse do sredine prvega meljaka (Pohar 1981), pri obravnavanem primerku anteriorno konča že pod drugim meljakom (*sl. 11.7c*). Poleg tega je na bazalnem robu spodnječeljustničnega telesa (*corpus mandibulae*) pod četrtim predmeljakom in prvim meljakom pri stepskem dihurju izboklina (Crégut-Bonnoure 1996b), ki je v primeru mandibule iz plasti 8 ni oz. ni nič bolj izrazita kot pri tipičnih primerkih navadnega dihurja.

Na Slovenskem je edina najdba vrste *M. eversmanni* znana s konca riško-würmskega interglaciala (Jama pod Herkovimi pečmi; Pohar 1981), zastopana pa je tudi v favni več sočasnih najdišč zahodnega dela panonskega bazena (Malez 1963; 1979; Jánossy 1986). Danes stepski dihur naseljuje polpuščave ter gozdno in travno stepo na območjih z mrzlimi zimami in toplimi do vročimi poletji (Wolsan 1999). V nasprotju s tem naj bi plast 8 iz Divjih bab I, kjer je bila med drugim najdena tudi "sporna" spodnja čeljustnica z inv. št. D. b. 2510, nastala v obdobju razmeroma vlažne klime (Šercelj, Culiberg 1991; Turk, Bastiani 2000; Turk *et al.* 2002b; poglavje 10 v tem zborniku). Takratno okolje je bilo skladnejše z ekološkimi potrebami navadnega dihurja, ki danes naseljuje predvsem nižine in doline rek, z (umetno) izsušene zemlje pa se umakne (Kryštufek 1991).



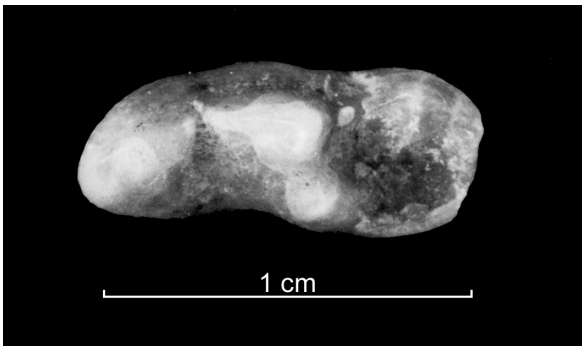
Sl. 11.7a-c: Spodnje čeljustnice dihurjev iz Divjih bab I: a – *Mustela putorius* (D. b. 1076; sklop plasti 2–5); b – *Mustela putorius* (D. b. 1082; sklop plasti 2–5); c – *Mustela* cf. *putorius* (D. b. 2510; plast 8). Puščica označuje anteriorni rob jame za zunanjo žvekalko (*fossa masseterica*). Fotografija: T. Lauko.
Fig. 11.7a-c: Mandibles of polecat from Divje babe I: a – *Mustela putorius* (D. b. 1076; complex of layers 2–5); b – *Mustela putorius* (D. b. 1082; complex of layers 2–5); c – *Mustela* cf. *putorius* (D. b. 2510; Layer 8). Arrow marks the anterior edge of the *fossa masseterica*. Photograph T. Lauko.

Martes cf. *martes* (Linnaeus, 1758)

Gradivo: Kuna zlatica je v vzorcu iz Divjih bab I zastopana s 139 ostanki. Celoten seznam najdb po plasteh in skeletnih elementih je podan v *prilogi 11.2E*.

Taksonomsko relevantne morfološke razlike med kuno zlatico in kuno belico (*M. foina* [Erxleben, 1777]) so omejene na nekaj detajlov v okviru lobanje, spodnje čeljustnice in zob. Zaradi navedenega in pa zavoljo velike variabilnosti v velikosti obeh vrst je specifična determinacija fosilnih ostankov rodu *Martes* v splošnem dokaj težavna (Bonifay 1971; Castaños 1987). Tako sem lahko izmed vseh 139 kosti in zob pravih kun iz Divjih bab I do vrste z gotovostjo določil le 27 primerkov: pet prvih zgornjih in sedem prvih spodnjih meljakov, 14 spodnjih čeljustnic ter fragment lobanje. Vse sem pripisal kuni zlatici. Najzanesljivejši taksonomski znak pri spodnjih čeljustnicah je razdalja med bradnima odprtinama (*foramen mentale*); ta pri kuni belici praviloma ne dosega 3 mm, pri kuni zlatici pa vedno presega 4 mm (Kryštufek 1991; *tab. 11.5*). Nadalje ima jezični rob prvega spodnjega meljaka pri vrsti *M. foina* na sredini jasno zajedo, medtem ko je pri vrsti *M. martes* M_1 na tem mestu le rahlo vbočen (Kryštufek 1991; *sl. 11.8*). Obe vrsti ločimo tudi po obliki prvega zgornjega meljaka. Ta ima pri kuni belici slabo razvit notranji lobus, tako da je dolžina zoba v sagitalni ravnini veliko krajša od njegove širine; pri kuni zlatici je dolžina zoba v sagitalni ravnini skoraj enaka širini (Pucek 1981). Fragment lobanje sem k vrsti *M. martes* pripisal zaradi lege tilniških odprtin (*foramen jugale*): razdalja med njima je namreč pri kuni zlatici manjša od dolžine bobničnega mehurja (*bulla tympanica*), pri kuni belici pa večja (Pucek 1981).

Ob zgoraj navedenih pripadajo kuni zlatici verjetno tudi vsi preostali fosilni ostanki rodu *Martes* iz Divjih bab I. Kot navaja Crégut-Bonnoure (1996b), naj bi bila kuna zlatica v mlajšem pleistocenu celo edini predstavnik pravih kun v Evropi, saj naj bi se kuna belica pojavila šele v holocenu (a glej tudi Malez 1963; Castaños 1987; Bon *et al.* 1991). Enako mnenje zagovarjata Argant (1991) za zahodno Evropo ter Wolsan (1993) za srednjo. V favni paleolitskih najdišč s Slovenskega je kuna belica znana le iz Potočke zijalke v Savinjskih Alpah, vendar pa je stratigrafski kontekst najdbe problematičen (Döppes 2004). Kuna zlatica je na Slovenskem znana iz več mlajšepleistocenskih najdišč (Toškan 2004).



Sl. 11.8: Prvi spodnji meljak kune zlatice (*Martes martes*) iz plasti 5 (inv. št. D. b. 2497). Fotografija: T. Lauko.
Fig. 11.8: First lower molar of pine marten (*Martes martes*) from Layer 5 (inv. no. D. b. 2497). Photograph T. Lauko.

Tab. 11.5: Opisna statistika za razdaljo med bradnima odprtinama (*foramen mentale*) pri kuni zlatici (*Martes martes*) iz Divjih bab I. Navedeni so tudi primerjalni podatki za recentne primerke *M. martes* in *M. foina* iz Nemčije. Primerjalni podatki so povzeti po Winterfeldu (1885; *cf.* Malez 1963). Vse mere so v mm.
Tab. 11.5: Descriptive statistics for the distance between the *foramen mentale* in pine marten (*Martes martes*) from Divje babe I. Comparative data for recent specimens of *M. martes* and *M. foina* from Germany. Comparative data are taken from Winterfeld (1885; *cf.* Malez 1963). All measurements are in mm.

Dimension	***M. martes* Divje babe I**	***M. martes* Recent**	***M. foina* Recent**
	Me (N) min–max	**(N) min–max**	**(N) min–max**
Distance between the two mental foramens	6.8 (9) 6.0–8.5	(17) 5.0–9.6	(26) 2.0–3.4

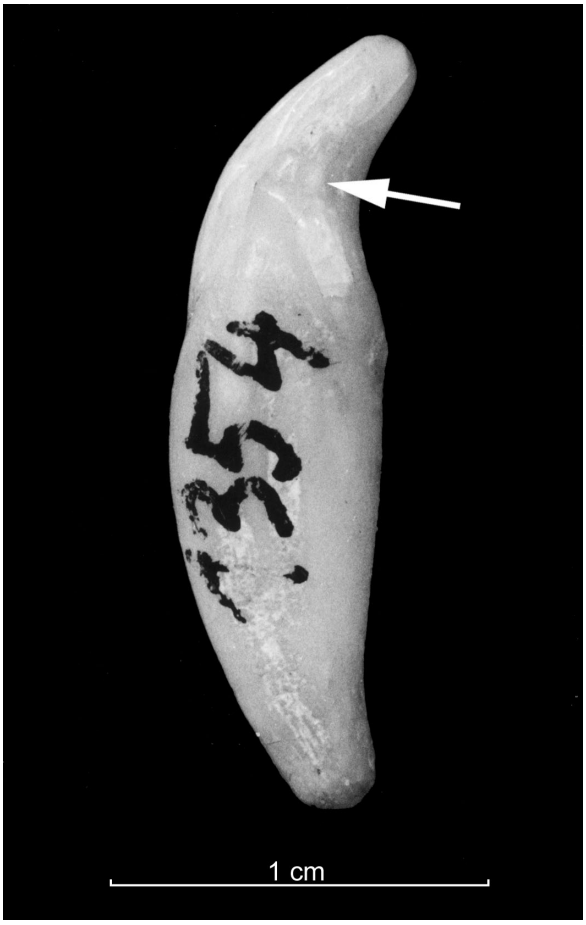
Lutra lutra (Linnaeus, 1758)

Gradivo: sklop plasti 2–5: dens (C_1).

Podočnik vidre iz Divjih bab I (inv. št. D. b. 1354) je prva znana najdba omenjene vrste s katerega od slovenskih mlajšepleistocenskih najdišč. Vrsta je sicer znana iz zgodnjeholocenskih plasti Brega pri Ljubljani (Pohar 1984), Pod Črmuklje pri Šembijah (Pohar 1986) in Viktorjevega spodmola pri Famljah (Toškan, Dirjec 2004a) ter iz mlajšepleistocenskih najdišč sosednjih Hrvaške (Malez 1986b), Madžarske (Jánossy 1986) in SV Italije (Bon *et al.* 1991).

Pri determinaciji C_1 iz sklopa plasti 2–5 sem izhajal predvsem iz njegove morfologije. Podočniki vidre se namreč bistveno ne razlikujejo od podočnikov jazbeca (*Meles meles* [Linnaeus, 1758]), katerega ostanki so dobro znani s kar nekaj mlajšepleistocenskih najdišč v regiji (Rakovec 1973). Primerek sem določil za vidro predvsem zato, ker ima spodnji podočnik pri jazbecu na mezio-lingvalni strani močno izražen rob; ta se od baze krone vleče skoraj do njene konice. Za razliko od tega ima C_1 vidre na tem delu le manjši greben, ki je omejen na bazalni del zobne krone (*sl. 11.9*). Poleg tega je obravnavan podočnik tudi po svoji velikosti očitno manjši od C_1 fosilnih jazbecev (*tab. 11.6*).

V posutem sedimentu iz Divjih bab I je bil najden še en spodnji podočnik, ki bi ga lahko pogojno pripisal



Sl. 11.9: Desni spodnji podočnik vidre (*Lutra lutra*) iz sklopa plasti 2–5 (inv. št. D. b. 1354). Puščica označuje greben na mezio-lingvalni strani krone. Fotografija: T. Lauko.
Fig. 11.9: Right lower canine of otter (*Lutra lutra*) from the complex of layers 2–5 (inv. no. D. b. 1354). Arrow marks the ridge on the meziolingual side of the crown. Photograph T. Lauko.

k vrsti *L. lutra*. Žal je krona na mezialnem delu poškodovana, zaradi obrušenosti pa manjka tudi njen vrh. Glede na morfologijo ohranjenega dela bi ga sicer lahko pripisal tudi jazbecu, po velikosti pa je vendarle bliže vidri (*tab. 11.6*).

Družina: Mačke (Felidae)

Felis silvestris Schreber, 1777

Gradivo: plast 8: mandibula, dens (P^4).

Obe najdbi divje mačke iz Divjih bab I sta verjetno pripadali isti živali, saj izvirata iz istega kvadrata in izkopa. Od spodnje čeljustnice je ohranjen le kronski odrastek (*processus coronoideus*) s spodnječeljustnično glavo (*caput mandibulae*), na P^4 pa manjkajo baze vseh treh korenin. Ohranjeni deli korenin so tako kot tudi krona votli. Pri domači mački izraste stalni četrti zgornji predmeljak pri starosti štirih do petih mesecev (Silver 1972). Ker primerek iz Divjih bab I že kaže rahle sledi obrabe žvekalne površine, ocenjujem, da je pripadal sicer juvenilni, a verjetno nad leto dni stari živali.

Lynx lynx (Linnaeus, 1758)

Gradivo: sklop plasti 2–5: dens (M_1); plast 6: dens (P_4); plast 2–11/12: dens (M_1).

Rod risov je v Divjih babah I zastopan s 3 izoliranimi zobmi. Na četrtem spodnjem predmeljaku iz plasti 6 (inv. št. D. b. 2072) je parakonid prisoten in dobro razvit. Enako velja za hipokonid in bazalni cingulum na posteriornem delu krone. Pripis navedenega primerka k rodu *Lynx* se zato kljub dodatnemu parastilidu posteriorno od hipokonida (*sl. 11.10a*) ne zdi sporen.

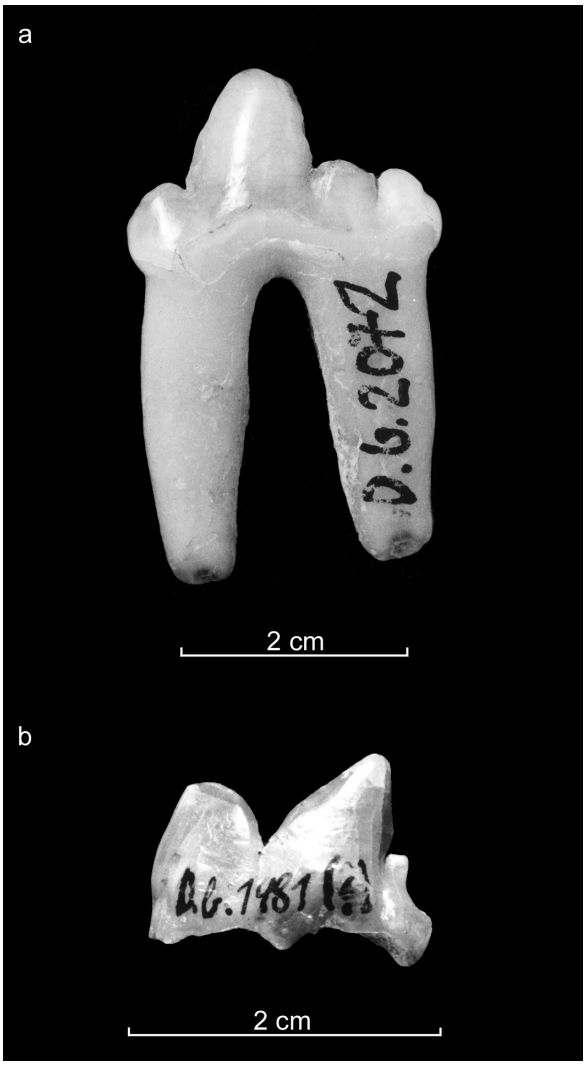
Bolj problematična od generične je specifična determinacija obravnavanih najdb. Iz mlajšega pleistocena Evrope je namreč poleg evrazijskega ali severnega risa znan še iberski ris (*Lynx pardinus* [Temminck, 1827]), pri čemer so razlike v morfologiji in velikosti skeletnih elementov med obema vrstama minimalne. Podatek o največji dolžini četrtega spodnjega meljaka iz Divjih bab I ima tako le omejeno taksonomsko vrednost, pa čeprav se zob umešča znotraj variacijske širine recentnih primerkov evrazijskega risa iz severne Evrope in s tem presega velikost P_4 fosilnih iberskih risov iz Španije

Tab. 11.6: Mere spodnjega podočnika (C_1) vidre (*Lutra lutra*) iz Divjih bab I. Navedena je tudi opisna statistika za fosilne primerke jazbeca (*Meles meles*) iz Evrope (Malez 1963; Argant 1991). Determinacija primerka z inventarno številko D. b. 1523 ni zanesljiva. Vse mere so v mm.
Tab. 11.6: Measurements of lower canines (C_1) of otter (*Lutra lutra*) from Divje babe I. Descriptive statistics for fossil specimens of badger (*Meles meles*) from Europe (Malez 1963; Argant 1991) are also stated. Identification of specimen with inventory number D. b. 1523 is not reliable. All measurements are in mm.

Dimension	**Divje babe I** *L. lutra*		**Europe** *M. meles* **(fossil)**
	D.b. 1354	**D.b. 1523**	**(N) min–max**
Ant.-post. breadth at the base of C_1 crown	5.1	5.6	(7) 8.0–9.5
Medio-lat. breadth at the base of C_1 crown	3.5	3.5	(7) 6.0–7.0

Tab. 11.7: Mere četrtega spodnjega predmeljaka (P_4) in prvega spodnjega meljaka (M_1) evrazijskega risa (*Lynx lynx*) iz Divjih bab I. Navedena je tudi opisna statistika za recentne primerke *L. lynx* iz severne Evrope (Schmid 1940) ter fosilne *L. pardinus* iz Španije (Ficcarelli in Torre 1977). Vse mere so v mm.
Tab. 11.7: Measurements of the fourth lower premolar (P_4) and first lower molar (M_1) of Eurasian lynx (*Lynx lynx*) from Divje babe I. Descriptive statistics of *L. lynx* from northern Europe (Schmid 1940) and fossil *L. pardinus* from Spain are also given (Ficcarelli and Torre 1977). All measurements are in mm.

Tooth	**Dimension**	**Divje babe I**	**N Europe**	**Spain**
			***L. lynx* (recent)**	
		L. lynx	**x (N)** **min–max**	***L. pardina* (fossil)**
P_4	Greatest length	13.8	12.2 (29) 11.2–13.9	< 11.5
M_1	Greatest length	18.3	15.7 (31) 14.0–17.3	< 14.0
	L. of protoconid	12.7	9.8 (32) 8.9–10.9	–
	L. of paraconid	8.1	7.6 (31) 6.7–8.2	–
	Greatest breadth	6.0	6.9 (32) 6.3–7.5	–
	L. of paraconid as % of protoconid length	65.3	77.1 (31) 69.8–83.5	–



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Sl. 11.10a, b: Kočnika evrazijskega risa (*Lynx lynx*) iz Divjih bab I: a – četrti spodnji predmeljak (D. b. 2072; plast 6); b – prvi spodnji meljak (D. b. 70; sklop plasti 2–5). Fotografija: T. Lauko.
Fig. 11.10a, b: Cheek teeth of lynx (*Lynx lynx*) from Divje babe I: a – fourth lower pre-molar (D. b. 2072; Layer 6); b – first lower molar (D. b. 70; complex of Layers 2–5). Photograph T. Lauko.

(*tab. 11.7*). Metrični podatki (zob) namreč ne veljajo za zanesljiv taksonomski znak (Argant 1996b). Na Slovenskem je sicer vrsta *L. lynx* zastopana v fosilni favni treh najdišč (Pavšič, Turk 1989; Dirjec. Turk 1992; Pohar, Brodar 2000), medtem ko dokazov o prisotnosti iberskega risa ni.[6] Slednji manjka tudi v mlajšepleistocenski favni SV Italije, JV Avstrije in Madžarske (Jánossy 1986; Rustioni *et al.* 1995; Fladerer 2000), na Hrvaškem pa je znana le iz jame Veternica v Medvednici (Malez 1963). Zaradi navedenega sem četrti spodnji predmeljak iz plasti 6 Divjih bab I pogojno vendarle pripisal evrazijskemu risu.

Isti vrsti sem pripisal tudi prvi spodnji meljak iz interpleniglacialnega sklopa plasti 2 do 11/12 (inv. št. D. b. 70). Pri iberskem risu namreč M_1 na posteriornem delu nima razvitih metakonida in bazalnega cinguluma (Bonifay 1966; 1971; Castaños 1987), medtem ko sta na primerku iz Divjih bab I prisotna oba (*sl. 11.10b*). Prvi spodnji meljak iz sklopa plasti 2–11/12 izstopa tudi

[6] Rakovec (1961) je sicer vrsti *L. pardinus* pripisal tri podočnike iz Parske golobine v Pivški kotlini, vendar je poznejša revizija pokazala na zmotnost takšne determinacije (Krofel *et al.* 2005).

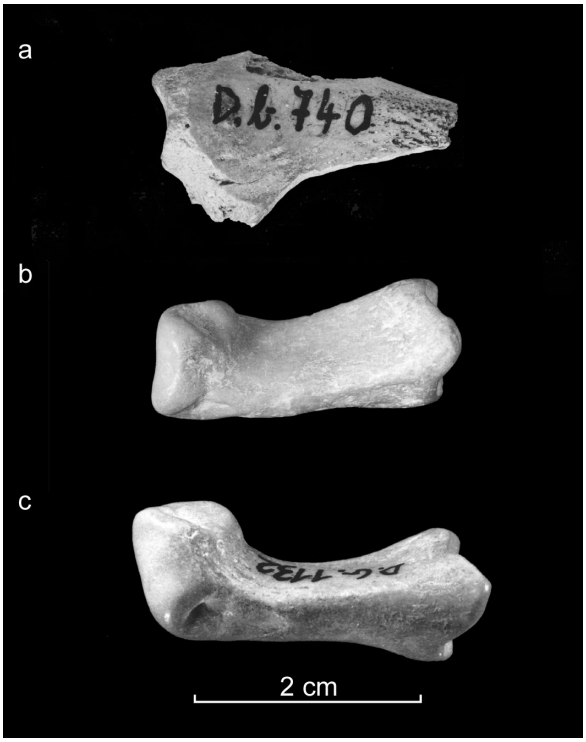
po podaljšanem talonidu, česar pri iberskem risu ni (Argant 1996b). Prav zaradi nadpovprečno podaljšanega metakonida-talonida se M_1 iz Divjih bab I znotraj variacijske širine recentnih evrazijskih risov iz severne Evrope umešča le v tistih dimenzijah, ki se ne nanašajo na skrajni distalni del zoba (tj. največja širina krone in dolžine parakonida; *tab. 11.7*).

Determinacija prvega spodnjega meljaka iz sklopa plasti 2 do 5 (D. b. I, kv. 41c/2) je bolj problematična, saj je od zoba ohranjen le del krone. Na osnovi velikosti ohranjenega fragmenta ter kota med posteriornim grebenom parakonida in mezialnim grebenom protokonida sem tudi ta primerek pripisal k rodu *Lynx*.

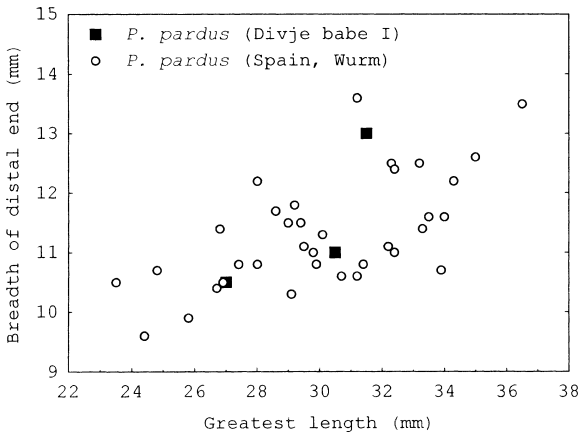
Panthera pardus (Linnaeus, 1758)

Gradivo: sklop plasti 2–5: dens (M_1), vertebra, os carpale, phalanx II (3x), phalanx III; plast neznana: phalanx III.

Leopard je v fosilni favni Divjih bab I zastopan z osmimi najdbami, ki so vse interpleniglacialne starosti. Repno vretence, zapestna kost ter po ena druga in tretja



Sl. 11.11a-c: Prstnice leopardov (*Panthera pardus*) iz Divjih bab I: a – fragment tretje prstnice (inv. št. D. b. 740; sklop plasti 2–5); b – druga prstnica (inv. št. D. b. 835; sklop plasti 2–5); c – druga prstnica (inv. št. D. b. 1132; sklop plasti 2–5). *Fig. 11.11a-c*: Phalanxes of leopards (*Panthera pardus*) from Divje babe I: a – fragment of third phalanx (inv. no. D. b. 740; complex of layers2–5); b – second phalanx (inv. no. D. b. 835; complex of layers 2–5); c – second phalanx (inv. no. D. b. 1132; complex of layers 2–5).



Sl. 11.12: Grafični prikaz razmerja med največjo dolžino in širino distalnega konca druge prstnice leoparda (*Panthera pardus*) iz Divjih bab I in z več mlajšepleistocenskih najdišč Španije. Podatke za španska najdišča podaja Castaños (1987). *Fig. 11.12*: Graphic presentation of the ratio between the greatest length and the breadth of the distal end of the second phalanxes of leopard (*Panthera pardus*) from Divje babe I and a number of Upper Pleistocene sites in Spain. Data for the Spanish sites provided by Castaños (1987).

prstnica so verjetno pripadali istemu osebku, saj so bili najdeni blizu skupaj. Morfološko se v celoti ujemajo z ustreznimi skeletnimi elementi recentnih in fosilnih leopardov, tako da njihova determinacija ni bila problematična (*sl. 11.11*). Enako velja za preostali prstnici iz istega sklopa plasti, ki se s fosilnimi primerki vrste *P. pardus* ujemajo tudi po velikosti (*sl. 11.12*).

Prvi spodnji meljak iz sklopa plasti 2 do 5 (inv. št. D. b. 646) je poškodovan; ohranjena sta le parakonid in del mezialne korenine. V največji dolžini parakonida se obravnavani primerek kljub vsemu umešča znotraj variacijske širine za recentne leoparde iz Afrike in Azije, obenem pa odstopa od metričnih podatkov za recentne rise iz Severne Evrope in Rusije (*tab. 11.8*).

Panthera spelaea Goldfuss, 1810

Gradivo: sklop plasti 2–5: dentes (dP_3, dP_4, P^4); plast 6-7: phalanx II (?); plast 7: phalanx III, vertebra; plast 8: dentes (dP_3, M_1), vertebra; plast 17a: dens (P_4), vertebra, phalanx III; plast 21: vertebra; sklop plasti 12/13–22: metatarsus III, astragalus, phalanx II, phalanx III; plast neznana: fibula.

Jamskemu levu sem pripisal 18 ostankov, od tega šest zob. Najdbe so v morfološkem smislu značilno felidne, pri specifični determinaciji pa sem se v veliki meri naslonil na metrične podatke (*tab. 11.9* in *tab. 11.10*). Jamski lev namreč po svoji velikosti bistveno presega pripadnike drugih velikih mačk, ki so v mlajšem pleistocenu naseljevale srednjeevropski prostor. Nekoliko problematična je le determinacija druge prstnice iz plasti

Tab. 11.8: Dolžina parakonida prvega spodnjega meljaka (M_1) leoparda (*Panthera pardus*) iz Divjih bab I. Navedena je tudi opisna statistika za recentne primerke *P. pardus* iz Afrike in Azije ter *L. lynx* iz severne Evrope in Rusije (Schmid 1940). Definicija dimenzije je povzeta po Schmidovi (1940). Vse mere so v mm.
Tab. 11.8 : Length of paraconide of the first lower molar (M_1) of leopard (*Panthera pardus*) from Divje babe I. Descriptive statistics for recent specimens of *P. pardus* from Africa and Asia and *L. lynx* from northern Europe and Russia are also given (Schmid 1940). The definition of the dimension is taken from Schmid (1940). All measurements are in mm.

Dimension	**Divje babe I**	**Africa. Asia** ***P. pardus* (recent)**	**N Europe. Russia** ***L. lynx* (recent)**
	P. pardus	**x (N)** **min-max**	**x (N)** ***min-max***
Length of paraconid	9.8	9.2 (167) 7.3-11.5	7.6 (31) 6.7-8.2

6 do 7 (inv. št. D. b. 1783; *sl. 11.13a*). Primerek je namreč izrazito kratek in robusten. Od jamskih levov z različnih evropskih najdišč (*tab. 11.10*) se razlikuje tako v svoji največji dolžini (tj. 33,0 mm) kot tudi v širini distalne epifize (tj. 26,0 mm).

Biometrične raziskave zobovja jamskih levov z različnih evropskih najdišč so izpostavile precejšnje razlike med posameznimi alopatričnimi populacijami. Turner (1984) ugotovljeno heterogenost razlaga (predvsem) v kontekstu spolnega dimorfizma, Schütt, Hemmer

Tab. 11.9: Mere stalnih zob jamskega leva (*Panthera spelaea*) iz Divjih bab I. Navedena je tudi opisna statistika za fosilne primerke iste vrste iz različnih najdišč Evrope ter recentne primerke *P. leo*, *P. tigris* in *P. pardus.* Dimenzije so povzete po Schmidovi (1940). Podatki za primerjalne vzorce so povzeti po naslednjih avtorjih: fosilni *P. spelaea* - Rakovec (1951), Schütt (1969), Tichy (1985), Sala (1990a), Gužvica (1998); recentni *P. leo* in *P. tigris* - Schütt (1969) ter recentni *P. pardus* - Schmid (1940). Vse mere so v mm.
Tab. 11.9: Measurements of permanent teeth of cave lion (*Panthera spelaea*) from Divje babe I. Descriptive statistics are also given for fossil specimens of the same species from various sites in Europe and recent specimens of *P. leo*, *P. tigris* and *P. pardus.* Dimensions are given according to Schmid (1940). Data for comparative specimens are taken from the following authors: fossil *P. spelaea* - Rakovec (1951), Schütt (1969), Tichy (1985), Sala (1990a), Gužvica (1998); recent *P. leo* and *P. tigris* - Schütt (1969) and recent *P. pardus* - Schmid (1940). All measurements are in mm.

Tooth	**Dimension**	**D. babe I**	***P. spelaea* (fossil)**	***P. leo* (recent)**	***P. tigris* (recent)**	***P. pardus* (recent)**
		P. spelaea	**(N)** **min-max**	**x (N)** **min-max**	**x (N)** **min-max**	**x (N)** **min-max**
P^4	Greatest length	33.2	(21) 35.5-42.3	35.5 (159) 31.0- 40.0	31.5 (68) 28.5-37.5	25.1 (12) 22.1-26.3
	Length to deuterocone	30.5	(21) 35.1-42.1	34.0 (159) 29.5-40.5	31.0 (68) 27.0-36.5	25.2 (12) 22.6-26.2
	Length of protocone	13.0	(9) 14.0-16.9	13.0 (159) 11.0-16.0	11.5 (68) 8.5-14.5	10.0 (12) 8.9-10.8
P_4	Greatest length	28.0	(31) 21.9-31.4	25.5 (159) 20.5-29.5	21.5 (68) 18.5-25.0	17.8 (12) 16.2-18.9
	Length of protoconid	14.1	(24) 11.0-15.1	11.0 (159) 9.5-14.0	9.5 (68) 7.5-12.0	8.8 (12) 8.5-10.1
	Breadth of distal part	13.3	(11) 10.0-14.0	11.0 (159) 9.0-15.5	9.5 (68) 8.0-12.0	8.3 (12) 7.6-8.9
	Breadth of middle part	13.0	(24) 10.0-12.9	10.0 (159) 7.5-13.0	8.5 (68) 7.0-10.5	8.6 (12) 7.6-9.2
M_1	Greatest length	27.7	(53) 26.2-32.7	26.5 (159) 22.5-32.5	24.0 (68) 19.5-28.0	17.5 (167) 14.6-21.1
	Length of protoconid	18.8	(43) 14.5-20.9	15.5 (159) 13.5-18.5	14.0 (68) 11.5-17.5	10.5 (170) 8.6-12.6
	Length of paraconid	14.0	(42) 12.5-17.6	14.0 (159) 11.0-17.5	12.5 (68) 10.0-16.0	9.2 (167) 7.3-11.5
	Greatest breadth	13.3	(45) 12.5-17.0	13.0 (159) 11.0-16.5	10.5 (68) 8.5-13.0	8.2 (170) 6.8-10.2
	Height between protoconid & paraconid	9.2	(39) 7.0-10.5	7.5 (159) 6.0-10.5	7.0 (68) 5.5-10.0	5.2 (167) 4.3-6.9

Tab. 11.10: Mere tretje stopalnice in druge prstnice jamskega leva (*Panthera spelaea*) iz Divjih bab I. Navedena je tudi opisna statistika za fosilne primerke iste vrste iz različnih najdišč Evrope. Primerjalni podatki so povzeti po naslednjih avtorjih: Rakovec (1965), Altuna (1981), Argant (1991) in Nagel (1996). Vse mere so v mm.
Tab. 11.10: Measurements of the third metatarsus and second phalanx of cave lion (*Panthera spelaea*) from Divje babe I. Descriptive statistics for fossil specimens of the same species from various sites in Europe are also given. Comparative data are taken from the following authors: Rakovec (1965), Altuna (1981), Argant (1991) and Nagel (1996). All measurements are in mm.

Skeletal element	**Dimension**	**Divje babe I**	**Europe**
		P. spelaea	***P. spelaea***
			Me (N)
			min–max
Metatarsus III	Greatest length	143.0	140.2 (11) 130.0–162.0
(D.b. 564; OIS 5a-5d)	Anterior–posteror breadth of diaphysis	18.1	20.0 (9) 18.0–20.0
Phalanx II	Greatest length	45.0	41.5 (10) 37.0–55.8
(D.b. 588; OIS 5a-5d)	Breadth of distal end	17.0	19.95 (10) 16.1–23.8

(1978) pa jo pripisujeta izolaciji zaradi ponavljajočih se poledenitev v würmu. Jamski levi iz vzhodnoalpskega prostora naj bi po njunem predstavljali ločeno vejo v razvoju vrste. Od tistih iz sosednjih populacij naj bi se razlikovali predvsem po večji masi ter relativno širših predmeljakih in meljakih. Vendar pa sta v tem smislu oba nepoškodovana kočnika iz Divjih bab I bliže primerkom z najdišč SZ Hrvaške, ki jih Gužvica (1998) povezuje z zahodnoevropsko linijo jamskega leva. To je pri prvem spodnjem meljaku (inv. št. D. b. 1864; *sl. 11.13b*) razvidno tako iz odebeljenega roba baze krone in poudarjenega cinguluma na lingvalni strani, kot tudi iz razmerja med največjo širino in dolžino zoba (ta znaša komaj 0,505). Podobno velja za četrti zgornji predmeljak (inv. št. D. b. 728), kjer znaša razmerje med dolžino zoba do devterokona in njegovo največjo dolžino le 0,919 (prim. Gužvica 1998).

Sestavo veredostojne starostne strukture onemogoča skromno število najdb (prim. Lyman 1987), velja pa opozoriti na enako število stalnih in mlečnih zob. Determinacija slednjih temelji na njihovih morfoloških značilnostih. Tako se mlečni P_3 (inv. št. D. b. 631; *sl. 11.13c*) s parom razmeroma močnih, očitno poševno izraščajočih korenin bistveno razlikuje od stalnega P_3 iste vrste (Smuts *et al.* 1978). Poševno izraščajoči korenini, od katerih je mezialna bistveno robustnejša od distalne, sta značilni tudi za mlečni četrti spodnji meljak (inv. št. D. b. 1355; *sl. 11.13d*); ta ima sicer že povsem molariformno oblikovano krono. Morfološko bi naveden zob lahko ustrezal tudi mlečnemu P_4 leoparda. Vendar pa je največja dolžina zoba iz Divjih bab I kar 18,5 mm, medtem ko je po Schmidovi (1940) razpon vrednosti iste dimenzije pri stalnih (!) P_4 recentnih leopardov komaj 13,5–20,4 mm (povprečna vrednost: 16,9; N = 157). Mere stalnih P_4 vrst *P. spelaea* in *P. leo* so navedene v *tabeli 10.9*, dolžina mlečnega P_4 pri vrsti *P. spelaea* iz Nemčije pa znaša 18,75 mm (Heller 1983). Tudi mlečni tretji zgornji meljak (inv. št. D. b. 2073; *sl. 11.13e*) morfološko povsem ustreza enakemu zobu jamskega leva (Smuts *et al.* 1978). Ima tri korenine, od katerih sta dve močneje razviti, krono pa od krone stalnih zob loči predvsem lega devterokona. Ta namreč pri mlečnem tretjem zgornjem predmeljaku ne leži lingvo–distalno od parastila, kot je to značilno za stalni P_3, temveč je pomaknjena mezialno na samo vzdolžno (tj. mezio–distalno) os zoba (prim. Rabeder 1992). Na osnovi smernic, ki jih podajajo Smuts in sodelavci (1978), so navedeni trije mlečni zobje pripadali do 17 mesecev starim osebkom.

Red: Sodoprsti kopitarji ali parkljarji (Artiodactyla)

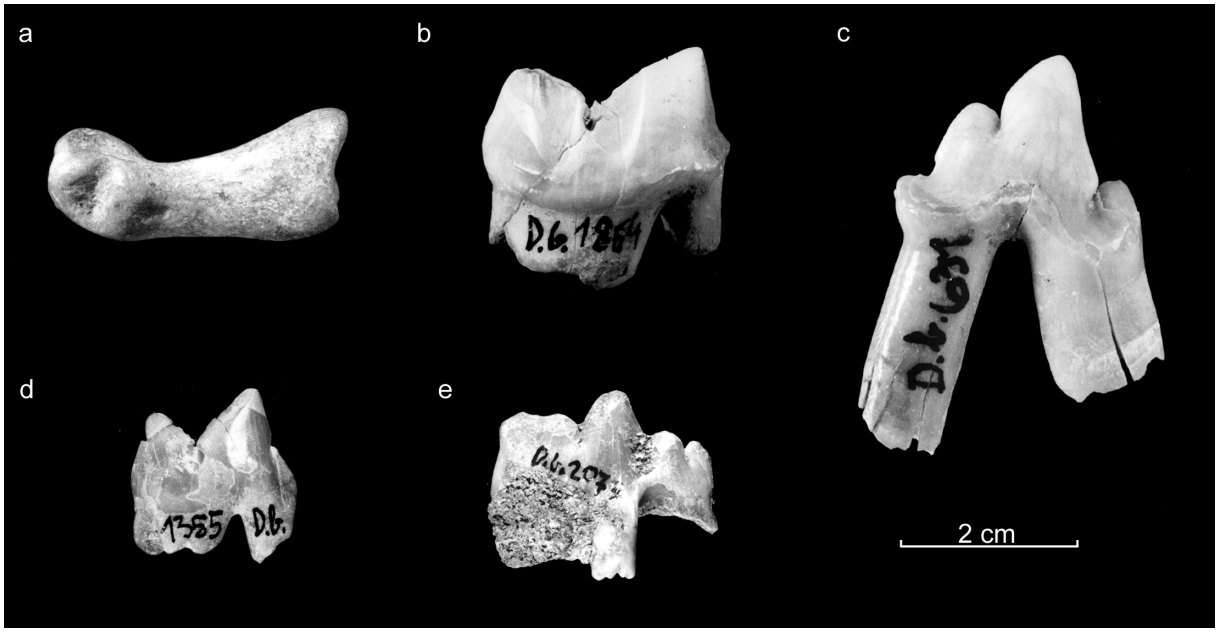
Parkljarji so v vzorcu iz Divjih bab I zastopani s šestimi vrstami iz dveh družin. Večino najdb sem določil vsaj do nivoja rodu, 13 ostankov pa sem determiniral le do nivoja družine. Od slednjih sem jih večji del pripisal votlorogom (Bovidae), fragment metapodija pa jelenom (Cervidae).

Družina: Prašiči ali svinje (Suidae)

Sus scrofa Linnaeus, 1758

Gradivo: sklop plasti 2–5: maxilla (vključujoč P^4 in M^1), dens ($I_{inf.}$), phalanx I.

Divji prašič je v favni Divjih bab I zastopan s tremi najdbami, ki vse izvirajo iz sklopa plasti 2 do 5. Struktura in stopnja obrabe zob kažeta, da so verjetno pripadali do 18 let starima osebkoma (prim. Schmid 1972; Rolett, Chiu 1994). Prstnica je ostanek vsaj eno do dve leti stare živali (Schmid 1972). Divji prašič velja za razmeroma toploljubno vrsto, tako da bi lahko bile najdbe iz sklopa plasti 2 do 5 Divjih bab I pravzaprav v drugotni legi. Po drugi strani pa kaže omeniti, da je vrsta zastopana tudi v favni nekaterih sočasnih najdišč SV Italije



Sl. 11.13a-e: Ostanki jamskega leva (*Panthera spelaea*) iz Divjih bab I: a – phalanx II (D. b. 1783; plast 6-7); b – M_1 (D. b. 1864; plast 8), c – mlečni P_3 (D. b. 631; sklop plasti 2–5); d – mlečni P_4 (D. b. 1355; sklop plasti 2–5); e – mlečni P^3 (D. b. 2073; plast 8). Fotografija: T. Lauko.
Fig. 11.13a-e: Remains of cave lion (*Panthera spelaea*) from Divje babe I: a – phalanx II (D. b. 1783; Layer 6-7); b – M_1 (D. b. 1864; Layer 8), c – deciduous P_3 (D. b. 631; complex of layers 2–5); d – deciduous P_4 (D. b. 1355; complex of layers 2–5); e – deciduous P^3 (D. b. 2073; Layer 8). Photograph T. Lauko.

(Bon *et al.* 1991), Slovenije (Rakovec 1973), Madžarske (Jánossy 1986), Hrvaške (Malez 1986) in morda celo JV Avstrije (Fladerer 2000).

Družina: Jeleni (Cervidae)

Cervus elaphus Linnaeus, 1785

Gradivo: sklop plasti 2–5: metacarpus*, metatarsus, metapodium*, phalanx II; plast 7/8: phalanx II; plast 10: os carpale, os tarsale; plast 13: dens ($I_{inf.}$), metacarpus; plast 14: os carpale; plast 17: metacarpus; plast 20: os carpale; sklop plasti 2–11/12: os carpale*; sklop plasti 12/13–22: os carpale; plast neznana: metacarpus, phalanx III. Z zvezdico (*) so označeni izrazito fragmentirani primerki, katerih specifična determinacija ni zanesljiva.

Jelen je v vzorcu iz Divjih bab I zastopan s 17 ostanki. Determinacija treh izmed njih je pogojna; morfološko sicer v ničemer ne odstopajo od tipičnih cervidnih primerkov, so pa vse izrazito fragmentirane. Število ostankov zgodnjeglacialne starosti je primerljivo s številom interpleniglacialnih najdb, česar v gradivu iz Divjih bab I ne izkazuje noben drug takson velikih sesalcev.

(?) *Alces alces* (Linnaeus, 1758)

Gradivo: sklop plasti 4–6: phalanx II.

Cervidna proksimalna epifiza druge prstnice iz sklopa plasti 4 do 6 (inv. št. D. b. 100) je verjetno pripadala losu. Primerek namreč v največji medio-lateralni širini proksimalne epifize ne odstopa od vrednosti za postglacialne lose vzhodne Francije in Švice ter tako v velikosti presega fosilne primerke vrste *C. elaphus* z različnih evropskih najdišč (*tab. 11.11*). Slovenski prostor naj bi sicer v würmu naseljevala tudi večja oblika (podvrsta?) jelena, ki ga Poharjeva (1994) povezuje z maralom (*C. elaphus maral*). Ker pa za dimenzijami prstnic postglacialnih losov zaostajajo tudi ustrezne vrednosti fosilnih maralov (Mottl 1951; Malez 1963; Chaix in Desse 1981), sem primerek iz sklopa plasti 4 do 6 pogojno vendarle

Tab. 11.11: Mediolateralna širina proksimalnega konca (Bp) druge prstnice losa (*Alces alces*) iz Divjih bab I. Navedena je tudi opisna statistika za postglacialne primerke iste vrste iz vzhodne Francije in Švice (Chaix, Desse 1981). Vse mere so v mm.
Tab. 11.11: Mediolateral breadth of proximal end (Bp) of the phalanx II of moose (*Alces alces*) from Divje babe I. Descriptive data for post-glacial specimens of the same species from eastern France and Switzerland are also given (Chaix, Desse 1981). All measurements are in mm.

Dimension	**Divje babe I**	**W Europe** *A. alces*
	(?) A. alces	**x (N) min-max**
Bp	27.5	28.9 (36) 23.6–33.2

pripisal k vrsti *A. alces*. Skladne s takšno determinacijo so morfološke značilnosti najdbe. Za lose značilna razširitev na antero-medialnem robu proksimalne sklepne površine je namreč (kljub fragmentiranosti) nakazana tudi na obravnavani drugi prstnici iz Divjih bab I (*sl. 11.14*).

Na Slovenskem so najdbe losa znane že s konca mindelško-riškega intergalciala (Brodar 1970), zastopan pa je tudi v favni več mlajšepleistocenskih najdišč (Toškan 2004). V nasprotju s tem so najdbe marala znane izključno s treh najdišč mlajšega würma (Rakovec 1962–63; Pohar 1985; 1992).

Opomba: V plasti 8 je bil poleg drugega najden tudi fragment cervidne sezamoidne kosti. Ker ta morfološko ne odstopa od enake kosti jelena, je pa od slednje očitno večja, gre morda tudi v tem primeru za losa.

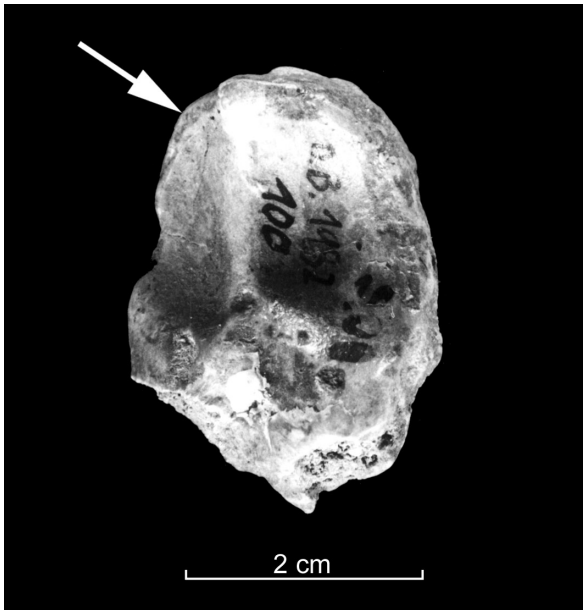
Capreolus capreolus (Linnaeus, 1758)

Gradivo: sklop plasti 2–5: ulna, os tarsale, phalanx I; plast 6: phalanx II; plast 8: phalanx I (2x), phalanx II, phalanx III, os carpale; plast 11: phalanx I; plast 14: phalanx I; plast neznana: phalanx I.

Skupno sem srni pripisal 14 ostankov, od katerih le eden izvira iz zgodnjeglacialnega sklopa plasti. Sicer maloštevilne izmerljive najdbe vrste *C. capreolus* iz Divjih bab I se po velikosti umeščajo znotraj variacijske širine subfosilnih primerkov iste vrste iz osrednje Slovenije (*tab. 11.12*).

Rupicapra rupicapra (Linnaeus, 1758)

Gradivo: Gams je v vzorcu iz Divjih bab I zastopan s 112 ostanki. Celoten seznam najdb po plasteh in skeletnih elementih je podan v *prilogi 11.2F.*

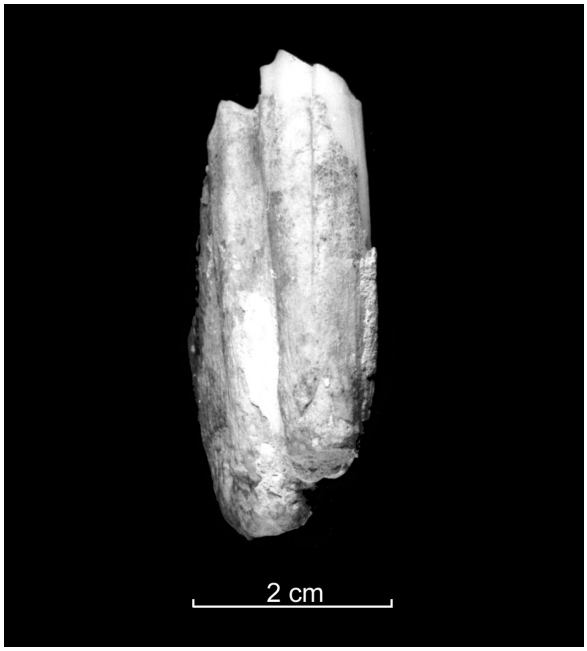


Sl. 11.14: Proksimalna epifiza druge prstnice losa (*Alces alces*) iz sklopa plasti 4–6 (inv. št. D. b. 100). Puščica označuje nakazano razširitev sklepne površine na njenem antero-medialnem robu.
Fig. 11.14: Proximal epiphysis of the phalanx II of moose (*Alces alces*) from the complex of layers 4–6 (inv. no. D. b. 100). Arrow marks the enlargement of the articular surface at its antero-medial edge.

Gams je daleč najbolje zastopan rastlinojed v Divjih babah I. Pri determinaciji sem se oprl na smernice, ki so jih objavili Prat (1966), Crégut-Bonnoure in Guérin (1996c), Pucher in Engl (1997) ter Gamble (1997). Razpoložljivi metrični podatki kažejo, da se fosilni gamsi v velikosti niso bistveno razlikovali od subfosilnih pri-

Tab. 11.12: Mere nekaterih kosti srne (*Capreolus capreolus*) iz Divjih bab I. Navedena je tudi opisna statistika za subfosilne primerke iste vrste iz osrednje Slovenije (eneolitik; Toškan in Dirjec 2004b). Dimenzije so povzete po von den Driesch (1976) in so razložene v *prilogi 11.1.* Vse mere so v mm.
Tab. 11.12: Measurements of some bones of roe deer (*Capreolus capreolus*) from Divje babe I. Descriptive data for sub-fossil specimens of the same species from central Slovenia are also given (Eneolithic; Toškan and Dirjec 2004b). Dimensions are taken from von den Driesch (1976) and are explained in *Annex 11.1.* All measurements are in mm.

Skeletal element	**Dimension**	**Divje babe I** *C. capreolus*				**Slovenia** *C. capreolus* **(subfossil)** **Me (N) min–max**
Ulna	BPC	17.0 D.b. 677				– (2) 14.0–15.0
Phalanx I	GL	–	–	39.0 D.b. 14	–	38.5 (10) 32.0–42.0
	Bp	11.0 D.b. 2479	–	11.0 D.b. 14	12.0 D.b. 1994	11.0 (9) 9.5–11.5
	Bd	–	9.0 D.b. 2481	10.5 D.b. 14	–	9.5 (13) 8.0–13.0
Phalanx II	Bp	11.0 D.b. 2476		–		10.0 (10) 8.0–11.0
	Bd	–		8.0 D.b. 2478		7.0 (10) 6.0–7.5



Sl. 11.15: Tretji spodnji meljak alpskega kozoroga (*Capra ibex*) iz sklopa plasti 2–5 (inv. št. D. b. 850). Fotografija: T. Lauko.
Fig. 11.15: Third lower molar of alpine ibex (*Capra ibex*) from the complex of layers 2–5 (inv. no. D. b. 850). Photograph T. Lauko.

merkov z istega območja (*pril. 11.1i*). Ostanki iz najglobljih plasti Divjih bab I domnevno izvirajo iz obdobja prehoda riško-würmskega interglaciala v würmski glacial (Turk *et al.* 2001a), s čimer se uvrščajo med najstarejše znane najdbe vrste *R. rupicapra* na Slovenskem.

Capra ibex Linnaeus, 1758

Gradivo: sklop plasti 2–5: dentes (C_1, M_3), femur, tibia (2x), phalanx II (2x), phalanx III; plast 6: dens (M_2).

Alpski kozorog je bil v vzorcu zastopan z devetimi ostanki. Morfološko vsi ustrezajo opisom, ki jih je za posamezne kosti vrste *C. ibex* podal Prat (1966). Nekoliko odstopa le tretji spodnji meljak iz sklopa plasti 2 do 5 (inv. št. D. b. 850). Njegov distalni (tj. tretji) stebriček namreč ne kaže za vrsto *C. ibex* značilne odebelitve na bazi krone (*sl. 11.15*). Metrično se navedeni primerek umešča znotraj variacijske širine fosilnih alpskih kozorogov z več evropskih najdišč (*tab. 11.13*).

Na osnovi obrabe žvekalne ploskve M_3 iz sklopa plasti 2 do 5 in M_2 iz plasti 6 bi lahko obe najdbi pripisal stari živali (Gamble 1997; Payne 1973; Deniz, Payne 1982). Pri kosteh je bilo mogoče starost ob uplenitvi/poginu oceniti le pri dveh primerkih, pri katerih epi- in diafiza še nista zraščeni. Tibia iz sklopa plasti 2 do 5 je pripadala subadultnemu osebku (starost ob zakolu < 5 let), femur iz posutega sedimenta pa juvenilni, največ poldrugo leto stari živali (Gamble 1997).

Red: Trobčarji (Proboscidea) / Lihoprsti kopitarji (Perissodactyles)

Družina: Sloni (Elephantidae) / Nosorogi (Rhinocerotidae)

Mammuthus primigenius (Blumenbach, 1799) seu *Dicerorhinus* sp. seu *Coleodonta antiquitatis* (Blumenbach, 1799)

Gradivo: sklop plasti 10–13: phalanx III.

Tretja prstnica iz sklopa plasti 10 do 13 (inv. št. D. b. 2433) pripada velikemu rastlinojedu (*sl. 11.16*). V kolikor gre za najdbo nosoroga, bi prišle načeloma v poštev kar tri vrste: gozdni nosorog oz. *Dicerorhinus kirchbergensis* (=*D. mercki*) (Jäger, Kaup, 1839–41), stepski nosorog oz. *D. hemitoechus* (Falconer, 1868) ter dlakavi nosorog oz. *Coelodonta antiquitatis* (Blumenbach, 1799). J. Radovčić iz Hrvaškega prirodoslovnega muze-

Tab. 11.13: Mere drugega in tretjega spodnjega meljaka alpskega kozoroga (*Capra ibex*) iz Divjih bab I. Navedena je tudi opisna statistika za fosilne primerke iste vrste z različnih evropskih najdišč (Malez 1963; Lequatre 1994; Münzel *et al.* 1994). Vse mere so v mm.
Tab. 11.13: Measurements of second and third lower molars of alpine ibex (*Capra ibex*) from Divje babe I. Descriptive data for fossil specimens of the same species from various European sites are also given (Malez 1963; Lequatre 1994; Münzel *et al.* 1994). All measurements are in mm.

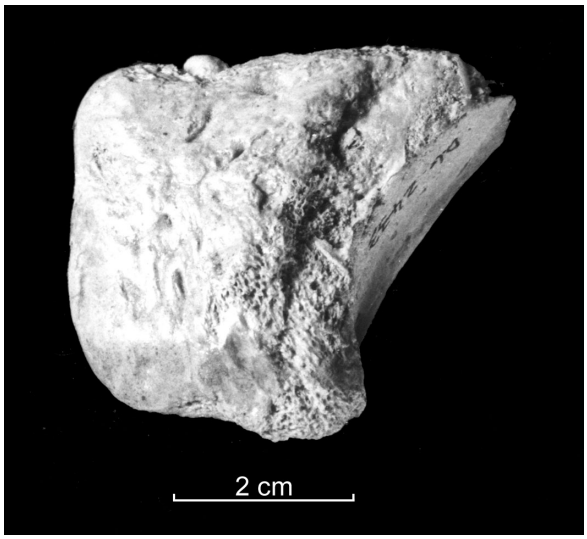
Tooth	**Dimension**	**Divje babe I**	**Europe**
			***C. ibex* (fossil)**
		C. ibex	**Me (N)**
			min–max
M_2	Greatest length	16.0	17.0 (9) 16.0–19.4
	Greatest breadth	10.7	9.7 (11) 8.4–10.7
M_3	Greatest length	27.0	29.0 (5) 28.8–32.7
	Greatest breadth	10.0	10.2 (5) 10.0–10.8

ja v Zagrebu je prstnico iz Divjih bab I primerjal s fosilnim materialom iz Krapine ter najdbo pogojno pripisal vrsti *Stephanorhinus kirchbergensis* (≈ *D. kirchbergensis*; *cf.* Guérin 1996; Radovčić, ustno). Gozdni nosorog je tudi edini predstavnik svoje družine, ki je v mlajšem pleistocenu zagotovo naseljeval prostor današnje Slovenije (Rakovec 1958; 1959; 1973; S. Brodar 1970; M. Brodar 1996). Ista vrsta je zastopana tudi v mlajšepleistocenski favni Hrvaške (Malez 1979), Madžarske (Jánossy 1986) in SV Italije (Bon *et al.* 1991), kjer pa sta zastopana tudi stepski in dlakavi nosorog. Fosilne najdbe slednjega so znane še iz JV Avstrije (Fladerer 2000).

Ob gozdnem nosorogu pride pri determinaciji tretje prstnice velikega rastlinojeda iz sklopa plasti 10 do 13 v poštev tudi mamut. Zaradi nekoliko manj ploščate sklepne površine sicer obravnavana prstnica nekoliko odstopa od tipičnih primerkov vrste *Mammuthus primigenius* (Blumenbach, 1799), gledano v celoti pa se zdi primerek iz Divjih bab I morfološko kljub vsemu bliže mamutu kot gozdnemu nosorogu. Fosilne najdbe mamuta so na Slovenskem znane z vsaj 15 najdišč (Rakovec 1954; 1973; Pohar 1990; Lenardić, Pohar 1995).

VERTIKALNA PORAZDELITEV NAJDB

Med izkopavanji v Divjih babah I je bilo največje število ostankov velikih sesalcev (brez jamskega medveda) pobranih iz sklopa plasti 2 do 5 (NISP = 502) ter iz plasti 8 (NISP = 146). Zgodnjeglacialni sklop plasti 12 do 23 je bistveno manj bogat; od tam namreč izvira le 110 najdb (*tab. 11.14*). Interpretacija vertikalne porazdelitve ostankov ni enostavna, saj se v njej ne kažejo le dejanske spremembe v strukturi nekdanjih združb. Med potencialno pomembne dejavnike sodijo še različna intenzivnost razpadanja najdb, spremenljiva vloga posameznih dejavnikov akumulacije, različna debelina plasti ter delež raziskanega tlorisa. Upoštevati je seveda treba tudi morebitne spremembe v metodah in tehnikah izkopavanja, zaradi česar v nadaljevanju nekoliko več pozornosti namenjam ostankom z izkopnega polja v osrednjem in notranjem delu jame (glej poglavje 1 v tem zborniku, *sl. 1.3*). S koncem raziskovanja vhodnega dela jame so namreč arheologi konvencionalen način koordinatnega dokumentiranja najdb zamenjali z enostavnejšim in bolj praktičnim, temelječim na osnovnih področnih enotah dimenzije 1 x 1 x 0,12 m. Sočasno s tem so uvedli tudi mokro sejanje in pregledovanje vseh odkopanih sedimentov.



Sl. 11.16: Tretja prstnica mamuta (*Mammuthus primigenius*) oz. nosoroga (Rhinocerotidae) iz sklopa plasti 10–13 (inv. št. D. b. 2433). Fotografija: T. Lauko.
Fig. 11.16: Third phalanx of mammoth (*Mammuthus primigenius*) or rhinoceros (Rhinocerotidae) from the complex of layers 10–13 (inv. no. D. b. 2433). Photograph T. Lauko.

Navedene modifikacije v metodiki izkopavanja so prispevale k zmanjšanju deleža najdb, ki so bile med pobiranjem spregledane in posledično zavržene. Poleg tega je boljša ocena prostornine pregledanega sedimenta omogočila izračun geometrijske gostote določljivih kosti na posamezno plast (tj. število najdb na volumensko enoto sedimenta; *sl. 11.17*).[7] Po največji koncentraciji najdb izstopa sklop plasti 2 do 5, drugo mesto pa zaseda plast 10 (in ne več 8 kot pred standardizacijo na enak volumen sedimenta; *tab. 11.14*). Podobno vertikalno porazdelitev izkazujejo tudi ostanki rjavega medveda in volka. Zanimivo je, da iz plasti 2 do 5 ter 10 do 14 izvira tudi glavnina vseh najdenih kamenih artefaktov (Turk *et al.* 2002b). To namreč kaže, da so med nastajanjem obeh sklopov plasti jamo izmenično obiskovali tako ljudje kot velike zveri.

Nekoliko drugačna je vertikalna porazdelitev najdb gamsa in drugih srednje velikih do velikih rastlinojedov (srna, kozorog, jelen). Največ ostankov na prostorninsko enoto sedimenta je bilo sicer tudi v tem primeru pobranih iz sklopa plasti 2 do 5, kar bi lahko kazalo na višjo frekvenco človekovih in volčjih obiskov jame. Težje razložljiv pa je majhen delež kosti in zob rastlinojedov v plasti 10. Preseneča tudi koncentracija gamsjih kosti v plasti 6 do 7, kjer je bilo najdenih razmeroma malo kamenih artefaktov in ostankov velikih zveri. Paleoklimatske ocene resda kažejo na poslabšanje razmer med odlaganjem vsaj dela plasti 2 do 5 ter tudi plasti 6 (Turk *et al.*, 2001a), kar je morda prispevalo k dejanskemu povečanju števila gamsov in kozorogov v takratnih združbah širše okolice Divjih bab I (*sl. 11.17; tab. 11.14*). Na takšen razvoj dogodkov bi bilo navsezadnje mogoče sklepati tudi iz številnih najdb alpskega svizca v navede-

[7] Ker je bil v osrednjem in notranjem delu jame sediment izkopan samo do plasti 14, so na *sl. 11.17* prikazani le podatki za obdobje OIS 3.

Tab. 11.14: Pogostnost najdb v Divjih babah I zastopanih taksonov velikih sesalcev po posameznih plasteh. V tabeli so prikazani le podatki za najdbe z razmeroma natančno opredeljeno stratigrafsko lego. Senčena polja označujejo primere, kjer gre večje število ostankov zelo verjetno pripisati le eni živali.
Tab. 11.14: Frequency of finds of taxa of large mammals represented at Divje babe I, by individual layers. Only data for finds with a relatively exactly defined stratigraphic location are included in the table. The shadowed areas mark cases in which there are a large number of remains, very probably from a single animal.

Taxon:	Stages and Layers																								Σ
	OIS 3												OIS 5												
	2-5	6	6-7	7	7-8	8	8-10	9	10	10-11	11	11-12	12	12-13	13	13-14	14	14-16	16	17	17a	17-19	18	20	21	
Lepus sp.	4	1				2									1											8
M. marmota	186		1	3	2	28	1		2																	223
U. arctos	68	4		3		35	3	1	17	1	4	1	1	5	10	3	6	1	1		3	1				168
C. lupus	64	8	2	6	1	23	2	1	26		1	1	1		3		1			1	1				1	143
V. vulpes	2																		3							5
A. lagopus			1			13																				14
M. putorius	46					3					1															50
M. martes	40	3	10	6	1	21	4		14	1	3	1	1	1	4		2		6	2						120
L. lutra	1																									1
L. lynx	1	1																								2
P. pardus	7																									7
P. spelaea	4		2	2		3															3				1	15
S. scrofa	3																									3
C. elaphus	4				1				2						2		1			1				1		12
C. capreol.	3	1				5					1						1									11
R. rupicap.	61	2	6	1		13			10		1				2		1				6		2	3	1	109
C. ibex	8	1																								9
Σ	502	21	22	21	5	146	10	2	71	2	11	3	3	6	22	3	12	1	10	4	13	1	2	4	3	900

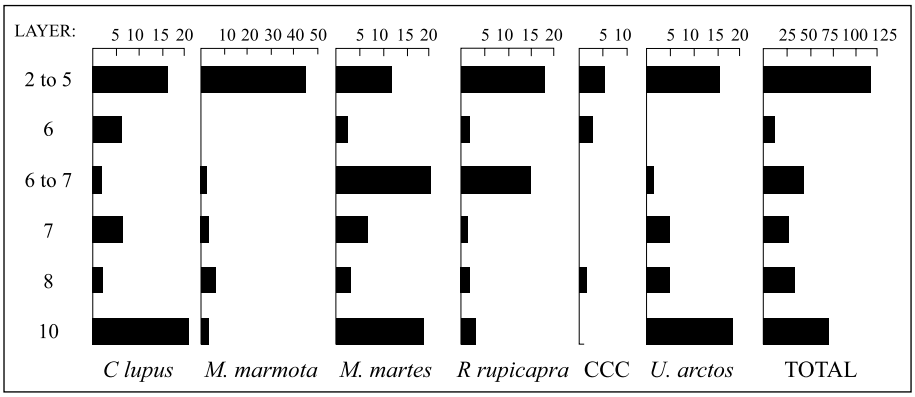
nem sklopu plasti. Po drugi strani pa je v istem stratigrafskem kontekstu relativno visoka tudi koncentracija najdb kune zlatice (*Martes* cf. *martes*), ki zaradi navezanosti na gozd preferira milejšo klimo. Ostanki kune so bili razmeroma številni tudi v plasteh 6 do 7 in 10, vendar pa je treba biti pri interpretaciji tega podatka previden. Porazdelitev najdb v prostoru namreč kaže, da jih je večina verjetno pripadala le dvema osebkoma (po enemu na plast). Prostorska porazdelitev ostankov iz plasti 2 do 5 je manj zgovorna, saj so navedene plasti zaradi krioturbacije nagubane.

Še neposrednejši vpogled v favno velikih sesalcev širše okolice Divjih bab I v različnih fazah würma omogočajo podatki v *tabeli 11.15*, ki kažejo število ostankov posameznega taksona po sedimentacijskih nivojih. Takšen prikaz podatkov je bil sicer mogoč le za del izkopnega polja (glej poglavje 1 v tem zborniku), zato je tudi skupno število najdb v tabeli manjše (NISP = 300). Po drugi strani pa lahko zaradi objektivnejše stratigrafije, večjega števila najdb in boljše časovne ločljivosti z večjo zanesljivostjo primerjamo podatke o ostankih velikih sesalcev vzdolž stratigrafskega stolpca s palinološkim in sedimentološkim zapisom ter z vertikalno porazdelitvijo večjega števila, časovno bolje ločljivih ostankov sesalske mikrofavne (glej poglavja 5, 8 in 10 v tem zborniku).

Ostanki zveri tvorijo v profilu dva izrazita vrhunca (*tab. 11.15*), ki se ujemata z mrzlo in vlažno klimo v času nastanka plasti 4–5a in spodnjega dela plasti 8. (glej poglavje 6 v tem zborniku, *sl. 6.7a*). Rezultat lahko razložim z večjim zanimanjem zveri za jame-brloge v času zaostrenih klimatskih razmer.

OCENA NEKDANJEGA OKOLJA

Tradicionalni arheozoološki/paleontološki pristop k preučevanju nekdanjega okolja temelji na projekciji ekoloških toleranc recentnih populacij posameznih vrst na populacije iz preteklih obdobij. Ker pa so se sesalci sposobni prilagoditi na različna okolja, so lahko v preteklosti naseljevali tudi drugačne habitate od tistih, v katerih živijo danes (npr. Musil 1985; Bützler 1986; Miracle in Sturdy 1991; Van Kolfschoten 1995; Phoca-Cosmetatou 2002). Vpliv temperature, vlažnosti in drugih fizikalnih pogojev na distribucijo posameznih vrst je namreč praviloma le posreden (odvisno od navedenih dejavnikov se spreminjajo konkurenčne sposobnosti živali). Dejstvo je, da fizikalni pogoji areal posamezne vrste neposredno omejujejo le na njeni absolutni meji distribucije, zato enačenje ekološkega[8] in fiziološkega optimuma ni ustrezno (Van Kolfschoten 1995). Seveda pa



Sl. 11.17: Vertikalna porazdelitev ostankov nekaterih bolje zastopanih taksonov velikih sesalcev iz Divjih bab I. Podatki se nanašajo izključno na osrednji in notranji del jame (glej poglavje 1 v tem zborniku, *sl. 1.3*) in so standardizirani na enak volumen sedimenta (tj. 10 m^3). Plasti, katerih skupna prostornina pregledanih usedlin iz osrednjega in notranjega dela izkopnega polja ni presegala 5 m^3, v analizi niso upoštevane. Volumen na sliki prikazanih plasti je: sklop pl. 2–5 (34,8 m^3), pl. 6 (11,0 m^3), pl. 6-7 (5,3 m^3), pl. 7 (9,0 m^3), pl. 8 (59,3 m^3) ter pl. 10 (6,5 m^3). Koeficient korelacije med debelino posameznih plasti in v njih ugotovljeno gostoto vseh ostankov je majhen in ni statistično značilen (Spearmanov R = –0,08; p > 0,05). Obrazložitev simbolov: CCC – *C. ibex* + *C. elaphus* + *C. capreolus*.

Fig. 11.17: Vertical distribution of the remains of some better represented taxa of large mammals from Divje babe I. Data refer exclusively to the central and inner part of the cave (see chapter 1 in this volume, *Fig. 1.3*) and they are standardised to the same volume of sediments (i.e. 10 m^3). Layers of which the total volume of examined sediments from the central and inner part of the excavation field did not exceed 5 m^3 were not taken into account in the analysis. The volume of the layers shown in the figure is: complex of layers 2–5 (34.8 m^3), Layer 6 (11.0 m^3), Layer 6-7 (5.3 m^3), Layer 7 (9.0 m^3), Layer 8 (59.3 m^3) and Layer 10 (6.5 m^3). The coefficient of correlation between the thickness of individual layers and the established density of all remains in them is small and is not statistically significant (Spearman's R = –0.08; p > 0.05). Explanation of symbols: CCC – *C. ibex* + *C. elaphus* + *C. capreolus*.

to ne pomeni, da podatki o prisotnosti ostankov posameznih indikatorskih vrst velikih sesalcev za paleoekološke študije niso zanimivi. Lahko so namreč zelo uporabni kot neodvisna kontrola paleookoljskih in paleoklimatskih rekonstrukcij, ki temeljijo na drugih paleoekoloških indikatorjih (npr. sedimentološki ali palinološki zapis, ostanki malih sesalcev ipd.).

Doslej najpopolnejša in z globalnimi paleoklimatskimi zapisi ($\delta^{18}O$ in pelod) primerljiva paleoklimatska krivulja za najdišče Divje babe I temelji na rezultatih sedimentološke analize (Turk *et al.* 2001a; 2002b; glej tudi poglavje 5 v tem zborniku). Iz njih je mogoče razbrati, da je bilo podnebje v OIS 3 domnevno manj stanovitno, v povprečju pa vsekakor bistveno hladnejše in vlažnejše kot v OIS 5a–5d. Takšne sklepe potrjujejo rezultati palinoloških in antrakotomskih raziskav (Šercelj, Culiberg 1991; Culiberg, Šercelj 1997; poglavje 8 v tem zborniku) ter študija ostankov malih sesalcev (glej poglavje 10 v tem zborniku). S predstavljeno paleoklimatsko krivuljo so skladni tudi ostanki velikih sesalcev, čeprav je večina taksonov ubikvističnih (*sl. 11.18*).[9] Izmed 12 vrst redu Carnivora bi izpostavil predvsem polarno lisico, ki danes večinoma naseljuje tundro. Njeni ostanki so bili najdeni v plasti 8, ki naj bi pretežno (8a, 8c in delno 8b) nastala prav v obdobju hladne klime.[10] Iz plasti 8 izvirajo tudi najdbe domnevno planinskega zajca, danes vezanega na območje tundre, tajge in alpinskih travnikov (Sulkava 1999). Domnevni ostanki vrste *L. timidus* so bili skupaj s številnimi najdbami alpskega svizca odkriti še v sklopu plasti 2 do 5. V istih plasteh je bil s posameznimi najdbami zastopan tudi divji prašič, katerega optimalni življenjski prostor predstavljajo listnati in mešani gozdovi. Med nastajanjem sklopa plasti 2 do 5 so torej obdobje razmeroma hladne klime najverjetneje prekinjale tudi nekoliko toplejše faze, ki so omogočale obstoj mešanih gozdnih sestojev. Gozd je bil bolj ali manj stalno prisoten tudi v uvodnem delu OIS 3. To nakazujejo najdbe kune zlatice v plasteh 10 do 12/13, saj omenjena zver med različnimi tipi habitatov preferira prav gozdove (Bright 1999).

Tretja prstnica velikega rastlinojeda iz sklopa plasti 10 do 13 je morfološko bliže mamutu kot gozdnemu nosorogu. Takšna determinacija je verjetnejša tudi z vidika paleoklime, saj naj bi bil uvodni del OIS 3 razmeroma hladen (*sl. 11.18*). V nasprotju z mamutom je bil nam-

[8] Pod pojmom ekološki optimum razumem tiste pogoje, pri katerih kaže dana vrsta v naravi največjo abundanco.

[9] Upošteval sem le gradivo iz OIS 3, saj je vzorec živalskih ostankov iz OIS 5a–5d preskromen.

[10] Ostanki polarne lisice so bili najdeni na globini –321 cm in –345 cm (tj. sedimentacijska nivoja 26 in 28); sedimentološke analize kažejo, da sta omenjena sedimentacijska nivoja dejansko nastala v obdobju hladne klime (glej podpoglavje 5.2 v tem zborniku).

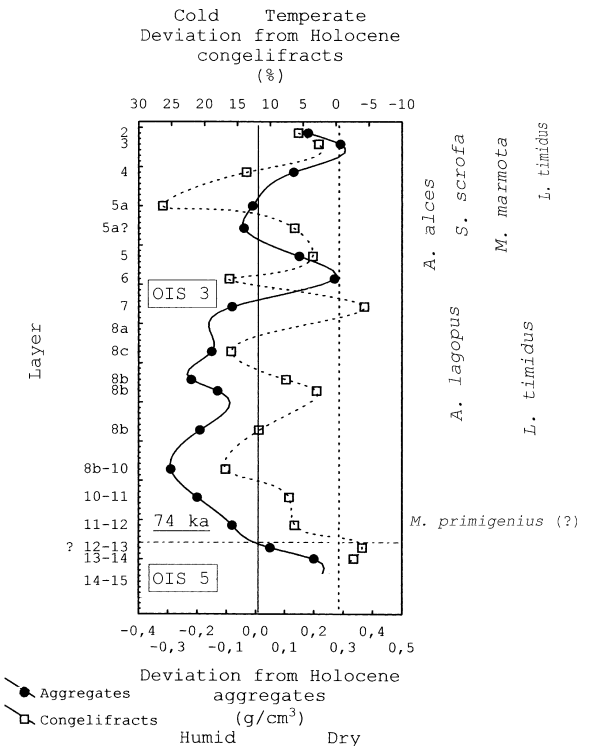
Tab. 11.15: Pogostnost najdb v Divjih babah I zastopanih taksonov velikih sesalcev po posameznih stratigrafskih nivojih. Podatki se nanašajo le na najdbe z izkopnih polj A in B (glej Turk 2003; poglavje 1 v tem zborniku).
Tab. 11.15: Frequency of finds of taxa of large mammals represented at Divje babe I, by individual stratigraphic level. Data refer only to finds from excavation fields A and B (see Turk 2003; chapter 1 in this volume).

Depth (cm)	Facies	*M. marmota*	*L.* cf. *timidus*	*Ursus arctos*	*P. spelaea*	*P. pardus*	*Lynx lynx*	*Felis silvestris*	*Canis lupus*	*Alopex lagopus*	*Alopeex/Vulpes*	*Martes martes*	*M. putorius*	*L. lutra*	*Cervus elaphus*	*C. capreolus*	*R. rupicaprs*	*Capra ibex*	T O TA L
-20	A	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	3	0	**5**
-32	A	5	0	1	0	0	0	0	0	0	0	0	0	0	0	0	2	0	**8**
-44	A	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	0	**8**
-56	A	7	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	1	**10**
-68	A	1	0	3	0	0	0	0	2	0	0	0	0	0	0	0	0	0	**6**
-81	A	12	0	5	0	0	0	0	3	0	0	0	1	0	0	0	1	0	**22**
-94	A	9	0	6	0	2	0	0	5	0	0	2	0	0	0	0	1	0	**25**
-106	A	0	0	2	0	2	0	0	3	0	0	1	0	0	0	0	1	0	**9**
-117	A	0	0	1	0	0	0	0	1	0	0	3	3	0	1	0	0	0	**9**
-129	A	1	0	1	0	0	0	0	2	0	0	2	17	0	0	0	0	0	**23**
-141	A	0	0	2	0	0	0	0	3	0	0	0	10	1	0	0	0	0	**16**
-153	A	1	0	0	0	0	0	0	2	0	0	1	1	0	0	0	0	0	**5**
-165	A	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
-177	A	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	**2**
-189	A	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	**1**
-201*	A	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	**1**
-213	A	0	0	0	0	0	0	0	1	0	0	2	0	0	0	0	1	0	**4**
-225	A	0	0	2	0	0	0	0	4	0	0	3	0	0	0	0	0	0	**9**
-237	B	0	0	5	1	0	0	0	1	0	0	3	0	0	0	0	0	0	**10**
-249	B	1	0	3	0	0	0	0	0	0	0	0	0	0	0	0	1	0	**5**
-261	B	0	0	3	0	0	0	0	2	0	0	0	0	0	0	0	1	0	**6**
-273	B	5	0	3	1	0	0	0	0	0	0	0	0	0	0	0	0	0	**9**
-285	B	0	0	3	0	0	0	0	2	0	0	2	0	0	0	0	0	0	**7**
-297	B	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**4**
-309	B	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	**3**
-321	B	1	1	1	0	0	0	0	0	3	0	2	0	0	0	0	0	0	**8**
-333*	B	0	0	4	1	0	0	0	2	0	0	3	1	0	0	0	2	0	**13**
-345	B	2	0	0	0	0	0	2	0	1	0	2	1	0	0	2	0	0	**10**
-357	B	1	0	2	0	0	0	0	1	0	0	2	0	0	0	1	0	0	**7**
-369	B	1	0	0	0	0	0	0	3	0	0	4	0	0	0	1	0	0	**9**
-381	B	1	0	5	0	0	0	0	10	0	0	10	0	0	1	0	1	0	**28**
-393	B	0	0	2	0	0	0	0	3	0	0	3	0	0	0	0	1	0	**9**
-405*	B	0	0	1	0	0	0	0	0	0	0	1	1	0	0	0	0	0	**3**
-417	B	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	**1**
-429	B	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	**1**
-441	C-1	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	**2**
-453	C-1	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	**2**
Σ		**57**	**1**	**55**	**3**	**4**	**1**	**2**	**52**	**4**	**1**	**51**	**35**	**1**	**2**	**5**	**25**	**1**	**300**

*Level with hearth.

reč gozdni nosorog vezan na toplejše in verjetno tudi vlažnejše okolje (Musil 1985). Najdba losa v sklopu plasti 4 do 6 kaže na prisotnost vlažnih habitatov (Pucek 1981).

Ker je projiciranje ekoloških preferenc recentnih populacij na tiste iz preteklih obdobij pogosto problematično (Van Kolfschoten 1995), sem se paleoekološke raziskave lotil še nekoliko drugače. Ekološko nišo posameznih vrst sem poskusil izpeljati iz treh lastnosti sesalskih populacij, ki jih je mogoče rekonstruirati tudi pri fosilnih taksonih: velikosti živali, vrste njihove prehrane (tj. karnivor, omnivor, insektivor idr.) in pa prostora, kjer se praviloma zadržujejo (tj. arborealne vrste, skansorialne vrste, fosorialne vrste idr.). Na osnovi navedenih podatkov naj bi bilo namreč mogoče verodostojno oceniti razpon ekoloških niš proučevane fosilne sesalske skupnosti, s tem pa tudi orisati njeno strukturo (Andrews



Sl. 11.18: Umestitev indikatorskih vrst velikih sesalcev iz Divjih bab I v posamezne klimatsko definirane faze würma. Paleoklimatska krivulja je bila sestavljena na osnovi sedimentološkega zapisa (Turk *et al.* 2002; Turk 2004).
Fig. 11.18: Placing of indicator species of large mammals from Divje babe I in individual climatically defined phases of the Würm. The paleoclimatic curve was composed on the basis of sedimentological records (Turk *et al.* 2002; Turk 2004).

1995). Podatki, ki se nanašajo na favno velikih in malih sesalcev iz Divjih bab I, so podani na *sliki 11.19*.

Lastne podatke sem primerjal s tistimi, ki jih za strukturo sesalskih skupnosti iz nižinskih gozdov (N = 8), montanskih gozdov (N = 3), gozdnato-gormovnih pokrajin (N = 8) ter ravninskih nizkih travnikov (N = 1) tropske Afrike podajajo Andrews in sodelavci (1979). Primerjava tropskih ekosistemov s tistimi v zmernem pasu sicer ni najustreznejša. Bistveno bolj od vertikalne strukturiranosti ekosistema namreč v njegovi biodiverziteti odsevata količina primarnim konzumentom dostopne hrane[11] in pa stabilnost v njeni razpoložljivosti (Kryštufek 2001). Po drugi strani pa danes vrsto ključnih velikih sesalcev, ki so (oz. to velja za njim sorodne fosilne vrste) v ledenih dobah naseljevali tudi evropska tla, najdemo le še ponekod v tropih (npr. lev, leopard, hijena, slon, nosorog, veliki votlorogi; Kurtén 1968; Musil 1992). Prav izključitev pestre združbe velikih rastlinojedov iz ekosistemov zmernih klimatov v zadnjih fazah würma in v holocenu pa je marsikje zagotovo privedla do popolnega zaraščanja dotlej odprtih habitatov, ne da bi na to vplivale morebitne klimatske ali edafske spremembe (prim. Kryštufek 2001). Največji predstavniki izginule megafavne (npr. mamut v Evropi) so namreč v pleistocenu verjetno omejevali razrast sklenjenega gozda, podobno kot rastlinojeda megafavna v Afriki to počne še danes. Kaj pa velike zveri? Njihova prisotnost o nekdanji klimi sicer ne pove veliko, zato pa posredno kaže na ustrezno nosilno zmogljivost okolja, torej na bogato združbo velikih rastlinojedov.

Izsledki analize so povzeti na *sliki 11.19* in se v celoti skladajo z neodvisno pridobljenimi paleookoljskimi ocenami (glej poglavja 5, 8 in 10 v tem zborniku). Odstopanje med vzorcema zgodnjeglacialne in interpleniglacialne starosti je največje v lokomotornih adaptacijah na prostor, v katerem se živali praviloma gibljejo (t.i. cona zadrževanja). V gradivu iz OIS 3 je namreč delež vrst velikih terestričnih sesalcev očitno večji od deleža vrst malih terestričnih sesalcev, ki jih sicer lahko najdemo tudi na spodnjih vejah grmičevja in padlih drevesih. Med recentnimi habitati afriškega tropskega pasu kažejo podobno sliko sesalske združbe gozdnato-grmovnatih in travniških habitatov. Ker pa v okviru travniških habitatov arborealne vrste manjkajo, se zdi v smislu ekološke diverzitete interpleniglacialna favna Divjih bab I vendarle še najbolj podobna združbam gozdnato-grmovnatih pokrajin. V nasprotju z vzorcem iz OIS 3 je v gradivu iz OIS 5a delež zastopanosti velikih terestričnih sesalcev primerljiv z deležem malih terestričnih sesalcev. V tem smislu je zgodnjeglacialna favna iz Divjih bab I še najbliže združbam tropskih gozdov, čeprav pri slednjih delež vrst malih terestričnih sesalcev praviloma presega delež vrst velikih.

Razlike med fosilnimi in recentnimi sesalskimi združbami sem tudi statistično testiral (*tab. 11.16*). Pri vsaki od štirih kategorij (tj. velikost, taksonomija, prehranjevalna skupina, cona zadrževanja) sem ugotavljal obseg korelacije med obravnavanimi favnami v deležu zastopanosti posameznih razredov (npr. pri kategoriji "prehranjevalna skupina" delež insektivorov, karnivorov, fruktivorov...).[12] V rezultatih se žal močno kaže skromna časovna ločljivost vzorca; ker se je gradivo akumuliralo v več deset tisoč let dolgem obdobju, imamo namreč pri analizi favnističnega gradiva opravka s palimpsestom. Visoki statistično značilni koeficienti korelacije med vzorcem iz OIS 3 ter recentnimi sesalskimi združbami nižinskih in/ali montanskih gozdov tropske Afrike v kar treh kategorijah so kljub temu zgovorni (*tab. 11.16*). Očitno namreč temperatura in vlažnost v interpleniglacialu nikoli nista bili tako nizki, da bi onemogočali obstoj (vsaj) gozdnato-grmovnate krajine. Obe-

[11] Sicer velika primarna produkcija listopadnega gozda tako npr. znatnemu delu primarnih konzumentov ni dostopna, saj je večina organske snovi v lesu.

[12] Uporabil sem neparametrični Spermanov R-test. Pri tem sem razrede znotraj posamezne kategorije ekološke raznolikosti rangiral tako, da sem razred z največ vrstami označil z rangom ena, tistega z drugim največjim številom vrst z rangom 2 itd.

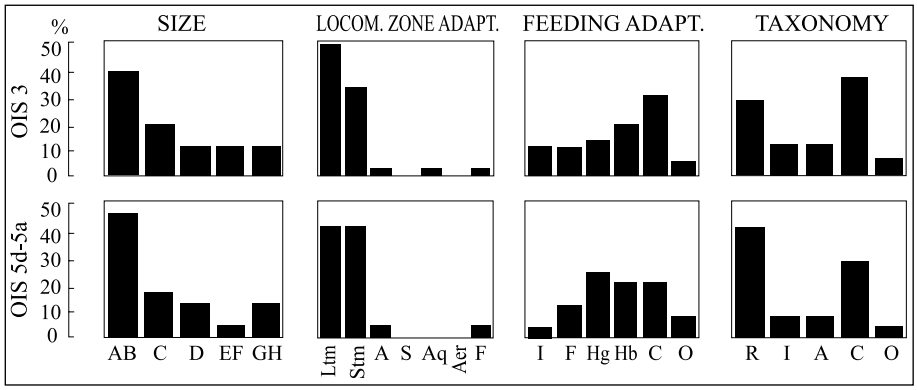
Tab. 11.16: Korelacijski koeficienti (Spearmanov R) med izbranimi kategorijami ekološke raznolikosti obeh fosilnih vzorcev iz Divjih bab I na eni strani in recentnih sesalskih združb treh tipov habitatov (gozd, gozdnato-grmovnata pokrajina in travnik) tropske Afrike na drugi. Senčena polja označujejo statistično značilne korelacijske koeficiente (p<0,05).
Tab. 11.16: Correlation coefficients (Spearman's R) among selected categories of ecological heterogeneity of both fossil specimens from Divje babe I, on the one hand, and recent mammal associations of three types of habitat (forrest, woodland-bushland and short grass plains) of tropical Africa on the other. Statistically significant correlation coefficients (p<0.05) are shaded.

Ecological category	Sample	Forest	Woodland - bushland	Short grass plains
Taxonomy	OIS 3	0.87	0.97	0.97
	OIS 5	0.97	0.87	0.87
Size	OIS 3	0.89	0.89	0.89
	OIS 5	0.97	0.82	0.82
Locomotor zonal adapt.	OIS 3	0.73	0.73	0.59
	OIS 5	0.66	0.71	0.62
Feeding adaptation	OIS 3	0.03	0.96	0.93
	OIS 5	-0.05	0.50	0.72

nem pa velja opozoriti tudi na veliko podobnost med interpleniglacialno favno in recentnimi travniškimi združbami, saj so bili visoki koeficienti korelacije med njimi ugotovljeni pri kar treh od skupno štirih kategorijah (tj. "taksonomija", "velikost" in "prehranjevalna skupina"). To namreč nakazuje, da so bili na območju Divjih bab I v OIS 3 ves čas prisotni tudi bolj ali manj odprti habitati.

V nasprotju s stanjem v OIS 3 naj bi bilo okolje v OIS 5a–5d bolj gozdnato. To izhaja iz razmeroma visoke korelacije med zgodnjeglacialno favno iz Divjih bab I in združbami recentnih tropskih gozdov v kategorijah "velikost" in "cona zadrževanja" (*tab. 11.16*). Skladni s tem so podatki iz *tabele 11.17*, ki povzemajo primerjavo obeh fosilnih vzorcev iz Divjih bab I z dvema subfosilnima favnama iz Viktorjevega spodmola pri Divači (JV Slovenija). Po deležu zastopanosti posameznih razredov znotraj kategorije "cona zadrževanja"[13] je namreč zgodnjeglacialni vzorec iz Divjih bab I bliže gradivu iz mezolitskih plasti Viktorjevega spodmola kot pa tistemu iz

[13] Kategorijo "cona zadrževanja" sem izbral zato, ker so ravno tu razlike med fosilnim vzorcem iz OIS 5a–5d in tistim iz OIS 3 največje (*sl. 11.19*).



Sl. 11.19: Histogrami ekološke raznolikosti za zgodnjeglacialno (≈ OIS 5a–5d) in interpleniglacialno (≈ OIS 3) favno iz Divjih bab I. Ordinata predstavlja delež vrst, uvrščenih v posamezen razred (abcisa). Število vrst znotraj vsakega od obeh vzorcev: OIS 3 (N = 33), OIS 5d–5a (N = 22). Legenda: velikost: AB – do 1 kg, C – 1 do 10 kg, D – 10 do 45 kg, EF – 45 do 180 kg, GH – nad 180 kg; cona zadrževanja: Ltm – veliki terestrični sesalci, Stm – mali terestrični sesalci, A – arborealen, S – skansorialen, Aq – akvatičen, Aer – aerialen, F – fosorialen; prehranjevalna skupina: I – insektivor, F – frugivor, Hg – herbivor, ki se pretežno pase, Hb – herbivor, ki pretežno smuka, C – karnivor, O – ostalo; taksonomska skupina: R – Rodentia, I – Insectivora, A – Artiodactyla, C – Carnivora, O – ostalo.
Fig. 11.19: Histograms of ecological diversity for Early Glacial (≈ OIS 5a–5d) and Interpleniglacial (≈ OIS 3) fauna from Divje babe I. The ordinate represents the share of species ranked in individual classes (abscissa). The number of species within each of the two samples: OIS 3 (N = 33), OIS 5d–5a (N = 22). Legend: size: AB – to 1 kg, C – 1 to 10 kg, D – 10 to 45 kg, EF – 45 to 180 kg, GH – above 180 kg; Locomotor zonal adaptation: Ltm – large terrestrial mammals, Stm – small terrestrial mammals, A – arboreal, S – scansorial, Aq – aquatic, Aer – aerial, F – fosorial; feeding adaptation: I – insectivore, F – frugivore, Hg –grazer, Hb – browser, C – carnivore, O – other; taxonomic groups: R – Rodentia, I – Insectivora, A – Artiodactyla, C – Carnivora, O – other.

Tab. 11.17: Korelacijski koeficienti (Spearmanov R) med zastopanostjo posameznih razredov znotraj ekološke kategorije "cona zadrževanja" pri obeh fosilnih vzorcih iz Divjih bab I na eni strani in obeh subfosilnih vzorcih iz Viktorjevega spodmola na drugi. Senčena polja označujejo statistično značilne korelacijske koeficiente (p < 0,05). Za obrazložitev glej besedilo.
Tab. 11.17: Correlation coefficients (Spearman's R) between representation of individual classes within ecological categories of the "locomotor zonal adaptation" with both fossil specimens from Divje babe I, on the one hand and both subfossil specimens from Viktorjev spodmol on the other. Statistically significant correlation coefficients (p < 0.05) are shaded. See text for explanation.

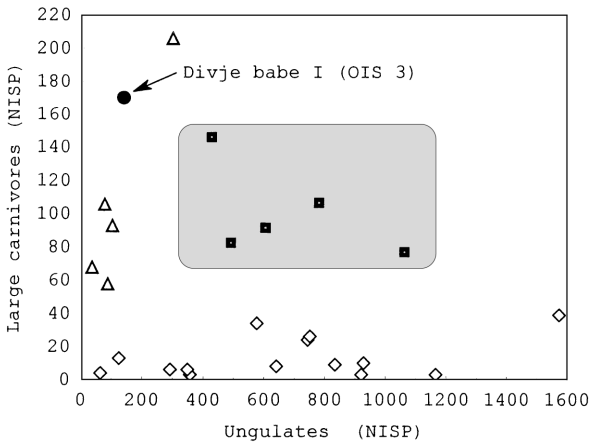
D. babe I	Viktorjev spodmol (Mesolithic)	Viktorjev spodmol (Bronze age)
OIS 3	0.790	0.789
OIS 5	0.962	0.858

bronastodobnega sedimenta istega najdišča. V nasprotju s tem razlik v obsegu korelacije med interpleniglacialnim vzorcem iz Divjih bab I in vsakim od obeh subfosilnih vzorcev iz Viktorjevega spodmola ni. Pri tem je potrebno navesti, da naj bi bila v mezolitiku širša okolica Viktorjevega spodmola pretežno gozdnata, medtem ko so na prehodu iz bronaste dobe v železno domnevno prevladovali odprti habitati (Toškan, Kryštufek 2004; Toškan, Dirjec 2004a).

DEJAVNIKI AKUMULACIJE

K akumulaciji ostankov makrofavne v paleolitskih jamskih najdiščih pogosto niso prispevali le ljudje, ampak tudi živali same. Znano je, da se v jame včasih zatečejo bolne ali ranjene živali, ki nato tam poginejo (prim. Fosse in Philippe 2005). Upoštevati je treba tudi naravno smrtnost med hiberniranjem oz. tik po njem; v primeru Divjih bab I je bil domnevno prav to poglavitni razlog za akumulacijo velikega števila ostankov jamskega medveda (Debeljak 2002b). Zveri naj bi h kopičenju kosti v jamah prispevale tudi s plenjenjem (Straus 1982; Miracle 1991; Stiner 1994; Blasco 1997). Tako se v Divjih babah I ostanki zajca stratigrafsko skoraj popolnoma ujemajo z najdbami lisice, ki je danes njegov najpomembnejši plenilec (*tab. 11.14;* Kryštufek 1991). Domnevno pomembna je bila tudi vloga volka in morda velikih mačk, saj je vrednost količnika med številom kosti zveri in kopitarjev razmeroma visoka (*sl. 11.20*). V gradivu interpleniglacialne starosti[14] iz Divjih bab I namreč prevladujejo prav ostanki medveda (hibernirajoči omnivor) in volka (v socialni skupnosti živeča zver), z nekoliko skromnejšim številom najdb pa so zastopani še lisica, divja mačka, vidra, kuna zlatica in dihur. Kot

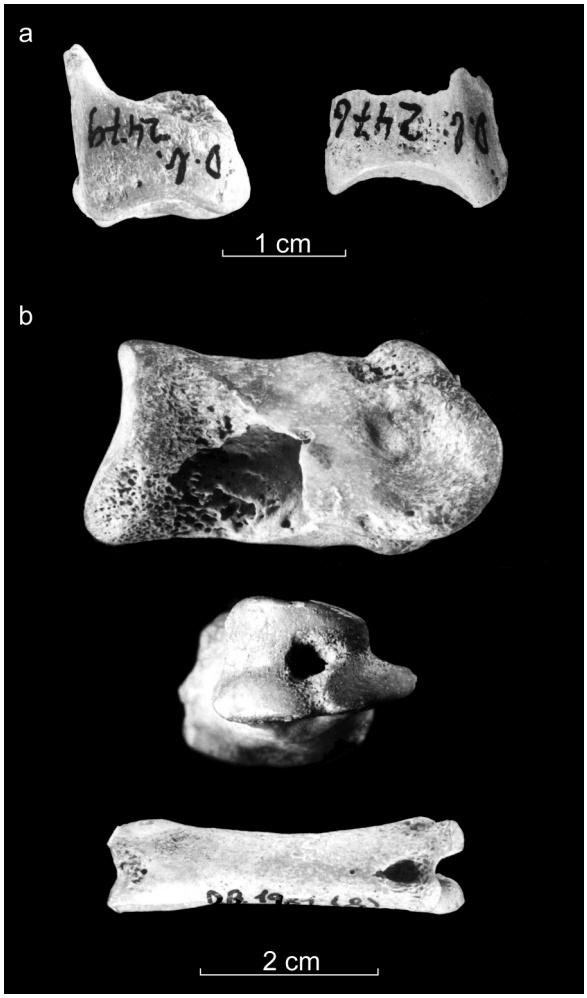
[14] Vzorec zgodnjeglacialne starosti je za podobno primerjavo preskromen.



Sl. 11.20: Grafični prikaz razmerja med številom določljivih primerkov (NISP) kopitarjev in velikih zveri (brez medveda) iz interpleniglacialnih plasti Divjih bab I. Za primerjavo so podani podatki z več italijanskih (Sala 1990b; Bartolomei *et al.* 1994; Stiner 1994; Fiore *et al.* 2004), enega francoskega (Moncel *et al.* 2004), enega španskega (Estévez 1987) in dveh slovenskih (Pohar 1985; 1992) paleolitskih najdišč. Skupina "velike zveri" zajema jamskega leva, leoparda, lisasto hijeno in volka. Legenda: △ - poglavitni dejavnik akumulacije domnevno velike zveri; ◇ - poglavitni dejavnik akumulacije domnevno paleolitski človek, □ - pomembni dejavniki akumulacije tako paleolitski človek kot tudi velike zveri (šarafirano polje).
Fig. 11.20: Graphic presentation of the ratio between the number of identifiable specimens (NISP) of ungulates and large carnivores (without bear) from the Interpleniglacial layers of Divje babe I. For comparison, data are given for a number of Italian (Sala 1990b; Bartolomei *et al.* 1994; Stiner 1994; Fiore *et al.* 2004), one French (Moncel *et al.* 2004), one Spanish (Estévez 1987) and two Slovene (Pohar 1985; 1992) Palaeolithic sites. The group of "large carnivores" includes cave lion, leopard, hyena and wolf. Legend: △- assemblages presumably collected by large carnivores; ◇ - assemblages presumably collected by Palaeolithic man, □ – assemblages presumably collected by both Palaeolithic man and large carnivores (shaded area).

kažejo raziskave številnih mlajšepleistocenskih najdišč je bil namreč delež (velikih) zveri med kuhinjskimi odpadki paleolitskega človeka praviloma bistveno manjši (Klein in Cruz-Uribe 1984; Miracle 1991; Stiner 1994; a glej tudi Blumenschine 1995; Yravedra 2002).

Vlogo v jami naravno poginulih živali pri nastajanju tafocenoze je v primeru Divjih bab I težko oceniti (izjemo predstavlja medved). Dejstvo pa je, da je večina kosti poškodovanih. Pri tem je pomembno, da fragmentiranost ni omejena le na manj kompaktne skeletne elemente (npr. lobanja, sternum, os penis). Medtem ko bi bilo namreč takšne poškodbe mogoče razložiti že z naravnim razpadanjem na in v sedimentu, je namreč številne (tudi prečne) lome dolgih kosti bolj utemeljeno povezovati z aktivnostjo človeka in/ali zveri. Pri tem pa se postavljata dve ključni vprašanji, namreč: (1) kolikšen delež kosti, ki jih je v Divjih babah I zavrgel paleolitski človek, predstavlja ostanek njegovega lastnega plena (v pri-



Sl. 11.21a, b: Fosilni ostanki prstnic iz Divjih bab I, ki so jih domnevno fragmentirali: a – paleolitski ljudje oz. b – volkovi. Primerki z za človeka značilnim vzorcem fragmentiranosti so običajno razklani; površina kosti na mestu loma je gladka. V nasprotju s tem volkovi prstnic običajno ne strejo, ampak jih obgrizejo. Na tako obdelanih primerkih lahko sicer najdemo manjše luknje, v celoti razklani ostanki pa se pojavljajo le izjemoma (Stiner 1994).
Fig. 11.21a, b: Fossil remains of phalanxes from Divje babe I, which are presumed to have been fragmented by: a – Palaeolithic man or b – wolves. Specimens with fragmentation typical of humans are normally split; the break edges are clean and unmarred. In contrast, wolves do not normally crush phalanxes but gnaw them. Although small holes can be found on such specimens, completely split remains only appear exceptionally (Stiner 1994).

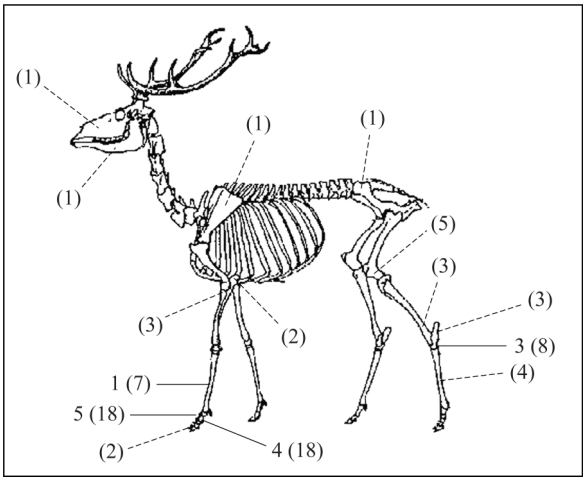
merjavi z deležem mrhovine) ter (2) v kolikšni meri so k akumulaciji ostankov prispevale velike zveri (brez medveda). O najustreznejši metodi za iskanje odgovora na ti vprašanji so mnenja v stroki močno deljena (Klein, Cruz-Uribe 1984; Marean, Spencer 1991; Marean, Kim 1998; Stiner 1991; 1994; 1998a; 2002; Blumenschine 1995; Domínguez-Rodrigo 1996; 1999; Milo 1998; Yravedra 2002; Pickering *et al.* 2003; Phoca-Cosmetatou 2004; 2005). Zaradi navedenega se bom v nadaljevanju dotaknil obeh najpogosteje uporabljenih pristopov. Njuna skupna točka je izhajanje iz podatkov o številu in mestu pojavljanja vseh tistih sledi na površini kosti, ki jih je mogoče neposredno navezati na aktivnost človeka (zasekanine, urezi, sledi udarcev) oz. zveri (odtisi zob). Upošteval sem tudi vzorec fragmentiranosti posameznih kosti, saj je paleolitski človek te razbijal drugače, kot to počno zveri (prim. Haynes 1980; 1983; Stiner 1994; Blasco 1997; *sl. 11.21*).

Med določljivimi ostanki kopitarjev so sledi zverske (pretežno volčje; prim. Haynes 1980; 1983) oz. človekove aktivnosti opazne predvsem na kosteh spodnjega dela obeh parov okončin (*sl. 11.22* in *sl. 11.23*). Kar zadeva zveri, predstavlja v tem pogledu edino izjemo domnevno obgrizena glava stegnenice (*caput femoris*) gamsa iz plasti 17a. Za človeka značilen vzorec fragmentiranosti kažejo poleg kosti spodnjega dela okončin še primerek lopatice in spodnje čeljustnice ter po en proksimalen fragment koželjnice, komolčnice in stegnenice. Iz rezultatov etnoloških študij izhaja, da vzorec procesiranja uplenjenih živali pri ledenodobnih ljudeh z različnih območij in iz različnih obdobij zelo verjetno ni bil povsem enak (Binford 1978; Monahan 1998; Domínguez-Rodrigo 1999). Spremenljiva je tudi sama prehrambna vrednost posameznih delov plena, ki je med drugim odvisna od vrste, starosti in spola uplenjenih živali ter sezone uplenitve/pogina (Outram 2000). Iz navedenega nedvomno izhaja, da je treba biti pri *post hoc* kvalitativnem rangiranju posameznih anatomskih regij živali zelo previden. Ker pa so sledi človekove aktivnosti vidne tudi na kosteh iz bolj mesnatih delov kopitarjev, vendarle sodim, da so imeli paleolitski ljudje z območja Divjih bab I vsaj občasno dostop do celotnega trupla uplenjenih oz. zaradi kakega drugega vzroka poginulih živali.

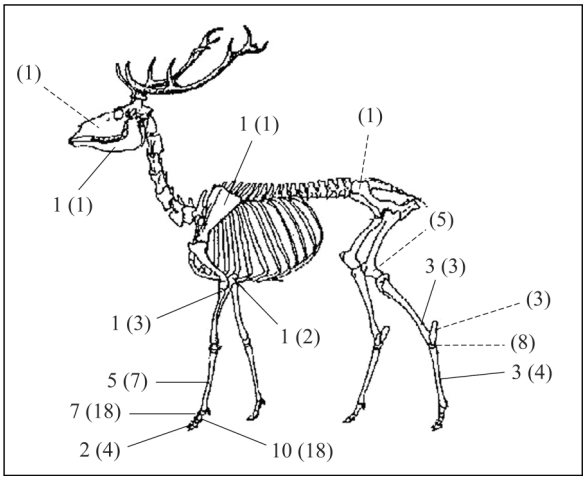
Na prisotnost (prevlado?) kosti uplenjenih živali med ostanki kopitarjev[15] iz Divjih bab I kaže tudi številčno razmerje med vsoto MNE posameznih skeletnih elementov glave in rogovja na eni strani ter kosti okončin brez prstnic, zapestnic in večine nartnic na drugi (v nadaljevanju: (H+H)/L; Stiner 1994). Ostanki plena obligatnih mrhovinarjev (npr. progasta in rjava hijena) naj bi namreč kazali bistveno višje vrednosti navedenega indeksa, kot to velja za aktivne plenilce (npr. volk), saj je praviloma le slednjim omogočen dostop do vseh delov uplenjene živali. Da so številni fragmenti lobanje, čeljustnic in rogov med ostanki hrane mrhovinarjev[16] dejansko posledica njihove omejene izbire, je Skinner s sodelavci (1980) dokazal z nastavljanjem celih trupel oslov v bližino brlogov progastih hijen. V skladu s pričakovanji so se namreč deleži ostankov posameznih ana-

[15] Upošteval sem le kosti kopitarjev srednjega velikostnega razreda. Med ostanki plena velikih zveri in človeka izkazujejo namreč prav ti največjo variabilnost v zastopanosti posameznih anatomskih regij (Stiner 1994).

[16] To še posebej velja za manj agresivne mrhovinarje (Richardson, Bearder 1996).



Sl. 11.22: Število in mesto pojavljanja sledi na fosilnih kosteh kopitarjev iz Divjih bab I, ki jih je mogoče neposredno navezati na aktivnost zveri (tj. odtisi zob, specifičen vzorec fragmentiranosti). V oklepaju je navedeno skupno število primerkov posameznega skeletnega elementa v obravnavanem vzorcu. Pri determinaciji nisem razlikoval med prstnicami prednjih in zadnjih okončin.
Fig. 11.22: Number and place of appearance of traces on fossil bones of ungulates from Divje babe I which can be directly connected to the activities of carnivores (i.e., gnawing marks, specific pattern of fragmentation). In brackets is stated the total number of specimens of an individual skeletal element in the sample in question. In the determination I did not distinguish between phalanxes of front and rear extremities.



Sl. 11.23: Število in mesto pojavljanja sledi na fosilnih kosteh kopitarjev iz Divjih bab I, ki jih je mogoče neposredno navezati na aktivnost paleolitskega človeka (tj. urezi, zasekanine, sledi udarcev, specifičen vzorec fragmentiranosti). V oklepaju je navedeno skupno število primerkov posameznega skeletnega elementa v obravnavanem vzorcu. Pri determinaciji nisem razlikoval med prstnicami prednjih in zadnjih okončin.
Fig. 11.23: Number and place of appearance of traces on fossil bones of ungulates from Divje babe I which can be directly connected to the activities of Palaeolithic man (i.e., cut marks, chop marks, cone fractures, specific pattern of fragmentation). In brackets is stated the total number of specimens of an individual skeletal element in the sample in question. In the determination I did not distinguish between phalanxes of front and rear extremities.

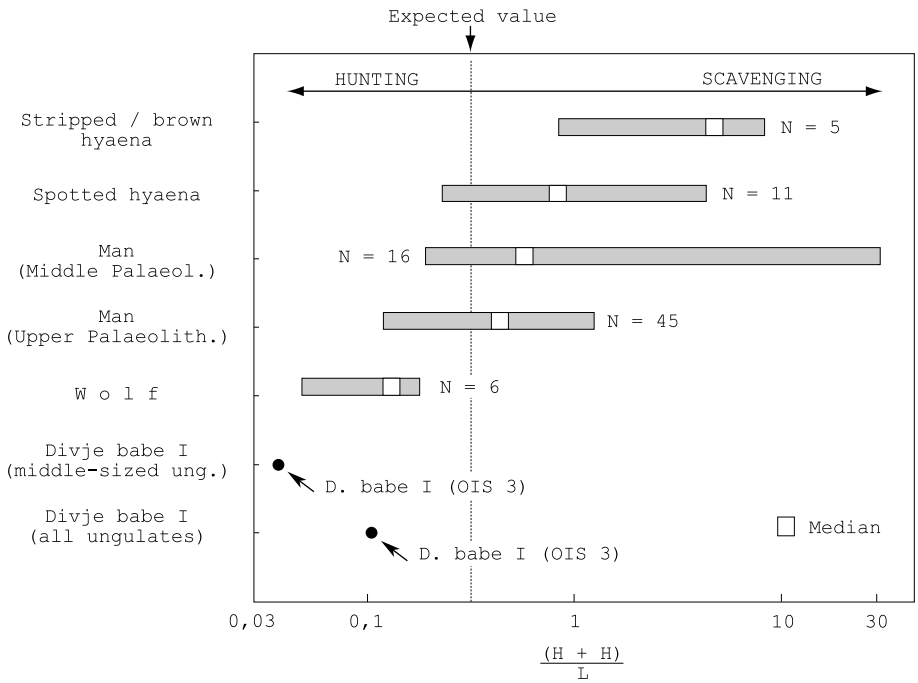
tomskih regij med ostanki plena hijen bistveno spremenili in se zelo približali deležem ostankov plena volkov.

Vrednost indeksa (H+H)/L za vzorec fosilnih ostankov kopitarjev srednjega velikostnega razreda iz Divjih bab I je podana na *sliki 11.24*. Podatek ne odstopa le od vrednosti za obligatne mrhovinarje, ampak tudi od tistih za lisasto hijeno, ki je od mrhovine odvisna le delno.[17] Število razpoložljivih ostankov jelena in kozoroga (tj. kopitarjev srednjega velikostnega razreda) je sicer v vzorcu iz Divjih bab I skromno. Vendar pa rezultati eksperimentalnih študij kažejo, da indeks (H+H)/L ni občutljiv na pičlo število najdb (Stiner 1994). Poleg tega po nizki vrednosti tega indeksa izstopa tudi vzorec fosilnih ostankov kopitarjev vseh velikostnih razredov, ki je po številu najdb sicer bistveno bogatejši (NISP = 155).

Ne glede na domnevno robustnost indeksa (H+H)/L pa številni avtorji njegovo uporabo v celoti zavračajo (npr. Blumenschine 1995; Marean, Kim 1998; Milo 1998; Domínguez-Rodrigo 1999; Yravedra 2002; Pickering *et al.* 2003). Njegova šibka točka naj bi bila predvsem nezadovoljivo upoštevanje prehrambnih preferenc velikih zveri. Tem naj bi bili namreč z maščobo prepojeni drobci spongiozne kosti ob epifizah bistveno bolj zanimivi od pustih kompaktnih fragmentov diafiz (a glej tudi Stiner 1994; 2002). Čeprav je pri tafonomskih študijah treba upoštevati tudi frekvenco pojavljanja manj kompaktnih (delov) kosti (Rogers 2000), naj bi bilo namreč vlogo človeka in/ali zveri pri akumulaciji kostnih ostankov mogoče primerno osvetliti šele z analizo (fragmentov) diafiz. V to smer kažejo številne aktualistične študije (Blumenschine 1988; 1995; Lupo 1995; Capaldo 1998), pritrdila pa so jim tudi eksperimentalna opazovanja (Marean 1991; Marean, Bertino 1994).[18] Število in mesto pojavljanja urezov, zasekanin, sledi udarcev in odtisov zob na dolgih kosteh je namreč zelo odvisno od tega, ali je imel do plena prvi dostop človek (kar ga načeloma postavlja v vlogo lovca) ali zver (kar človeka potisne kvečjemu v vlogo mrhovinarja). Z vidika obeh (tj. zveri in človeka) je mogoče prehrambno vrednost kosti razdeliti na tri komponente: mehko tkivo okrog kosti

[17] Koeficient korelacije (Spearmanov R) med MNE in strukturno gostoto posameznih kosti ni statistično značilen. Iz navedenega izhaja, da razlike v obstojnosti najdb domnevno niso bistveno vplivale na ugotovljen delež zastopanosti posameznih skeletnih elementov. Podatki o strukturni gostoti kosti se nanašajo na jelena (Lyman 1999).

[18] Večina citiranih aktualističnih in eksperimentalnih študij sicer temelji na opazovanju hijen, vendar pa je predstavljeni vzorec procesiranja plena zelo podoben tudi pri kanidih (prim. Morey, Klippel 1991).

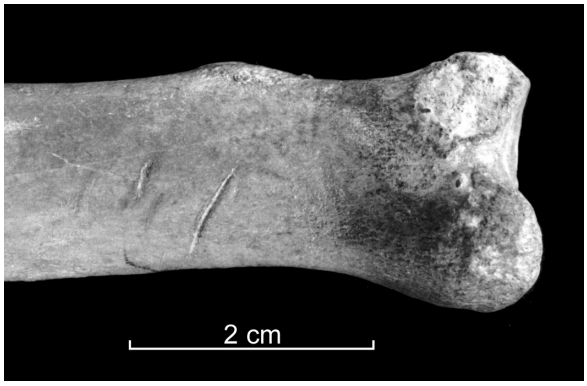


Sl. 11.24: Razpon vrednosti indeksa (H+H)/L za vzorec fosilnih kopitarjev iz Divjih bab I. Kot primerjava so navedeni podatki za tri različne vrste recentnih zveri ter za paleolitskega človeka z več italijanskih najdišč (Stiner 1994). Pričakovana vrednost (= expected value) se nanaša na vrednost indeksa (H+H)/L, kot bi jo pričakovali pri popolni zastopanosti vseh skeletnih elementov plena. Za obrazložitev glej besedilo.
Fig. 11.24: Range of values of index (H+H)/L for sample of fossil ungulates from Divje babe I. As comparison, three different species of recent carnivores and for Palaeolithic man from a number of Italian sites are cited (Stiner 1994). Expected value refers to the value of index (H+H)/L, as would be expected with a complete representation of all skeletal elements of prey. See text for explanation.

(meso, maščoba, kite), mozeg v mozgovnem kanalu (predvsem dolge kosti) in pa maščoba v spongiozni kosti, ki se pri cervidnih/bovidnih dolgih kosteh nahaja predvsem ob obeh epifizah. Ko ljudje in zveri z dolgih kosti uplenjenih oz. naravne smrti poginulih živali trgajo mehko tkivo, puščajo največ sledi (urezi, odtisi zob) na diafizah, saj je tam največ mesa in maščob. Dostop do kostnega mozga si omogočijo z grizenjem oz. strtjem kosti, pri čemer sledi obeh aktivnosti najdemo predvsem na diafizah (hijene; Marean, Kim 1998) oz. epifizah (volkovi; Haynes 1980; 1983). Poudariti velja, da je zanimanje zveri za fragmente diafiz po odstranitvi kostnega mozga praktično nično. Drugače je z epifizami (oz. s spongiozno kostjo tik ob njih), ki imajo zaradi relativno visoke vsebnosti maščobe še vedno precejšnjo prehrambno vrednost. Zveri jih običajno pogoltnejo, v želodcu ekstrahirajo kar največji delež maščobe, preostanek pa izbljuvajo (hijene) oz. izločijo z odvajanjem (kanidi). V nasprotju s tem so srednjepaleolitski ljudje maščobo iz spongiozne kosti domnevno pridobivali s prekuhavanjem (npr. Hanson 1998; a glej tudi Marean, Kim 1998).

Frekvenca in mesto pojavljanja urezov, zasekanin, sledi udarcev in odtisov zob na fosilnih kosteh iz Divjih bab I potrjujeta tezo, da je imel pogosto prav paleolitski človek prvi dostop do poginulih (uplenjenih?) jelenov, gamsov, kozorogov in srn. To kažejo posamezne sledi urezov na diafizah dolgih kosti (*sl. 11.25*), predvsem pa večje število odtisov zverskih zob na epifizah (oz. tik ob njih) kot na diafizah.[19] V nasprotju s tem se glavnina sledi, kakršne Blumenschine s sodelavci (1996), Marean, Kim (1998) ter Milo (1998) povezujejo z aktivnostmi človeka, pojavlja na diafizah. Večina uplenjenih oz. v jami naravno poginulih živali je bila torej domnevno najprej na razpolago človeku. Ta je od kosti odtrgal mehka tkiva (na to kaže prisotnost urezov in odsotnost odtisov zob na diafizah) oz. si je s strtjem kosti omogočil dostop do mozga. Ostanki (tj. fragmenti diafiz, epifize) so z energetskega vidika bistveno manj zanimivi, zato jih človek verjetno ni redno prekuhaval, sežigal ipd. To v primeru Divjih bab I nakazuje že odsotnost ostankov običajnih lovnih vrst v ognjiščih in neposredno ob njih (Paunović *et al.* 2002; glej tudi *tab. 11.15*). Če (ko) je človek kosti zavrgel (oz. ko je zapustil jamo), so se do njih dokopale velike zveri, v Divjih babah I predvsem volkovi. Zanimivi so jim bili z maščobo prepojeni fragmenti spongiozne kosti, o čemer pričajo sledi obgrizovanja na epifizah oz. tik ob njih (*sl. 11.26*). Pri

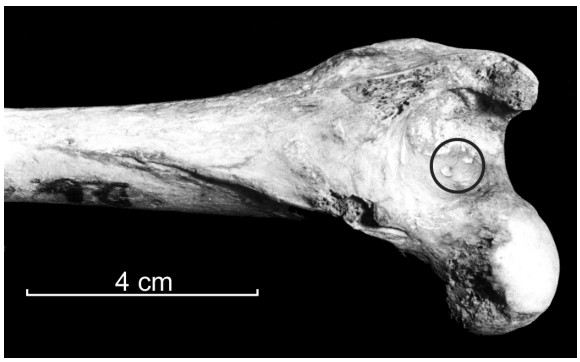
[19] Upošteval sem le gradivo, ki je bilo izkopano po letu 1990; pred tem se namreč sediment še ni rutinsko spiral preko sit, zaradi česar so bili številni manjši fragmenti diafiz med izkopavanji spregledani in zato zavrženi.



Sl. 11.25: Sledi urezov na diafizi volčje koželjnice iz plasti 17 (inv. št. D. b. 174). Fotografija: T. Lauko.
Fig. 11.25: Cut marks on the diaphyis of a wolf's radius from Layer 17 (inv. no. D. b. 174). Photograph T. Lauko.

tem skorajšnja odsotnost podobnih sledi na fragmentiranih diafizah nakazuje, da so večino dolgih kosti verjetno že pred prihodom zveri strli ljudje.

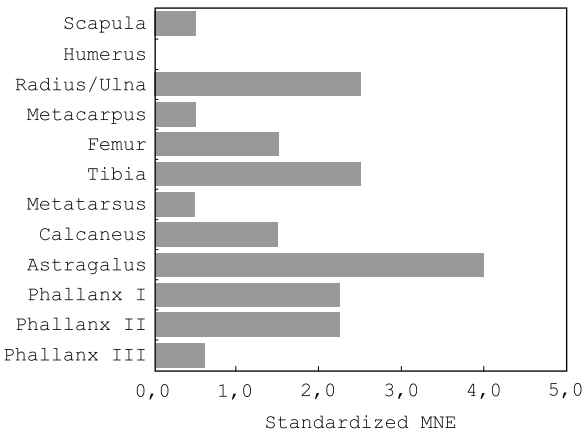
Podoben vrstni red dostopa do (ostankov) uplenjenih/poginulih živali je bil ugotovljen tudi pri analizi številnih drugih paleolitskih najdišč v Evropi (npr. Estévez 1987; Auguste 1995; Blasco 1997; Yravedra 2002), zato sam po sebi ni presenetljiv. Odprto pa ostaja vprašanje, kako močan je bil v Divjih babah I pritisk zveri na odpadke paleolitskega človeka? Po eksperimentalnem razbijanju kosti afriških kopitarjev prvega in drugega velikostnega razreda (*sensu* Bunn 1982), pri čemer so uporabljali izključno kameno orodje, so sledi udarcev zasledili na približno tretjini vseh fragmentov dolgih kosti (Blumenscine 1995). V nadaljevanju so ugotavljali tudi delež ostankov z odtisi zob, potem ko so cele (poskus 1) oz. že zdrobljene dolge kosti brez mozga (poskus 2) nastavili različnim prosto živečim afriškim zverem (večinoma je šlo za lisaste hijene). V prvem poskusu je bil delež obgrizenih kosti pričakovano visok (v povprečju 70,8 %), saj so si hijene z drobljenjem kosti omogočile dostop do mozga. V nasprotju s tem so bili v okviru poskusa 2 odtisi zob opaženi na samo petini vseh ostankov (večinoma na fragmentih spongiozne kosti). Delež obgrizenih kosti kopitarjev iz Divjih bab I je še nižji; to gre do neke mere gotovo pripisati različni intenzivnosti, s katero so hijene in volkovi drobili kosti. Po drugi strani pa lahko glede na pičlo število najdb z odtisi zob sklepamo tudi na razmeroma skromno vlogo volkov (in velikih mačk) kot mrhovinarjev pri ostankih plena paleolitskega človeka oz. v jami naravno poginulih živalih. Nenazadnje bi bilo v nasprotnem primeru med ostanki apendikularnega skeleta kopitarjev pričakovati precej manjši delež skočnic, petnic in drugih kompaktnih kosti od ugotovljenega (*sl. 11.27*); ostanke naštetih skeletnih elementov namreč pogosto v celoti razkrojijo že prebavni sokovi psov (Payne. Munson 1985). Skladna s tem je ugotovitev, da epifize koželjnic (N = 3) in stegnenic (N = 3) kopitarjev v vzorcu iz Divjih bab I niso obgrizene, kar bi bilo ob večjem pritisku volkov na ostanke človekovega plena oz. v jami naravno poginulih živali sicer pričakovano (prim. Haynes 1980).



Sl. 11.26: Sledi obgrizovanja na proksimalnem koncu volčje stegnenice iz sklopa plasti 4-6 (inv. št. D. b. 129). Fotografija: T. Lauko.
Fig. 11.26: Gnawing marks on the proximal end of a wolf's femur from the complex of layers 4-6 (inv. no. D. b. 129). Photograph T. Lauko.

SKLEP

Ker so mali sesalci boljši kazalec nekdanjega okolja od velikih (Andrews 1990), sem v pričujočem prispevku največ pozornosti namenil dejavnikom akumula-



Sl. 11.27: Standardizirane vrednosti najmanjšega števila elementov (*Minimum Number of Elements*; MNE) za posamezne elemente apendikularnega skeleta v vzorcu kopitarjev iz Divjih bab I. Vrednosti MNE so standardizirane po številu pojavljanja posameznega skeletnega elementa v skeletu (Stiner 1994).
Fig. 11.27: Standardized values of the Minimum number of elements (MNE) for individual elements of appendicular skeleton in the sample of ungulates from Divje babe I. MNE values are standardised by the number of appearances of an individual skeletal element in the skeleton (Stiner 1994).

cije sesalskih kosti v Divjih babah I. Za nastanek tafocenoze naj bi bili ob naravno poginulih živalih odgovorni tudi paleolitski človek in zveri. Tako kažejo število in mesto pojavljanja urezov, zasekanin, odtisov zob in sledi udarcev s kamnitim orodjem na dolgih kosteh kopitarjev. Zdi se, da so bila trupla jelenov, gamsov, kozorogov in srn običajno najprej dostopna človeku, njemu nezanimive odpadke (predvsem gre tu za z maščobo prepojene fragmente spongiozne kosti ob epifizah) pa naj bi naknadno uživale še zveri. Malo verjetno je, da bi bili ljudje pri iskanju mrhovine uspešnejši od zveri, zato naj bi glavnina kosti kopitarjev v Divjih babah I predstavljala ostanek človekovega plena. Med dejavnike akumulacije velja kljub temu prištevati tudi velike zveri. V tem smislu je zanimiv podatek, da med najdenimi kočniki volkov, leopardov in jamskih levov močno prevladujejo primerki mladih in subadultnih živali[20] (*sensu* Stiner 1994). Iz tega namreč izhaja, da so imeli v jami občasno svoje brloge tudi volkovi in velike mačke. Glede na njihovo etologijo (Ewer 1973; Domínguez-Rodrigo 1994; Stiner 1994; Blasco 1997) pa to v končni fazi pomeni, da predstavlja vsaj del najdb v jami zelo verjetno ostanek njihovega lastnega plena.

Nobenega dvoma ni, da so ljudje in zveri jamo obiskovali izmenično. Žal razlikovanje med posameznimi obiski ni mogoče, saj je časovna ločljivost vzorca preskromna in se meri v stoletjih. Vertikalna porazdelitev kosti z vidnimi sledmi človekove aktivnosti kaže, da jih večina izvira iz sklopa plasti 2 do 5. Isti sklop plasti izstopa tudi po velikem številu kamenih artefaktov (Turk, Kavur 1997). Vendar pa navedenih podatkov še ni mogoče interpretirati kot kazalec povečane frekvence človekovega obiskovanja jame na račun pogostnosti obiskov velikih zveri. Število najdenih orodij, jeder, odbitkov, razbitin in lusk je namreč največje ravno tam, kjer je največja tudi geometrijska gostota kosti volkov (tj. v plasti 4; Turk, Dirjec 1997b; Turk, Kavur 1997)[21]. Poleg tega je bilo v plasti 4 pobranih kar 122 celih kosti na kubični meter sedimenta (v okviru sklopa plast 2–5 jih je bilo več najdenih le še v plasti 3), kar ob daljšem človekovem bivanju v jami ne bi pričakovali. Da so se ljudje lahko dokopali do mozga, so namreč dolge kosti okončin praviloma intenzivno razbijali. Po drugi strani pa je tudi res, da jame človeku niso vedno služile le kot bivališče ali lovska postojanka, ampak so imele lahko tudi drugačno vlogo (npr. obredni prostor). Morda je bilo tako tudi v Divjih babah I. V tem smislu velja omeniti najdbo domnevne piščali in preluknjane lobanje jamskega medveda (glej podpoglavje 12.4 v tem zborniku) ter najdbe oglja tise, brina in jelše (glej poglavje 8 v tem zborniku), ki jih v drugih paleolitskih najdiščih južno od alpske poledenitve ni (Šercelj, Culiberg 1985).[22] Nenavadna je tudi odsotnost ostankov običajnih lovnih živali v ognjiščih in ob njih (Paunović *et al.* 2002; *tab. 11.15*). Še več: kosti, ki so bile razmetane okoli ognjišč, pripadajo skoraj izključno jamskemu medvedu in so brez vidnih poškodb, ki nastanejo pri razkosavanju plena s kamnitim orodjem. Če Divje babe I paleolitskemu človeku dejansko niso služile (le) za zavetišče ali lovsko postojanko, lahko seveda pričakujem, da je bil pri obdelavi živali v jami specifičen (obreden?) tudi vzorec njihovega razkosavanja in razbijanja kosti. V tem primeru živalski ostanki najverjetneje sploh ne bi predstavljali kuhinjskih odpadkov paleolitskega človeka, to pa bi seveda imelo pomembne implikacije za celovito oceno njegove vloge pri nastajanju preučevane tafocenoze.

ZAHVALA

Zahvaljujem se dr. Ivanu Turku, ki mi je omogočil študij fosilnih ostankov iz Divjih bab I. Članek je v pretežnem delu povzetek lastne doktorske disertacije, zato bi se želel na tem mestu zahvaliti mentorici prof. dr. Vidi Pohar ter članoma komisije prof. dr. Jerneju Pavšiču in prof. dr. Borisu Bulogu. Podiplomsko usposabljanje je financiralo Ministrstvo za šolstvo, znanost in šport. Za spodbudne razprave, ki so spremljale celoten potek raziskave, sem hvaležen dr. Ivanu Turku in Janezu Dirjecu. Zahvaljujem se tudi dr. J. Radovčiću in dr. P. Wojtalu za pomoč pri determinaciji tretje prstnice mamuta/nosoroga ter Mihi Kroflu za nasvete pri determinaciji velikih mačk. Za omogočen dostop do primerjalne osteološke zbirke sem hvaležen kolegom z Zavoda za geologijo in paleontologijo kvartarja iz Zagreba, za fotografije Tomažu Lauku, za tehnično pomoč pri oblikovanju slikovnega gradiva pa Dragu Valohu.

[20] Od skupno 16 kočnikov omenjenih treh vrst jih je mladim ali subadultnim primerkom pripadalo kar 12 (Toškan 2004).

[21] Plasti 10–13, v katerih je druga največja gostota volka, so bile v podrobno obravnavanem osrednjem delu jame skoraj brez paleolitskih najdb, pač pa jih je bilo absolutno največ pri jamskem vhodu.

[22] Edino izjemo predstavlja primerek oglja brina (*Juniperus* sp.) iz Parske golobine pri Pivki (Šercelj, Culiberg 1985).

11. REMAINS OF LARGE MAMMALS FROM DIVJE BABE I STRATIGRAPHY, TAXONOMY AND BIOMETRY

BORUT TOŠKAN

Abstract

In the Upper Pleistocene (OIS 3 and OIS 5) layers of the Palaeolithic cave site Divje babe I, in addition to finds of cave bear, a further 995 remains of large mammals from at least 20 different species were found: *Lepus timidus* seu *europaeus*, *Marmota marmota*, *Ursus arctos*, *Canis lupus*, *Vulpes vulpes*, *Alopex lagopus*, *Mustela putorius*, *Martes martes*, *Lutra lutra*, *Felis silvestris*, *Lynx lynx*, *Panthera pardus*, *Panthera spelaea*, *Sus scrofa*, *Cervus elaphus*, *Alces alces*, *Capreolus capreolus*, *Rupicapra rupicapra*, *Capra ibex* and *Mammuthus primigenius* seu *Dicerorhinus* seu *Coleodonta*. The number and place of appearance of cutmarks, carnivore tooth marks and hammerstone percussion marks on the long bones of ungulates show that both Palaeolithic man and carnivores contributed to the accumulation of the taphocenosis in the cave. It appears that man typically had first access to carcasses of large herbivores (red deer, chamois, ibex, roe deer), while carnivore access was largely restricted to scavenging of hominid-butchered fare, specifically grease from hammerstone-generated (near-) epiphyseal fragments. It is very unlikely that people would be more successful than wolf, bear, cave lion, leopard and lynx in seeking carrion, so the bulk of the bones of ungulates in Divje babe I presumably represent the remains of human prey.

Many remains of large mammals were collected during the extensive period of excavation of the Divje babe I site (western Slovenia, 450 m asl). As expected (Miracle 1991) the large majority of them belong to cave bear (*Ursus spelaeus*) and these have already been the subject of a number of preliminary studies (e.g., Turk *et al.* 1988–1989; 1990; 1992; Turk, Dirjec 1989; 1991; Debeljak 1996; 2002a). Little attention, however, has been devoted to date to the finds of other large mammals (see, e.g., Turk, Dirjec 1997b). I thus provide below a taxonomic review of the mammal macrofauna, followed by findings concerning the characteristics of the palaeoenvironment and the role of man vs. carnivores in the accumulation of the studied taphocenosis.

METHODS

The material in question was collected in two successive phases of excavations, in which different field-work techniques and methods were used. In the first period (i.e., between 1980 and 1986) the eastern part of the cave was investigated in a conventional manner, during which the sediments were not rinsed through a sieve. Individual finds were documented vertically by layers, which were followed between approximately meter distant neighbouring profiles. From the start of the second phase of excavations (period between 1989 and 1999), when the central and inner parts of the cave were excavated, the methodology essentially changed. From then on, the basic sample was a 1 x 1 m square with a depth of 12 cm. From 1990 onwards, all excavated sediments were rinsed and examined on sieves with 10 mm, 3 mm and 0.5 mm mesh. More detailed data on the site and field-work methodology is given by Turk (Chapter 1 in this volume). The oldest excavated layers (i.e., layers 21–26) are presumed to have been deposited in the Riss-Würm Interglacial (OIS 5e), layers 12–20 in the Early Glacial (OIS 5a-5d), the majority of the remainder (layers 2–11) in the Interpleniglacial or Middle Würm (OIS 3); Layer 1 is of Holocene origin (OIS 1). The age of the oldest studied sediments is believed to be more than 115,000 years, and those from Layer 2 approximately 40,000 years (Turk *et al.* 2001a; Chapter 1 in this volume).

I was assisted in identification by fossil and recent material from Slovenia (collection of the Institute of Archaeology ZRC SAZU and the Department of Palaeontology NTF, University of Ljubljana) and Croatia (collection of the Institute of Quaternary Palaeontology and Geology, Zagreb). In terms of systematic classification, I used the system given by Guérin, Patou-Mathis (1996). Age structures were assessed by tooth-wear analyses. Measurements were taken according to Torres (1988; for bear skull) and Von Driesch (1976; other skeletal elements); metric data are given in *Annex 11.1*. In looking for cutmarks, chopmarks, percussion marks and tooth marks, a stereomicroscope (15x magnification) with a strong light source was used (see Blumenschine *et al.* 1996).

The analysis of abundance uses the number of identified specimens (NISP), since the overall number of

finds was relatively modest. Teeth embedded in jawbones were treated as isolated (e.g., a mandible with preserved M_1 would be treated as NISP = 2). By doing so, I tried to minimize the disturbing influence of differential taphonomic loss and fragmentation in various periods of the Würm. The analysis of anatomical part representation uses the minimum number of skeletal element counts (MNE), based on bone material, not teeth. In this study, bone MNE is derived from the most common portion of each skeletal element and represents the sum of right and left sides for elements that naturally occur in pairs (Stiner 1994).

Non-parametric tests were used in statistical processing (e.g., Spearman rank R, χ^2-test, Mann-Whitney U test; StatSoft, Inc. 2001), since the distribution of the analysed metric data generally deviates from normal. Statistical processing was done with the programme package STATISTICA for Windows, version 6.0 (StatSoft, 2001).

All the bone finds from Divje babe I are stored in the National Museum of Slovenia in Ljubljana.

TAXONOMY

In addition to finds of cave bear, it was possible to identify a further 995 remains of large mammals, which were ascribed to 20 species from 10 families (*Fig 11.1*). The majority of species (i.e. 15) still inhabit Slovenia today, although some only because of reintroduction after previous local extinction (e.g., *Capra ibex*, *Lynx lynx*, *Marmota marmota*). Of the total of five species no longer present in Slovenia today, two became extinct at the end of the Pleistocene (*Mammuthus primigenius* (?) and *Panthera spelea*). The remaining three (*Alces alces*, *Alopex lagopus* and *Panthera pardus*) withdrew elsewhere.

Order: hares, rabbits and pikas (Lagomorpha)
Family: hares and rabbits (Leporidae)

Lepus timidus/europaeus

Material: group of layers 2–5: ulna, vertebra lumbalis, ossa coxae (2x);[1] Layer 6: dens; Layer 8: phalanges (2x); Layer 13: humerus; Layer 2–11/12: astragalus; layers 12–22: metapodium.

Distinguishing between European hare (*Lepus europaeus* Pallas, 1778) and mountain hare (*Lepus timidus* Linnaeus, 1758) is difficult. Right upper incisors are thought to allow reliable specific identification (Rakovec 1961; Malez 1963; Kryštufek 1991), but there are none in the Divje babe I sample. It should also be possible to differentiate between the two species on the basis of the degree of development of the posterior-lingual enamel ridge of the second upper premolars (Chaline 1966), but the only available P^2 from Divje babe I is damaged in this part. Metric data are not of great help either, since both available long bones are fragmented. The greatest breadth of the distal epiphysis of the humerus from Layer 13 (inv. No. D. b. 1303) is 12 mm. This value lies within the range seen in recent European hare from the former Soviet Union (range: 7.5-15 mm; N is not stated; Gromova 1950) but, at the same time, it does not differ from fossil specimens of mountain hare from southern Moravia (range: 11–13 mm; N = 22; Rakovec 1959).

Finds of the genus *Lepus* from Divje babe I originate from layers 2–13, which are thought to have been deposited in OIS 3. The climate at that time was cold and, as such, more suitable for mountain hare. Today, the area of distribution of this species is mostly covered by tundra and taiga[2] (Lequatre 1994), while European hare prefers arable land, meadows and pastures (Kryštufek 1991). Furthermore, while *L. timidus* seems to have been generally widespread in Slovenia during the Upper Pleistocene (Rakovec 1959; 1961; 1962-63; 1973; Osole 1976), fossil remains of *L. europaeus* are only known from Potočka zijalka (Brodar, S. in M. 1983).

Order: Rodents (Rodentia)
Družina: Squirrels (Sciuridae)

Marmota marmota (Linnaeus, 1758)

Material: Alpine marmot is represented in the sample from Divje babe I with 234 remains. The complete list of finds by layers and skeletal elements is given in *Annex 11.2A*.

Two allopatric species of marmot inhabited Europe in the Würm: alpine marmot and steppe marmot (*M. bobac* Müller, 1776). On the basis of the number of roots of the fourth lower premolars and the colour of incisors, the specimens from Divje babe I were ascribed to *M. marmota* (Rakovec 1935; Chaline 1966). All the available P_4, namely, have three roots (and not two, as in the case of *M. bobac*), and the incisors are also intensive orange (in the case of steppe marmot they are appreciably lighter). The same species (i.e. *M. marmota*) have also been ascribed to finds of marmot from other Palaeolithic sites of Slovenia, Northeast Italy, Southeast Austria, Western Hungary, Croatia and Bosnia and Herzegovina (Rakovec 1973; Jánossy 1986; Malez 1986a; Bon *et al.* 1991; Fladerer 2000; Toškan 2004).

[1] The lumbar vertebra and both fragments of pelvis (one left, one right) come from the same quadrat and cut so they are probably the remains of the same animal.

[2] In the Alps *L. timidus* inhabits mountain pastures, dwarf pine scrub and high moorland (Kryštufek 1991).

Recent alpine marmots inhabit open mountain grasslands. They dig tunnels in which they sleep, overwinter and hide from predators. They can only therefore settle where the soil is at least three metres deep or there is at least as much alluvium (Kryštufek 1991). As is evident from *Table 11.14*, finds of marmot in Divje babe I are most numerous in layers 2-5.[3] It is known that recent marmots sometimes seek shelter in rocky cracks and underground cavities (Turk *et al.* 1996); this is not least demonstrated by the fossil tunnels in some Upper Pleistocene cave sites (e.g., Pohar 1989; Pohar, Brodar 2000). It is also known that a relatively large number of animals die during the five to six month hibernation (Kryštufek 1991). However, since the majority of marmot remains from Divje babe I originate from the upper one metre of sediment (i.e., layers 2–5), they probably represent human and/or small carnivore food waste. Winter hibernation tunnels of recent alpine marmot, namely, go at least 2 to 3 metres deep (Vidic 1994), which is deeper than Layer 5 in Divje babe I.[4]

Order: Carnivores (Carnivora)

Carnivores are represented in the sample from Divje babe I by 12 species from four families. Fourteen remains (mainly phalanges, incisors, carpal and tarsal bones) could only be identified on the level of order. The remaining finds are presented in more detail below.

Family: Bears (Ursidae)

Ursus spelaeus Rosenmüller, 1794

The remains of cave bear in Divje babe I represent by far the largest share of finds of large mammals (>99 % NISP), so they are dealt with separately in the volume (see Chapters 12, 15–18 in this volume).

Ursus arctos Linnaeus, 1758

Material: Brown bear is represented in the sample from Divje babe I with 192 remains. The complete list of finds by layers and skeletal parts is given in *Annex 11.2B*.

Fossil finds of brown bear normally occur together with finds of cave bear, although usually in smaller numbers. The disproportion in numbers of the two species is probably a result of the lesser dependence of brown bear on hibernation in caves (Couturier 1954; Argant 1996a). The genus *Ursus* displays great morphological variability (Kryštufek 1991), which often makes specific identification problematic. Roughly one third of a total of 192 bear bones and teeth from Divje babe I could only therefore be ascribed to *U. arctos* provisionally. The majority are isolated premolars, which appear only exceptionally with *U. spelaeus* (Ewer 1973; Torres 1988). Identification of the remaining check-teeth is less problematic, since differences between the two species are greater in the case of molars (*Table 11.1*).

The find of a skull from Layer 6 is interesting (inv. No. D.b. 1606a), since it is almost undamaged (see Chapter 15 in this volume, *Fig. 15.4b*). In terms of size, it somewhat exceeds Upper Pleistocene specimens from the Iberian Peninsula (*Annex 11.1C*; see Torres 1988). The lower jaw from Layer 14 (inv. No. D.b.532) deserves special attention. It is a damaged specimen, of which only the *corpus mandibulae* with its alveolar part is preserved. The teeth are missing but, on the basis of the alveoli, the canines and third lower molar already had formed roots. Morphologically, the mandible is between brown and cave bear (*Fig. 11.2*). It is linked to the latter by the convex lower edge and labial wall of the *corpus mandibulae* and by the absence of alveoli of the first premolar. On the other hand, the slender distal part of the *corpus mandibulae*, which is connected to the relatively gracile canines, links the specimen in question to brown bear (Torres 1988; Capasso Barbato *et al.* 1990). The length of the cheek-teeth row (P_4–M_3; measured along the alveoli) is 97.3 mm, which lies within the range of *U. spelaeus* from Mokroška jama in the Savinja Alps (Rakovec 1967).

The oldest remains of brown bear known so far in Slovenia are from Jama pod Herkovimi pečmi on Kozjak (Würm I; Pohar 1981), the species being also represented in the fauna of numerous other Upper Pleistocene sites in the region (Toškan 2004). Taking into account available ESR dates (Turk *et al.* 2001a; Chapter 6 in this volume) the specimens from the deepest layers of Divje babe I could be classified alongside those from Jama pod Herkovimi pečmi as the oldest remains of brown bear known to date in Slovenia.

Family: Dogs (Canidae)

Canis lupus Linnaeus, 1758

Material: Wolf is represented in the sample from Divje babe I by 167 specimens. The complete list of finds by layers and skeletal parts is given in *Annex 11.2C*.

Wolf is represented in the fauna of the majority of Slovene Palaeolithic sites (Toškan 2004), although generally only with a modest number of remains. This is not so in the case of Divje babe I, since in terms of the number of finds, it is behind only bear and marmot.

[3] Layer 2 deposited before the deep freezing of the soil in the parts behind the cave entrance (*cf.* Turk 1997), i.e. when digging tunnels in the cave would still be possible.

[4] In view of the ethology of recent alpine marmot and the geological composition of the group of layers 2–5 there seems little possibility of winter tunnels being shallower in the cave than those in the open (F. Frey-Roos, oral communication).

Identification was not problematic, with the exception of a few smaller and fairly fragmented remains, mainly phalanges (even these, however, show typical canide morphology). In this sense it is worth mentioning the canines from layers 5-6 (inv. No. D. b. 95; *Fig. 11.3*) and 17a (inv. no. D. b. 476). Although the teeth do not differ morphologically from those of wolf, in terms of size[5] both lie within the range of fossil dhole (*Cuon alpinus* [Thenius 1954]). The latter species is represented in Mousterian layers of Apnarjeva jama by Celje (Malez, Turk 1991) and in a number of Upper Pleistocene sites in Austria, Hungary and Croatia (Malez 1965; 1986a; Mottl 1975; Jánossy 1986).

The size of wolves in Western Europe increased relatively uniformly from the end of the last glacial (= Riss) right up to the onset of the Holocene (Crégut-Bonnoure 1996a). Whether a similar trend can be expected for the area south of the Alpine glaciation is impossible to say only on the basis of the finds from Divje babe I. From the small amount of available metric data, it can be only concluded that the remains in question here lie within the range of fossil *C. lupus* from Central Europe (*Fig. 11.4*). Fossil wolves from Divje babe I, however, exceed recent specimens from the area of the former Soviet Union (Gromova 1950; 1960).

Vulpes vulpes (Linnaeus, 1758)

Material: complex of layers 2–5: dentes (C_1 in M_1); Layer 16: dens (P_2), ulna; unknown layer: mandibula.

Red fox is represented in the sample from Divje babe I with a modest number of remains, which is actually characteristic for the majority of contemporary sites in the region (Toškan 2004). Because distinguishing between red and arctic fox (*Alopex lagopus*) is difficult only on the basis of isolated teeth (Rakovec 1959; Poplin 1976; Altuna 2004), I relied mainly on metric data in the identification (*Table 11.2*). Specific identification of some finds nevertheless remains tentative, since *V. vulpes* shows great variability in the size of individual skeletal elements (Kryštufek 1991; Crégut-Bonnoure 1996a). Because of the incomplete state of preservation, the identification of both teeth from the layers 2–5 is also to some extent questionable. The first lower molar (inv. No. D. b. 1462) was ascribed to *V. vulpes,* despite the fact that in relation to its length, it lies within (at the upper limit of) the range for fossil and recent arctic fox from Europe (Poplin 1976). Namely, because of the fragmentation of the mesial part, the greatest length of the tooth could not be measured (the obtained measurement represents only its slightly underestimated approximation). Similar applies to the canine from the same complex of layers (inv. No. D. b. 458), which already has a slightly worn tip of the crown.

Identification of the ulna and mandible is less problematic. In the case of *V. vulpes,* the *foramen mentale* lies on the mandible below the first lower premolar (which also applies to the specimen from Divje babe I), while with *A. lagopus* it is located slightly posteriorly, i.e., below the second premolar (Poplin 1976). What about the ulna from Layer 16 (inv. No. D. b. 457)? Because of smaller prominences for tendon/muscule attachments (see Malez 1963) and the saddle like depression between the *olecranon* and the posterior part of the *processus olecrani* (see Beneš 1975) it was ascribed to red fox (*Fig. 11.5a*). Such a determination is confirmed by the size of the bone (*Table 11.3*).

Alopex lagopus (Linnaeus, 1758)

Material: Layer 6-7: dens (C_1); Layer 8: mandibula, dentes (I_3, P_2, P_4), vertebrae (3x), ulna, metacarpus, phalanx II (2x), ossa coxae, calcaneus.

Arctic fox is represented in the sample by 14 finds. With the exception of the calcaneus, all remains from Layer 8 were found close together, so there are probably good grounds for ascribing them to the same individual. The identification of the mandible (inv. No. D.b. 2039) is based on the position of the *foramen mentale* (*Fig. 11.6*), the relatively small curved basal edge of the *corpus mandibulae* and the size itself of the specimen (Poplin 1976; Argant 1991). The identification of the ulna (inv. No. D. b. 2040; *Fig. 11.5b*) is similarly not in question, since it does not even achieve the dimensions of recent arctic fox (*Table 11.3*). The size of the premolars is also modest (length P_2: 8.0 mm), so they were ascribed to a relatively small specimen (female?) of *A. lagopus*.

Identification of the canines from Layer 6-7 and the calcaneus from Layer 8 is based exclusively on their size. The calcaneus from Layer 8, namely, lies within the range of recent and fossil *A. lagopus* (maximum length: 27 mm, maximum width: 11.0 mm), and the canine does not even achieve the values of recent arctic foxes in the height of the crown on the buccal side (= 11.5 mm) (see Gromova 1960; Castaños 1987; Altuna 2004).

Arctic fox appears sporadically within the context of European Upper Pleistocene sites. Its remains only become rather more numerous in sediments deposited in OIS 2 (Kurtén 1968). In contrast to the ubiquitous red fox, *A. lagopus* is closely bound to an environment with a cold climate and today inhabits areas of tundra with arctic islands (Pulliainen 1999). In the coldest periods of the Würm, its area of distribution also included the Iberian Peninsula (Altuna 2004), southern France (Bonifay 1971), Italy (Bartolomei *et al.* 1992), Croatia

[5] Dimensions: labial-lingual breadth: 10.2 and 12.5 mm; anterior-posterior breadth: 6.5 and 7.8 mm.

(Malez 1963), Hungary (Jánossy 1986) and even Bulgaria (Wiszniowska 1982). Finds from Layer 8 of Divje babe I are dated to the period between 60,000 and 50,000 BP (Turk *et al.* 2001a; Chapters 6 and 7 in this volume), so that to date they represent the geologically oldest evidence of the presence of *A. lagopus* in Slovenia. Together with those from Betalov spodmol by Postojna (Würm II+III; Rakovec 1959), they are also the only ones that do not originate from OIS 2 (Toškan 2004).

Vulpes vulpes seu *Alopex lagopus*

Material: Layer 5: phalanx II; Layer 8: dens (I^3); Layer 12/13: phalanx I; Layer 16: dens (I^3).

Four finds of fox from Divje babe I did not allow for their determination to the level of species, although they do not deviate morphologically from corresponding elements of common fox (comparable material for arctic fox was not available to me). The phalanges are too fragmented to be measured.

Family: Mustelids (Mustelidae)

Mustela putorius Linnaeus, 1758

Material: Western polecat is represented in the sample from Divje babe I with 50 remains. The full list of finds by layers and skeletal elements is given in *Annex 11.2D*.

With the exception of the canine and the metapodial, all remains from layers 2–5 probably belonged to the same individual, since they were found close together. I relied in identification mainly on the three mandibles, since distinguishing between western and steppe polecat (*Mustela eversmanni* [Lesson, 1827]) on the basis of post-cranial skeletal elements is problematic (Crégut-Bonnoure 1996b). Western polecat is best distinguished from its steppe relative by the height of the mandible between the last premolar and the first molar (Koby 1951). While the stated dimension with western polecat is always smaller than 8 mm, with recent steppe polecats it ranges between 8.4 and 9.3 mm (*Table 11.4*). It should not be overlooked that recent polecats are very variable in size. Even dwarf and giant specimens can be found, which are presumed to be a result of more or less favourable conditions in the period of fast physical growth (Buchalczyk, Ruprecht 1977). Precisely because of the aforementioned, I ascribed the lower mandible from Layer 8 (inv. No. D. b. 2510) to *M. putorius,* even though its height exceeds 8 mm. Not least, the specimens in question do not deviate in any other dimension from fossil and recent western polecat (*Table 11.4*), and there are clear similarities on the morphological level. So the *fossa masseterica*, which with steppe polecat should reach anteriorly all the way to an imaginary point below the centre of the first molar (Pohar 1981), already ends in the specimen in question below the second molar (*Fig. 11.7c*). Moreover, with steppe polecat there is a bulge on the basal edge of the *corpus mandibulae* below the fourth premolar and the first molar (Crégut-Bonnoure 1996b). Such a bulge is not visible in the case of the mandible from Layer 8 or it is at least not more accentuated than with typical specimens of western polecat.

The only find of *M. eversmanni* in Slovenia is known from the end of the Riss-Würm Interglacial (Jama pod Herkovimi pečmi; Pohar 1981), but it is also represented in the fauna of a number of contemporary sites in the western part of the Pannonian basin (Malez 1963; 1979; Jánossy 1986). Today, steppe polecat inhabits semi-desert and forest/grassland steppe in areas with cold winters and warm to hot summers (Wolsan 1999). However, the disputed polecat mandible from Divje babe I (inv. No. D. b. 2510) originates from Layer 8, which deposited in a period of a relatively humid climate (Šercelj, Culiberg 1991; Turk, Bastiani 2000; Turk *et al.* 2002b; Chapter 10 in this volume). The then environment thus seems to have been more in accord with the needs of western polecat, which today mainly inhabits lowlands and river valleys, withdrawing from (artificially) drained land (Kryštufek 1991).

Martes cf. *martes* (Linnaeus, 1758)

Material: Pine marten is represented in the sample from Divje babe I by 139 remains. The full list of finds by layers and skeletal elements is given in *Annex 11.2E*.

Taxonomically relevant morphological differences between pine marten and beech marten (*M. foina* [Erxleben, 1777]) are limited to a few details on the skull, mandible and teeth. Because of this, and the great variability occurring in the size of the two species, specific identification of fossil remains of the genus *Martes* is in general fairly difficult (Bonifay 1971; Castaños 1987). So of all the 139 bones and teeth of martens from Divje babe I, only 27 could be identified with certainty in terms of species (i.e., 5 first upper and 7 first lower molars, 14 mandibles and a fragment of skull). All were ascribed to pine marten. The most reliable taxonomic sign with mandibles is the distance between the *foramen mentale*; with beech marten this does not generally exceed 3 mm, but with pine marten always exceeds 4 mm (Kryštufek 1991; *Table 11.5*). Furthermore, the lingual edge of the first lower molar with *M. foina* has a clear notch in the middle, while with *M. martes* M_1 is only slightly concave at this point (Kryštufek 1991; *Fig. 11.8*). The two species can also be distinguished by the shape of the first upper molar. In beech marten, this has a poorly developed inner lobus, so that the length of the tooth in the sagital

plane is a great deal shorter than its width; in pine marten the length of the tooth in the sagital plane is almost the same as the width (Pucek 1981). The only fragment of skull was ascribed to *M. martes* because of the location of the *foramen jugale*: the difference between them in pine marten is less than the length of the *bulla tympanica*, while in beech marten it is greater (Pucek 1981).

Together with the first upper/lower molars, mandibles and the skull fragment, all the other fossil remains of the genus *Martes* from Divje babe I probably also belong to pine marten. As Crégut-Bonnoure (1996b) states, pine marten was probably the only representatives of martens in Europe during the Upper Pleistocene, since beech marten only appeared in the Holocene (but see also Malez 1963; Castaños 1987; Bon *et al.* 1991). Argant (1991) advocates the same opinion for Western Europe and Wolsan (1993) for Central. Beech marten is only known in the fauna of Palaeolithic sites in Slovenia from Potočka zijalka in the Savinja Alps, but the stratigraphic context of the find is problematic (Döppes 2004). Pine marten is known from a number of Upper Pleistocene sites in Slovenia (Toškan 2004).

Lutra lutra (Linnaeus, 1758)

Material: complex of layers 2–5: dens (C_1).

The otter from Divje babe I (inv. No. D. b. 1354) is the first known find of this species from any of the Slovene Upper Pleistocene sites. The species is known from Early Holocene layers of Breg by Ljubljana (Pohar 1984), Pod Črmukljo by Šembije (Pohar 1986) and Viktorjev spodmol by Famlje (Toškan, Dirjec 2004a) and from Upper Pleistocene sites of neighbouring Croatia (Malez 1986b), Hungary (Jánossy 1986) and NE Italy (Bon *et al.* 1991).

The identification of the C_1 from the layers 2–5 is mainly based on its morphology, since in terms of size canines of otter do not essentially differ from the canines of badger (*Meles meles* [Linnaeus, 1758]), whose remains are well known from several Upper Pleistocene sites in the region (Rakovec 1973). The specimen was thus identified as otter because the lower canine in badger has a strongly expressed edge on the mesio-lingual side: this stretches from the base of the crown almost to its tip. In contrast, the C_1 of otter has only a smallish ridge in this part, which is limited to the basal part of the tooth crown (*Fig. 11.9*). In addition, the canine in question is also clearly smaller than the C_1 of fossil badgers (*Table 11.6*).

One further canine was found in scattered sediment from Divje babe I, which could provisionally be ascribed to *L. lutra*. Unfortunately, the crown is damaged in the mesial part, its tip being worn. In view of the morphology of the preserved part, it could also be ascribed to badger but in terms of size it is closer to otter (*Table 11.6*).

Family: Cats (Felidae)

Felis silvestris Schreber, 1777

Material: Layer 8: mandibula, dens (P^4).

Both finds of wildcat from Divje babe I probably belong to the same animal, since they come from the same sample (i.e. quadrat/cut). Only the *processus coronoideus* with the *caput mandibulae* is preserved of the mandible and the P^4 lack the base of all three roots. The preserved parts of the roots, as well as the crown, are hollow. In domestic cat, a permanent fourth upper premolar erupts at the age of four to five months (Silver 1972). Because the specimen from Divje babe I already shows slight traces of wear, it probably belongs to a juvenile (although more than a year old) animal.

Lynx lynx (Linnaeus, 1758)

Material: complex of layers 2–5: dens (M_1); Layer 6: dens (P_4); Layer 2–11/12: dens (M_1).

The genus *Lynx* is represented in Divje babe I by 3 isolated teeth. The paraconid on P_4 (inv. No. D. b. 2072) is present and well developed. The same applies to the hypoconid and basal cingulum on the posterior part of the crown. Ascription of the specimen to the genus *Lynx*, therefore, does not seem questionable, despite the additional parastilid posterior to the hypoconid (*Fig. 11.10a)*.

Specific identification of the finds under discussion is more problematic than the generic. In addition to the Eurasian or northern lynx, namely, Iberian lynx (*Lynx pardinus* [Temminck, 1827]) is also known from the Upper Pleistocene in Europe, and the differences in morphology and size of skeletal elements between the two species are minimal. The greatest length of the fourth lower molar from Divje babe I is of only limited taxonomic value eventhough it lies within the range seen in recent specimens of Eurasian lynx from northern Europe, thus exceeding the size of P_4 in fossil Iberian lynx from Spain (*Table 11.7*). Metric data of teeth, in fact, are not considered a reliable taxonomic sign (Argant 1996b). *Lynx lynx* is represented in the fossil fauna of three sites in Slovenia (Pavšič, Turk 1989; Dirjec, Turk 1992; Pohar, Brodar 2000), while there is no evidence of the presence of the Iberian lynx.[6] The latter is also missing in the Upper Pleistocene fauna of NE Italy, SE Austria and Hungary (Jánossy 1986; Rustioni *et al.* 1995; Fladerer 2000), and appears in Croatia only from Veternica cave in Medvednica (Malez 1963). Because of this, the fourth lower premo-

[6] Rakovec (1961) ascribed three canines from Parska golobina in Pivška kotlina to *L. pardinus*, but later revision indicated such an identification as being erroneous (Krofel *et al.* 2005).

lar from Layer 6 of Divje babe I was provisionally ascribed to Eurasian lynx.

I also ascribed to the same species the first lower molar from the Interpleniglacial group of layers 2–11/12 (inv. No. D. b. 70). In Iberian lynx, namely, M_1 does not have developed metaconids and basal *cingulum* in the posterior part (Bonifay 1966; 1971; Castaños 1987), while both are present in the specimen from Divje babe I (*Fig. 11.10b*). The first lower molar from the group of layers 2–11/12 also stands out by the extended talonid, which the Iberian lynx does not have (Argant 1996b). Precisely because of the above-average extension of the metaconid-talonid, the M_1 from Divje babe I lies within the range seen in recent Eurasian lynxes from northern Europe only in the dimensions that do not relate to the extreme distal edge of the tooth (i.e., the greatest breadth of the crown and length of the paraconid; *Table 11.7*).

Identification of the first lower molar from layers 2–5 (D. b. I, kv. 41c/2) is more problematic, since only part of the tooth crown is preserved. On the basis of the size of the preserved fragment and the angle between the posterior ridge of the paraconid and mesial ridge of the protoconid, this specimen was also ascribed to the genus *Lynx*.

Panthera pardus (Linnaeus, 1758)

Material: complex of layers 2–5: dens (M_1), vertebra, os carpale, phalanx II (3x), phalanx III; unknown layer: phalanx III.

Leopard is represented in the fossil fauna of Divje babe I with eight finds, which are all of Interpleniglacial (= OIS 3) age. The tail vertebra, the wrist bone and one each second and third phallanx probably belong to a single individual, since they were found close together. Morphologically they correspond in entirety with the relevant skeletal elements of recent and fossil leopards, so that their identification was not problematic (*Fig. 11.11*). The same applies to the remaining phalanges from the same complex of layers, which also correspond in terms of size with fossil specimens of *P. pardus* (*Fig. 11.12*).

The first lower molar from layers 2–5 (inv. No. D. b. 646) is damaged; only the paraconid and part of the mesial root have been preserved. Nevertheless, in terms of the greatest length of the paraconid, the specimen under discussion lies within the range seen in recent leopard from Africa and Asia and, at the same time, deviates from the data for recent lynx from Northern Europe and Russia (*Table 11.8*).

Panthera spelaea Goldfuss, 1810

Material: complex of layers 2–5: dentes (dP_3, dP_4, P^4); Layer 6-7: phalanx II (?); Layer 7: phalanx III, vertebra; Layer 8: dentes (dP_3, M_1), vertebra; Layer 17a: dens (P_4), vertebra, phalanx III; Layer 21: vertebra; complex of layers 12/13–22: metatarsus III, astragalus, phalanx II, phalanx III; unknown layer: fibula.

Cave lion is represented with 18 remains, of which 6 were teeth. In the morphological sense, the finds are typically feline, but with the specific identification I relied on metric data (*Table 11.9* and *Table 11.10*). In terms of size, cave lion significantly exceeds members of other large cats which inhabited the Central Europe during the Upper Pleistocene. Only the identification of the second phallanx from Layer 6-7 (inv. No. D. b. 1783; *Fig. 11.13a*) is slightly problematic. The specimen is extremely short and robust, thus differing from cave lion from several European sites (*Table 11.10*) both in its greatest length (= 33.0 mm) and in the breadth of the distal epiphysis (= 26.0 mm).

Metric analyses of *P. spelaea* teeth from several European sites highlighted considerable differences between individual allopatric populations. Turner (1984) explained the heterogeneity (mainly) by sexual dimorphism, but Schütt, Hemmer (1978) ascribed it to isolation because of re-glaciation during the Würm. Cave lions from the eastern Alpine area are thought by them to have represented a separate branch in the development of the species. They are said to have differed from those of neighbouring populations mainly in terms of greater weight and relatively wider premolars and molars. However, in these terms, both undamaged molars from Divje babe I are closer to specimens from sites in NW Croatia, which Gužvica (1998) links with the western European line of cave lion. This is evident with the first lower molar (inv. No. D. b. 1864; *Fig. 11.13b*) from the thickened edge of the base of the crown, the accentuate *cingulum* on the lingual side and the ratio between the greatest breadth and length of the tooth (this amounts to barely 0.505). Similar applies to the fourth upper premolar (inv. No. D. b. 728), in which the ratio between the length of the tooth to the deuterocone and its greatest length is only 0.919 (see Gužvica 1998).

The construction of a reliable age structure for cave lions from Divje babe I is prevented by the modest number of finds (see Lyman 1987), but it is nevertheless worth drawing attention to the same number of permanent and deciduous teeth. Identification of the latter is based on their morphological characteristics. The deciduous P_3 (inv. No. D. b. 631; *Fig. 11.13c*), with a pair of relatively strong, clearly obliquely growing roots, differs significantly from the permanent P_3 of the same species (Smuts *et al.* 1978). Obliquely growing roots, of which the mesial is essentially stronger than the distal, are also characteristic of the deciduous fourth lower molar (inv. No. D. b. 1355; *Fig. 11.13d*); although this already has a completely molariform shape of the crown. Morphologically, the aforementioned tooth could also correspond to the deciduous P_4 of leopard. However,

the greatest length of the tooth from Divje babe I is approximately 18.5 mm, while according to Schmid (1940), the range of values of the same dimension with permanent P_4 of recent leopards is barely 13.5–20.4 mm (average value: 16.9; N = 157). Measurements of permanent P_4 of *P. spelaea* and *P. leo* are given in *Table 10.9*; the length of deciduous P_4 in *P. spelaea* from Germany amounts to 18.75 mm (Heller 1983). The deciduous third upper molar (inv. No. D. b. 2073; *Fig. 11.13e*) does not differ morphologically from the same tooth of a cave lion (Smuts *et al.* 1978). It has three roots, two of which are strongly developed. The crown is distinguished from the crown of a permanent tooth mainly in the location of the deuterocone. In the case of the deciduous third upper premolar, the deuterocone does not lie lingually-distally from the parastil, as is characteristic of permanent P_3. Instead, the axis of the tooth is withdrawn mesially and not just longitudinally (i.e., mesially-distally; see Rabeder 1992). All three deciduous teeth cited above belong to 17 month animals (cf. Smuts *et al.* 1978).

Order: Even-toed ungulates (Artiodactyla)

Ungulates are represented in the sample from Divje babe I with six species from two families. While the majority of finds could be identified at least to the level of genus, in 13 cases this was not possible. Of the latter, 12 were ascribed to bovids (Bovidae), and a fragment of a metapodial to cervids (Cervidae).

Family: Hogs and pigs (Suidae)

Sus scrofa Linnaeus, 1758

Material: complex of layers 2–5: maxilla (including P^4 and M^1), dens ($I_{inf.}$), phalanx I.

Wild boar is represented in the fauna of Divje babe I with three finds, which all come from the complex of layers 2–5. The structure and wear stage of the teeth shows that the maxilla probably belonged to an 18 year old individual (see Schmid 1972; Rolett, Chiu 1994). The phalanx was ascribed to an animal at least one to two years old (Schmid 1972). Wild boar is a relatively thermophilous species, so the finds from Divje babe I could actually not be sinsedimentational. However, the species is also represented in the fauna of some contemporary sites in NE Italy (Bon *et al.* 1991), Slovenia (Rakovec 1973), Hungary (Jánossy 1986), Croatia (Malez 1986) and perhaps in SE Austria (Fladerer 2000).

Family: Deer (Cervidae)

Cervus elaphus Linnaeus, 1785

Material: complex of layers 2–5: metacarpus*, metatarsus, metapodium*, phalanx II; Layer 7/8: phalanx II; Layer 10: os carpale, os tarsale; Layer 13: dens ($I_{inf.}$), metacarpus; Layer 14: os carpale; Layer 17: metacarpus; Layer 20: os carpale; complex of layers 2–11/12: os carpale*; complex of layers 12/13–22: os carpale; unknown layer: metacarpus, phalanx III. Particularly fragmented specimens, whose specific identification is not reliable are marked with an asterisk (*).

Red deer is represented in the sample from Divje babe I with 17 remains. Identification of three of them is provisional; they do not deviate morphologically in any way from typical deer specimens but all are particularly fragmented. The number of remains of Early Glacial age (= OIS 5a-5d) is comparable with the number of Interpleniglacial (= OIS 3) finds, which is shown by no other taxon of large mammal in the material from Divje babe I.

(?) *Alces alces* (Linnaeus, 1758)

Material: complex of layers 4–6: phalanx II.

The cervid proximal epiphysis of the second phalanx from the group of layers 4–6 (inv. No. D. b. 100) probably belonged to moose. The specimen does not deviate in the greatest medio-lateral breadth of the proximal epiphysis from values for post-glacial moose of eastern France and Switzerland and thus exceeds in size fossil specimens of *C. elaphus* from various European sites (*Table 11.11*). Nevertheless, the area of today's Slovenia is thought to have been inhabited in the Würm also by a larger form (sub-species?) of red deer, which Pohar (1994) links with *Cervus elaphus maral*. Since phalanges of the latter subspecies do not achieve the size of post-glacial moose (Mottl 1951; Malez 1963; Chaix and Desse 1981), I provisionally ascribed the phalanx from the complex of layers 4–6 to *A. alces*. The morphological characteristics of the find accord with such an identification, since the broadening on the antero-medial edge of the proximal articular surface characteristic of moose is also seen (despite the fragmentation) on the second phalanx in question from Divje babe I (*Fig. 11.14*).

Finds of moose are already known in Slovenia from the end of the Mindel-Riss Interglacial (Brodar 1970), and from a number of Upper Pleistocene sites (Toškan 2004). In contrast, finds of *C. elaphus maral* are only known from three Late Würm sites (Rakovec 1962–63; Pohar 1985; 1992).

Note: In Layer 8, in addition to other animal remains, a fragment of cervid sesamoid bone was also found. It does not deviate morphologically from the same bone of red deer (*Cervus elaphus*), but since it is clearly larger, it is perhaps a moose (*Alces alces*) find, too.

Capreolus capreolus (Linnaeus, 1758)

Material: complex of layers 2–5: ulna, os tarsale, phalanx I; Layer 6: phalanx II; Layer 8: phalanx I (2x), phalanx II, phalanx III, os carpale; Layer 11: phalanx I; Layer 14: phalanx I; unknown layer: phalanx I.

Altogether, 14 remains were ascribed to roe deer, of which only one originates from OIS 5. The available metric data correspond with sub-fossil specimens of *C. capreolus* from central Slovenia (*Table 11.12*).

Rupicapra rupicapra (Linnaeus, 1758)

Material: Chamois is represented in the sample from Divje babe I with 112 specimens. The full list of finds by layers and skeletal elements is given in *Annex 11.2F.*

Chamois is by far the best represented herbivore in Divje babe I. The identification was based on the guidelines published by Prat (1966), Crégut-Bonnoure, Guérin (1996c), Pucher, Engl (1997) and Gamble (1997). Available metric data show that fossil chamois do not differ essentially from subfossil specimens from the same region (*Annex 11.1i*). Remains from the deepest layers of Divje babe I are thought to originate from the period of transition of the Riss-Würm interglacial to the Würm glacial (Turk *et al.* 2001a), so they are among the oldest known finds of *R. rupicapra* in Slovenia.

Capra ibex Linnaeus, 1758

Material: complex of layers 2–5: dentes (C_1, M_3), femur, tibia (2x), phalanx II (2x), phalanx III; Layer 6: dens (M_2).

Ibex is represented in the sample with nine remains. Morphologically, most of them correspond to the description given by Prat (1966) for *C. ibex*. Only the third lower molar from the complex of layers 2–5 (inv. No. D. b. 850) deviates slightly in that its distal (i.e., third) cusp does not show the thickening at the base of the crown typical of *C. ibex* (*Fig. 11.15*). Metrically, the aforementioned specimen lies within the range seen in fossil ibex from a number of European sites (*Table 11.13*).

Animals of all age classes are represented in the sample. The M_3 from the complex of layers 2–5 and M_2 from Layer 6 are both worn enough to be safely ascribed to mature animals (Gamble 1997; Payne 1973; Deniz, Payne 1982). Both ibex long bones in the sample, on the other hand, have unfused epiphyses. The tibia from the complex of layers 2–5 belonged to a subadult individual (age at death < 5 years) and the femur from scattered sediment to a no more than six-month-old animal (Gamble 1997).

Order: Elephants (Proboscidea)/Odd-toed ungulates (Perissodactyles)

Family: Elephants (Elephantidae)/Rhinoceroses (Rhinocerotidae)

Mammuthus primigenius (Blumenbach, 1799) seu *Dicerorhinus* sp. seu *Coleodonta antiquitatis* (Blumenbach, 1799)

Material: complex of layers 10–13: phalanx III.

The phalanx from the complex of layers 10–13 (inv. No. D. b. 2433) belongs to a large herbivore (*Fig. 11.16*). Insofar as the find is that of a rhino, in principle three species enter into consideration: Mercke's rhinoceros *Dicerorhinus kirchbergensis* (=*D. mercki*) (Jäger, Kaup, 1839–41), steppe rhinoceros *D. hemitoechus* (Falconer, 1868) and woolly rhinoceros *Coelodonta antiquitatis* (Blumenbach, 1799). J. Radovčić from the Croatian Natural History Museum in Zagreb compared the phalanx from Divje babe I with fossil material from Krapina, and provisionally ascribed the find to the species *Stephanorhinus kirchbergensis* (≈ *D. kirchbergensis*; see Guérin 1996; Radovčić, oral). Mercke's rhinoceros is also the only representative of its family which certainly inhabited the area of today's Slovenia in the Upper Pleistocene (Rakovec 1958; 1959; 1973; S. Brodar 1970; M. Brodar 1996). The same species is also represented in the Upper Pleistocene fauna of Croatia (Malez 1979), Hungary (Jánossy 1986) and NE Italy (Bon *et al.*, 1991), but steppe and woolly rhinoceros are also represented there. Fossil finds of the latter are also known from SE Austria (Fladerer 2000).

Together with Mercke's rhinoceros, mammoth must also be considered in the identification of the third phalanx of a large herbivore from the complex of layers 10–13. Because of the slightly less platelike articular surface, the phalanx in question slightly deviates from typical specimens of *Mammuthus primigenius* (Blumenbach, 1799) but seen overall, the specimen from Divje babe I seems closer to mammoth than Mercke's rhinoceros. Fossil finds of mammoth are known from at least 15 sites in Slovenia (Rakovec 1954; 1973; Pohar 1990; Lenardić, Pohar 1995).

VERTICAL DISTRIBUTION OF FINDS

During excavations at Divje babe I, the largest number of remains of large mammals (without cave bear) was collected from the complex of layers 2–5 (NISP = 502) and Layer 8 (NISP = 146). The Early Glacial (= OIS 5) layers 12–23 are significantly less rich; only 110 finds come from there (*Table 11.14*). Interpretation of the vertical distribution of remains is not straightforward, since it does not show only the actual changes in the structure of former communities. Poten-

tially important disturbing factors include differential taphonomic loss, the variable role of man and carnivores as factors of accumulation of the taphocenosis, different thicknesses of layers and the proportion of investigated floor area. It is also of course necessary to take into account the change in the method and technique of excavation, because of which rather more attention will be devoted below to remains from the excavated field in the central and inner part of the cave (see Chapter 1 in this volume, *Fig. 1.3*). With the completion of investigation of the entrance part of the cave, namely, the archaeologists replaced the conventional method of coordinate documentation of finds with a simpler and more practical method based on basic field units of a dimension 1 x 1 x 0.12 m. They also simultaneously introduced wet sieving of all sediments.

The aforementioned modification to the methodology of excavation contributed to a reduction in the number of finds which were overlooked during collection and, consequently, discarded. In addition, the better estimate of the volume of examined sediment enabled a calculation of the geometric density of finds by layers (*Fig. 11.17*).[7] The complex of layers 2–5 stands out in terms of the highest concentration of finds, with Layer 10 (and no longer Layer 8 as in *Table 11.14*) occupying second place. The remains of brown bear and wolf show a similar vertical distribution. It is interesting that that the bulk of all stone artefacts also originate from layers 2–5 and 10–14 (Turk *et al.* 2002b). This suggests that both humans and large carnivores alternately visited the cave during the deposition of the two groups of layers.

The vertical distribution of finds of chamois and other medium to large herbivores (red deer, ibex, roe deer) is slightly different, although in this case, too, the most remains per volumetric unit of sediment was collected from layers 2–5. This might be indicative of a higher frequency of human and wolf visits to the cave. More difficult to explain is the small share of bones and teeth of herbivores in Layer 10. The concentration of chamois bones in layers 6–7 is also surprising, since relatively few stone artefacts and remains of large carnivores originate from these layers. Paleoclimatic estimates do in fact indicate worsening conditions during deposition of at least part of layers 2–5 as well as Layer 6 (Turk *et al.* 2001a), which perhaps contributed to an actual increase in the numbers of chamois and ibex in the then communities of the wider area of Divje babe I (*Figure 11.17; Table 11.14*). Such a development of climatic events could also be inferred from the numerous finds of alpine marmot in the cited group of layers. It is thus surprising that the concentration of finds of pine marten (*Martes* cf. *martes*) in the same stratigraphic context is also relatively high, although the cited species prefers a milder climate because of its reliance on forest. The remains of marten are also relatively numerous in layers 6–7 and 10 but care must be taken in the interpretation of this evidence. The scattering of finds, namely, shows that the majority probably belonged to only two individuals (one per layer). The vertical distribution of remains from layers 2–5 is less eloquent since, because of cryoturbation, the cited layers are folded.

Data in *Table 11.15*, which show the number of remains of individual taxa by sedimentary level, enable a further more direct insight into the fauna of large mammals of the wider environment of Divje babe I in various phases of the Würm. Such a presentation of data, however, was only possible for part of the excavation field (see Chapter 1 in this volume) so the total number of finds in the table is smaller (NISP = 300). On the other hand, such a presentation of data allows for direct comparison of available macrofaunistic data with palynological and sedimentological records and with the vertical distribution of remains of mammal microfauna, since it is based on a more objective stratigraphy and better temporal resolution (see Chapters 5, 8 and 10 in this volume).

The vertical distribution of carnivore remains form two pronounced peaks (*Table 11.15*) which correspond to the cold and damp climate at the time of deposition of layers 4–5a and the lower part of Layer 8 (see Chapter 6 in this volume, *Fig. 6.7a*). The result can be explained by the greater interest of carnivores in a cave-lair during more severe climatic conditions.

PALEOENVIRONMENT

The traditional archaeological/paleontological approach to paleoenvironmental studies is based on the projection of the ecological tolerance of recent populations of various species to conspecific populations from past periods. Nevertheless, since mammals are capable of adapting to various environments, they may have inhabited different habitats in the past to those in which they live today (e.g. Musil 1985; Bützler 1986; Miracle, Sturdy 1991; Van Kolfschoten 1995; Phoca-Cosmetatou 2002). The impact of temperature, humidity and other physical conditions on the distribution of individual species is generally only indirect (the competitive ability of animals changes depending on the aforementioned conditions). In fact, the area of distribution of a species is directly limited by the physical conditions of the environment only at its absolute limits of distribution, so equating ecological[8] and physiological optima is inappropriate (Van Kolfschoten 1995). This does not of

[7] Since sediment was only excavated to layer 14 in the central and inner part of the cave, only data for the OIS 3 are shown in *Fig. 11.17*.

[8] In the concept of ecological optimum I understand the

course mean that data on the presence of individual indicator species of large mammal are not of interest for paleontological studies. They can be very useful as an independent control of paleoenvironmental and paleoclimatic reconstructions that are based on other paleoecological indicators (e.g., sedimentological or palynological records, remains of small mammals etc.).

To date, the most complete paleoclimatic curve for Divje babe I comparable with global paleoclimatic records ($\delta^{18}O$ and pollen) is based on the results of sedimentological analysis (Turk *et al.* 2001a; 2002; see also Chapter 5 in this volume). It is possible to infer from them that the climate in OIS 3 was probably less stable and, on average, certainly essentially colder and damper than in OIS 5a-5d. The results of palynological and anthracotomical research (Šercelj, Culiberg 1991; Culiberg, Šercelj 1997; Chapter 8 in this volume) and the study of micromammal remains (see Chapter 10 in this volume) support such a conclusion. The remains of large mammals accord with the presented paleoclimatic curve, too, although the majority of taxa are ubiquitous (*Fig. 11.18*).[9] One of the few exceptions in this sense is arctic fox, which nowadays inhabits mainly tundra. Its remains were found in Layer 8, which, not surprisingly, is thought to have been predominately (8a, 8c and partially 8b) deposited in a period of a cold climate.[10] Remains of *Lepus* cf. *timidus*, bound today to areas of tundra, taiga and alpine grasslands (Sulkava 1999), also come from Layer 8.

Layers 2–5 contained, in addition to other finds, remains of both *Lepus* cf. *timidus* and *Marmota marmota*, known generally to avoid (dense) forest. However, a tooth, a phalanx and a fragmented maxilla of wild boar were also found in the same stratigraphic context, whose optimum habitat is moderate deciduous and mixed forest. It thus seems that during the deposition of layers 2–5, periods of relatively cold climate were probably also broken by slightly warmer phases, which enabled the existence of stands of mixed forest. Forest must have been more or less continuously present also in the introductory part of OIS 3, since finds of pine marten were found in layers 10–12/13. The latter carnivore, namely, prefers forest among various types of habitat (Bright 1999).

The third phalanx of the large herbivore from the complex of layers 10–13 is morphologically closer to mammoth than Mercke's rhinoceros. Such an identification is also more likely from the point of view of paleoclimate, since the introductory part of OIS 3 was presumably relatively cold (*Fig. 11.18*). In contrast to mammoth, namely, Mercke's rhinoceros seems to have been bound to a warmer and probably damper environment (Musil 1985). The find of moose in the complex of layers 4–6 indicates the presence of a damp habitat (Pucek 1981).

Because projecting the ecological preferences of recent populations on those from past periods is often problematic, I set about paleoecological research slightly differently. I tried to deduce the pattern of community structure for fossil mammal fauna from Divje babe I according to their species diversity by taxonomic group, size, feeding adaptation (i.e., carnivore, omnivore, insectivore etc.) and locomotor zonal adaptation (i.e., arboreal species, scansorial species, fossorial species etc.). On the basis of these data, namely, it should be possible reliably to assess the ecological diversity pattern of fossil mammal communities, thus providing a means of obtaining information on the habitat of those communities (Andrews 1995). Data relating to large and small mammal fauna from Divje babe I are given in *Figure 11.19*.

I compared Divje babe I data with data for modern mammal communities from distinct tropical African habitats: lowland forests (N = 8), montane forests (N = 3), woodland-bushland (N = 8) and short grass plain (N = 1) (Andrews *et al.* 1979). It should be mentioned that the comparison of tropical ecosystems with those in the temperate zone is not ideal. Essentially more than in the vertical structure of an ecosystem, in fact, biodiversity is reflected in the quantity of food available to primary consumers[11] and the (seasonal) stability of its availability (Kryštufek 2001). On the other hand, most large mammals (or related fossil species) that inhabited European territory in the Upper Pleistocene are only still found in the tropics (e.g., lion, leopard, hyena, elephant, rhinoceros, large bovids; Kurtén 1968; Musil 1992). The exclusion of most large herbivores from ecosystems of moderate climates in the final phases of the Würm and in the Holocene often led to the complete overgrowing of until then open habitats, without this having been influenced by possible climatic or edaphic changes (see Kryštufek 2001). The largest representatives of megafauna (e.g., mammoth in Europe) probably limited the over-dominance of forest, as they still do in Africa today. What about large carnivores? Their presence does not tell a lot about the former climate, but it does indirectly indicate the adequate bearing capacity of the environment, thus a rich community of large herbivores.

The results of analysis are summarised in *Figure 11.19* and are entirely in line with independently obtained paleoenvironmental estimates (see Chapters 5, 8 and 10 in this volume). Deviation between the samples from OIS 5a-5d and OIS 3 is greatest in the "locomotor zonal

conditions with which the given species shows the greatest abundance in nature.

[9] I only took into account material from OIS 3, since the sample of animal remains from OIS 5a-5d was too modest.

[10] This was shown by specific sedimentological analyses (see sub-chapter 5.2 in this volume). Remains of arctic fox were found at a depth of –321 cm and –345 cm.

[11] E.g. even though the primary production of deciduous forest is high, a great deal of the organic material is in the wood (i.e. not available to primary consumers), thus limiting the habitat biodiversity.

adaptation" category. In the material from OIS 3, in fact, the share of large ground mammal species is clearly greater than the share of small ground mammal species, which can also be found on the lower branches of shrubs and fallen trees. In tropical Africa, mammal communities of woodland-bushland and short grass plains show a similar picture. However, since arboreal species are missing from grassland habitats, the Interpleniglacial (= OIS 3) fauna of Divje babe I most resembles the community of woodland-bushland landscapes. In contrast to the sample from OIS 3, the share of large ground mammal species in the material from OIS 5a-5d is proportionate with the share of small ground mammal species. In these terms the Early Glacial (= OIS 5a-5d) fauna of Divje babe I is closest to the community of African tropical forests, although in the case of the latter, small ground mammal species generally exceed the share of species of large ones.

The statistical significance of the diversity distribution between various mammal communities was also tested (*Table 11.16*). Correlations were calculated between fossil and modern faunas for their distribution of classes within each category. The diversity distributions of fossil faunas were first ranked within each of the four taxonomic and ecological categories, and the correlations between them and the same distribution of classes for the means of the four modern community types were calculated.[12] The correlation coefficients were taken to indicate a high level of similarity in class distributions between the faunas being compared. Unfortunately, the low temporal resolution is strongly reflected in the results: because the material accumulated over a period of several tens of thousands of years, we are actually dealing with a palimpsest. The highly statistically significant coefficient of correlation between the sample from OIS 3 and recent mammal communities of lowland and/or montane forests of tropical Africa in three categories is nevertheless eloquent (*Table 11.16*) Temperature and humidity in the OIS 3 clearly were never so low as to prevent the existence of (at least) a woodland-bushland landscape. Moreover, it is worth pointing out the great similarity between Interpleniglacial (= OIS 3) fauna and recent grassland communities from tropical Africa, since high coefficients of correlation were found between them in three of a total of four categories (i.e., taxonomy, size and feeding adaptation). This indicates that more or less open habitats were also present in the area of Divje babe I throughout OIS 3.

In contrast with the situation in OIS 3, the environment in OIS 5a-5d was more forested. This is indicated by the relatively high correlation between the then fauna of Divje babe I and communities of recent tropical African forests in the categories of "size" and "locomotor zonal adaptation" (*Table 11.16*). The data from *Table 11.17* summarise the comparison of the two fossil samples from Divje babe I with two sub-fossil faunas from Viktorjev spodmol by Divača (SE Slovenia). The distribution of classes within the "locomotor zonal adaptation" category[13] observed for the Early Glacial (= OIS 5a-5d) fauna from Divje babe I is more similar to the Mesolithic mammal community from Viktorjev spodmol than the Bronze Age community from the same site. In contrast, differences in the extent of correlation between the Interpleniglacial (= OIS 3) sample from Divje babe I and either of the sub-fossil samples from Viktojev spodmol are only minimal. What need to be added is that the habitat indicated for Viktorjev spodmol in the Mesolithic was presumably mixed forest, while open habitats are thought to have predominated at the Bronze Age – Iron Age boundary (Toškan, Kryštufek 2004; Toškan, Dirjec 2004a).

AGENCIES OF BONE COLLECTION

Not just man but also animals themselves often contributed to the accumulation of macrofaunal remains in Palaeolithic cave sites. It is known that sick and wounded animals sometimes retreated to caves, in which they then died (see Fosse and Philippe 2005). Natural mortality during hibernation or immediately after it must also be taken into account. In the case of Divje babe I, this was actually probably the main reason for the accumulation of a large number of cave bear remains (Debeljak 2002b). Carnivores would also have contributed to the accumulation of bones with prey (Straus 1982; Miracle 1991; Stiner 1994; Blasco 1997). It might well not be coincidental that the stratigraphic position of (mountain) hare remains in Divje babe I almost exactly corresponds to the stratigraphic position of fox finds, which is today its most important predator (*Table 11.14;* Kryštufek 1991). The role of wolf and perhaps large cats was also presumably important, since the value of the quotient between the number of bones of carnivores and ungulates is relatively high (*Fig. 11.20*). Furthermore, in the carnivore material of Interpleniglacial age[14] from Divje babe I, the remains of bear (hibernating omnivore) and wolf (social community living carnivore) predominate, with only modest finds of fox, wildcat, otter, pine marten and polecat. As studies of numerous Upper Pleistocene sites show, the share of (large) carnivores in "kitchen waste" of Palaeolithic humans was

[12] The non-parametric Sperman's R-test was used. The classes within individual categories of ecological diversity were ranked by giving the class with the highest proportion of species rank 1, that with the second highest proportion of species rank 2, etc.

[13] The "locomotor zonal adaptation" category was chosen because the differences between the fossil samples from OIS 5a-5d and OIS 3 are here the greatest (*Fig. 11.19*).

[14] The Early Glacial (= OIS 5a-5d) sample is too small for similar analysis.

generally essentially less (Klein and Cruz-Uribe 1984; Miracle 1991; Stiner 1994; but see also Blumenschine 1995; Yravedra 2002).

The role of animals dying naturally in the cave as one of the agencies of bone collection is difficult to evaluate in the case of Divje babe I (bear is the exception). It is nevertheless a fact that the majority of bones are damaged and that the fragmentation is not limited to less compact skeletal elements (e.g., skull, sternum, os penis), only. It is thus to be expected such a damage to be linked to natural disintegration on and in the sediment, alone. Furthermore, the numerous (also transverse) breaks of long bones are more thoroughly linked with human and/or carnivore activity, indicating that man and/or carnivores did played an essential role in bone collection. Two key questions can thus be raised: (1) what proportion of the bones discarded by Palaeolithic man in Divje babe I were the remains of his own prey (in comparison with the share of carrion) and (2) to what extent did large carnivores (without bear) contribute to the accumulation of remains in the cave? Opinion is strongly divided about the most suitable method of seeking an answer to such questions (Klein, Cruz-Uribe 1984; Marean, Spencer 1991; Marean, Kim 1998; Stiner 1991; 1994; 1998a; 2002; Blumenschine 1995; Domínguez-Rodrigo 1996; 1999; Milo 1998; Yravedra 2002; Pickering *et al.* 2003; Phoca-Cosmetatou 2004; 2005). Because of this, I will focus below on both of the two most frequently used approaches. Both lay great stress on bone surface modifications, which can be directly linked to the activity of man (cutmarks, percussion marks) or carnivores (gnawing marks). The pattern of fragmentation of individual bones will also be taken into account, since human-caused fractures often differ from those made by carnivores (see Haynes 1980; 1983; Stiner 1994; Blasco 1997; *Fig. 11.21*).

Among the identified ungulate remains, traces of human or carnivore (particularly wolf; see Haynes 1980; 1983) activity are mainly observable on the bones of the lower part of the extremities (*Fig. 11.22* and *Fig. 11.23*). As concerns carnivores, the only exception is the presumably chewed *caput femoris* of a chamois from Layer 17a. What about humans? In addition to bones of the lower part of the extremities, a scapula, a mandible and one each proximal fragment of a radius, ulna and femur show typical human-caused fractures. The results of ethnological studies indicate that the pattern of processing animal prey among Pleistocene people from different regions and from different periods must not have been entirely the same (Binford 1978; Monahan 1998; Domínguez-Rodrigo 1999). The food utility of individual carcass parts is also variable, depending on the species, age, sex and the season of the kill/death of the animal (Outram 2000). It undoubtedly follows from the aforementioned that great care must be taken in the *post hoc* qualitative ranking of individual anatomical regions of an animal. Since traces of human activity are also visible on the bones of meatier parts of ungulates, I nevertheless believe that Palaeolithic man from the area of Divje babe I had at least occasional access to the complete carcass of animals they had killed, or which had died for some other reason.

The sum of horn/antler and head MNE counts for individual ungulate[15] species relative to the MNE for all major limb bones above the foot ([H+H]/L; Stiner 1994), also seems to indicate hunting/prey. The remains of prey of explicit scavengers (e.g., spotted and brown hyena) should show essentially higher values of the cited index than applies for active predators (e.g., wolf), since access to all parts of a hunted animal is generally only enabled to the latter. By placing whole carcases of donkeys in the vicinity of dens of spotted hyena, Skinner *et al.* (1980) showed that the numerous fragments of skulls, mandibles and horns among the food remains of scavengers[16] is actually a result of their limited choice. After placing donkey carcases in the vicinity of dens, namely, the anatomical representation of hyena den faunas essentially changed and very much approached that of wolf den faunas.

The value of the (H+H)/L ratio for medium-sized ungulates from Divje babe I is given in *Figure 11.24*. The data does not deviate only from the values for explicit scavengers, but also for spotted hyena, which is only partially dependent on carrion.[17] The number of available red deer and ibex (i.e., medium-sized ungulates) is modest in the sample from Divje babe I, but the results of experimental studies show that the (H+H)/L ratio is not sensitive to small sample size (Stiner 1994). Besides, in terms of the low value of this index, the much larger sample of all ungulate remains (NISP = 155) also stands out.

Irrespective of the presumed robustness of the (H+H)/L index, many authors reject its use entirely (e.g., Blumenschine 1995; Marean, Kim 1998; Milo 1998; Domínguez-Rodrigo 1999; Yravedra 2002; Pickering *et al.* 2003). Its weak point is considered to be that it does not adequately take into account the food preferences of large carnivores. Namely, the grease-laden near-epiphyseal fragments of cancellous bone are supposed to have been essentially more interesting to them than the almost greaseless compact mid-shaft fragments (but see also Stiner 1994; 2002). Although cancellous (parts of)

[15] Only the bones of medium-sized ungulates were taken into account, since they show the greatest variability in anatomical representation (Stiner 1994).

[16] This applies in particular to less agressive scavengers (Richardson, Bearder 1996).

[17] The coefficient of correlation (Spearman's R) between MNE and the structural density of individual bones is not statistically significant. It follows from this that differential preservation did not essentially influence the established anatomical representation of Divje babe I medium-ungulate faunas. Data on the structural density relate to red deer (Lyman 1999).

bones must also be taken into account in taphonomic studies (Rogers 2000), the role of man and/or carnivores as bone collectors can thus only be adequately explained by analysis of (fragments of) diaphyses. Numerous actualistic studies point in this direction (Blumenschine 1988; 1995; Lupo 1995; Capaldo 1998), and the thesis has also been confirmed by experimental observation (Marean 1991; Marean, Bertino 1994).[18] The number and placement of cutmarks, percussion marks and tooth marks on long bones depends very much on whether man had first access to prey (which in principle places him in the role of hunter) or whether carnivores did (which puts man primarily in the role of scavenger). From the point of view of both man and carnivore, the food value of bones can be divided into three components: soft tissue around the bone (meat, fat, sinew), bone marrow (mainly in long bones) and greasy cancellous bone, which is mainly limited to near-epiphyseal parts in cervid/bovid long bones. When people or carnivores tear the soft tissue from long bones of an animal, they leave the most traces (cutmarks, tooth marks) on the diaphyses, where there is the most meat and fat. Access to the bone marrow is enabled by chewing or crushing bones, whereby traces of both activities are found mainly on the diaphyses (hyena; Marean, Kim 1998) or epiphyses (wolves; Haynes 1980; 1983). It is worth stressing that carnivores have practically no interest in midshaft fragments after the removal of the bone marrow. It is otherwise with epiphyses (or the cancellous near-epiphyseal fragments) which, because of the relatively high grease content, still have significant food value. Carnivores normally devour them, extract the highest possible proportion of fat in the stomach and disgorge the remains (hyena) or excrete it in excrement (canides). In contrast, Middle Palaeolithic man presumably obtained the grease from the cancellous bone fragments by boiling them (e.g., Hanson 1998; but see also Marean, Kim 1998).

The number and placement of cutmarks, percussion marks and tooth marks on fossil bones from Divje babe I corroborate the thesis of Palaeolithic man often having been the first to have access to the carcases of red deer, chamois, ibex and roe deer. This is demonstrated by individual cutmarks on the diaphyses of long bones (*Fig. 11.25*) and above all by the much larger number of tooth marks on the epiphyses (or near-epiphyseal fragments) than on diaphyses.[19] In contrast, the main traces that Blumenschine *et al.* (1996), Marean, Kim (1998) and Milo (1998) connect with human activity appear on diaphyses. The majority of animals (killed or scavenged) were thus presumably first available to humans. They tore the soft tissue from the bone (this is indicated by the presence of cutmarks and absence of tooth marks on the diaphyses) or accessed the marrow by crushing the bones. The remains (i.e., fragments of diaphyses, epiphyses) were essentially less interesting from an energetic point of view, so humans probably did not regularly cook/burn them etc. In the case of Divje babe I this is also indicated by the absence of the remains of usually hunted animals in hearths or directly beside them (Paunović *et al.* 2002; see also *Table 11.15*). If (when) man discarded the bones (or when he abandoned the cave), large carnivores gained access to them, in Divje babe I mainly wolves. They were interested in the grease-saturated fragments of cancellous bone, to which testify tooth marks on the epiphyses or near-epiphyseal fragments (*Fig. 11.26*). The almost complete absence of similar traces in fragmented diaphyses indicates that the majority of long bones had already been crushed by people before the arrival of carnivores.

A similar order of access to (carcases) of hunted/scavenged animals has also been found in the analysis of numerous other Palaeolithic sites in Europe (e.g., Estévez 1987; Auguste 1995; Blasco 1997; Yravedra 2002), so it is not in itself surprising. The question remains open of how strong was the pressure of carnivores on the waste of Palaeolithic man in the case of Divje babe I. On the basis of experimental crushing of the bones of African ungulates of the first and second size class (*sensu* Bunn 1982), in which exclusively stone tools were used, percussion marks were found on approximately a third of all fragments of long bones (Blumenscine 1995). Thereafter, the share of remains with tooth marks when whole (experiment 1) or fragmented long bones without marrow (experiment 2) were exposed to various wild African carnivores (mostly spotted hyena) was established. In the first experiment, the share of gnawed bones was high, as expected (average 70.8%), since crushing the bones gave the hyenas access to the marrow. In contrast, within the context of experiment 2, tooth marks were only visible on a fifth of all remains (the majority on fragments of cancellous bone). The share of gnawed bones of ungulates from Divje babe I is still lower! This can be ascribed to some extent to the various intensities with which hyenas and wolves crush bones (no hyena remains were found in Divje babe I). Nevertheless, in view of the small number of tooth-marked fragments, a relatively modest role of wolf (and large cats) as scavengers on the hominid-butchered fare or carrion can be inferred. Not least, a significantly lower number of carpal/tarsal bones could otherwise be expected than that established (*Fig. 11.27*), since small compact bones (i.e.,

[18] The majority of the cited actualistic and experimental studies are based on observation of the hyena, but the presented pattern of processing prey is also very similar with canides (see Morey, Klippel 1991).

[19] Only the material which was excavated after 1990 was taken into account. Prior to this the sediment had not been routinely sieved, because of which numerous small fragments of diaphyses were overlooked during excavation and therefore discarded.

astragalus, calcaneus, os centrotarsale) are often dissolved even by the alimentary juices of dogs (Payne, Munson 1985). It is in line with this finding that the epiphyses of the radius (N = 3) and femur (N = 3) of ungulates in the sample from Divje babe I are not gnawed, which one would expect with greater pressure of wolves on the remains of human prey and animals dying naturally in the cave (see Haynes 1980).

CONCLUSION

Because small mammals are a better indicator of the palaeoenvironment than are large ones (Andrews 1990), a great deal of attention in this contribution was devoted to the role of various agencies of bone collection. Naturally dying animals are presumed to have been responsible for the formation of the taphocenosis, as well as Palaeolithic man and carnivores. The latter is indicated by the number and location of cutmarks, percussion marks and tooth marks on the long bones of ungulates. It seems that the carcases of red deer, chamois, ibex and roe deer were normally first available to humans, their energetically still interesting food waste (mainly grease saturated near-epiphyseal fragments of cancellous bone) being subsequently exploited by carnivores. There is little likelihood that people were more successful in seeking carrion than carnivores, so most of the bones of ungulates in Divje babe I probably represent the remains of human prey. Nevertheless, large carnivores should also be counted among bone collectors. It is interesting in this sense that teeth of young and subadult animals (*sensu* Stiner 1994) greatly predominate among the molars of wolf, leopard and cave lion.[20] It thus seems that wolves and large cats occasionally used the cave as a lair. In view of their etiology (Ewer 1973; Domínguez-Rodrigo 1994; Stiner 1994; Blasco 1997) this means that at least some of the finds in the cave are probably the remains of carnivores' own prey.

There is no doubt that people and carnivores visited the cave alternately. Unfortunately, it is not possible to differentiate among individual visits, since the temporal resolution of the sample is too low. The majority of bones with visible traces of human activity come from layers 2–5. The same complex of layers also stands out in terms of the large number of stone artefacts (Turk, Kavur 1997). However, the cited data cannot be interpreted as an indicator of increased frequency of human visits to the cave at the expense of the frequency of visits of large carnivores. The number of stone tools, cores, fragments and flakes, namely, is highest precisely where there is also the highest geometric density of wolf remains (i.e., in Layer 4; Turk, Dirjec 1997b; Turk, Kavur 1997).[21] In addition, some 122 non-fragmented bones per cubic metre of sediment were collected in Layer 4 (within the context of layers 2–5 more of them were found only in Layer 3), which would not be expected with extended human residence in the cave. In order for people to get to the marrow, namely, they generally had to smash long bones intensively. On the other hand, it is also true that caves did not always serve humans as residences or hunting outposts but could also have had other purposes (e.g., a place of ritual). Perhaps this was also so in Divje babe I. It is worth mentioning in this context the find of a presumed flute and the pierced skull of a cave bear (see sub-chapter 12.4 in this volume), as well as the finds of charcoal of yew, juniper and alder (see Chapter 8 in this volume), which to the best of our knowledge were not found in other Palaeolithic sites south of the Alpine glaciation (Šercelj, Culiberg 1985).[22] The absence of remains of the main hunted animals on or beside hearths is also unusual (Paunović *et al.* 2002; *Table 11.15*). Furthermore, bones that were scattered around hearths belong almost exclusively to cave bear and do not show the damage that occurs in the dismemberment of prey with stone tools. If Divje babe I did not actually serve Palaeolithic man (only) as a shelter or hunting outpost, the pattern of dismembering and crushing bones could also be expected to be specific (ritual?). In this case, the animal remains would not represent the cooking waste of Palaeolithic man, and this would of course have important implications for the overall evaluation of his role in the formation of the studied taphocenosis.

ACKNOWLEDGEMENTS

I would like to thank Dr. Ivan Turk for enabling me to study the fossil remains from Divje babe I. The article is to a large extent a summary of my own doctoral dissertation, so I would like to take this opportunity to thank my supervisor, Prof. dr. Vida Pohar, and members of the commission, Prof. dr. Jernej Pavšič and Prof. dr. Boris Bulog. The Ministry of Education, Science and Sport financed the post-graduate education. I would like to thank Dr. Ivan Turk and Janez Dirjec for the stimulating discussions which accompanied the entire course of the re-

[20] Of a total of 16 molars of the cited three species found in Divje babe, 12 belong to young or sub-adult specimens (Toškan 2004).

[21] In layers 10–13, characterized by the second highest density of wolf remains, there were almost no Palaeolithic finds in the central part of the cave, which was processed in detail (i.e., water-sieving of the sediment), but absolutely the most at the cave entrance.

[22] The only exception is a specimen of juniper charcoal (*Juniperus* sp.) from Parska golobina by Pivka (Šercelj, Culiberg 1985).

search. I am also grateful to Dr. J. Radovčić and Dr. P. Wojtal for help in identifying the third phalanx of the mammoth/rhinoceros and Miha Krofel in identifying large cats. I am grateful to colleagues at the Institute for Quaternary Paleontology and Geology (Zagreb) for allowing access to comparative osteological collections, to Tomaž Lauko for photographs, and to Drago Valoh for technical help in designing the illustrative material.

PRILOGE / ANNEXES

Lepus cf. *timidus*	Measure
Humerus	D.b. 1303
Bd	12.0
BT	10.0
Ulna	D.b. 1050
BPC	8.5
Ossa coxae	D.b. 785
LA	11.5
Astragalus	D.b. 1502
GL	16.0

◁◁

Pril. 11.1A: Mere ostankov planinskega zajca (*Lepus* cf. *timidus*). Vse najdbe so iz OIS 3. Vse mere so v mm.
Annex. 11.1A: Measurements of the remains of mountain hare (*Lepus* cf. *timidus*). All finds are from OIS 3. All measurements are in mm.

Pril. 11.1B: Mere ostankov alpskega svizca (*Marmota marmota*). Vse najdbe so iz OIS 3. Vse mere so v mm.
Annex. 11.1B: Measurements of the remains of alpine marmot (*Marmota marmota*). All finds are from OIS 3. All measurements are in mm.

M. marmota	Measures									
Cranium	D.b.153	D.b.325	D.b.328	D.b.329	D.b.851					
P^3-M^3	22.0	–	21.0	–	21.5					
M^1-M^1	12.5	–	14.0	–	–					
BOC	–	19.5	–	20.0	–					
Mandibula	D.b. 153a	D.b.307	D.b.310	D.b.400	D.b.639	D.b.640	D.b.1092	D.b.1481	D.b.1482	
P_4-M_3	20.5	20.0	21.0	20.0	21.0	21.0	18.0	21.5	22.0	
Id-M_3	32.0	32.0	36.0	–	–	–	–	35.0	–	
Id- P_4	13.0	12.5	16.0	–	–	–	15.0	14.0	–	
Atlas	D.b.308	D.b.1189								
GB	14.0	–								
GL	21.0	–								
BFcr	14.5	14.5								
BFcd	–	18.0								
LAd	–	3.0								
H	–	13.0								
Scapula	D.b.1486	D.b.1586	D.b.1889							
BG	8.0	–	7.5							
GL	–	–	14.0							
SLC	–	11.0	–							
Humerus	D.b.314	D.b.352	D.b.664	D.b.1232	D.b.1330	D.b.1485	D.b.1739			
Bp	–	–	–	15.5	15.0	17.0	–			
Bd	–	20.5	–	–	–	–	–			
BT	–	12.0	14.5	–	–	–	13.0			
Dp	16.5	–	–	–	–	–	–			
Radius	D.b.1488	D.b.1502	D.b.1504							
Bp	9.0	10.0	10.0							
Ulna	D.b.654									
BPC	7.0									
Ossa coxae	D.b.242	D.b.332								
LAR	10.5	11.5								
Femur	D.b.239	D.b.319	D.b.320	D.b.608	D.b.1490	D.b.1507	D.b.1770			
Bp	–	–	–	19.0	–	–	19.0			
DC	–	9.5	9.5	–	9.0	–	9.0			
BTr	16.0	–	–	16.0	14.5	–	–			
Bd	–	–	–	–	–	16.5	–			
Tibia	D.b.10	D.b.115	D.b.318	D.b.333	D.b.1222	D.b.1231	D.b.1491	D.b.1880	D.b.2098	D.b.2099
Bd	10.0	11.0	11.5	11.0	10.0	10.0	11.0	12.0	11.0	10.5
Dd	–	–	–	–	8.0	–	8.0	9.0	9.0	9.0
Astragalus	D.b.877	D.b.984	D.b.1112	D.b.1188	D.b.1214	D.b.1223	D.b.1581	D.b.1583	D.b.1741	
GL	11.0	10.0	11.0	11.5	11.0	12.0	11.0	11.0	12.0	
Calcaneus	D.b.1143	D.b.1475	D.b.1494	D.b.1873						
GL	–	–	–	17.0						
GB	9.5	11.0	12.0	11.5						

Pril. 11.1C: Mere ostankov rjavega medveda (*Ursus arctos*). Podatki, ki se nanašajo na najdbe iz OIS 5a–5d, so zapisane poševno. Vse mere so v mm.
Annex. 11.1C: Measurements of the remains of brown bear (*Ursus arctos*). Data relating to finds from OIS 5a–5d are in italics. All measurements are in mm.

Ursus arctos	**Measures**					
Cranium	D.b.1606					
m. 1	410.0					
m. 2	361.5					
m. 4	172.0					
m. 6	210.5					
m. 8	165.4					
m. 9	75.5					
m. 10	33.0					
m. 11	221.0					
m. 12	79.0					
m. 13	105.5					
m. 14	87.0					
m. 15	59.0					
m. 16	75.0					
m. 17	132.0					
m. 18	83.0					
m. 19	65.0					
M^2 L	43.0					
M^2 B	22.0					
Mandibula	D.b.532	D.b.1063	D.b.1122	D.b.1370	D.b.1849	
C_{ab}-M_3	121.5	–	–	132.0	–	
P_4-M_3	–	86.0	–	89.0	84.0	
M_1-M_3	–	–	–	–	68.5	
HM_2	42.0	38.0	–	–	59.5	
HP_4/M_1	38.0	35.0	39.0	42.0	53.5	
Radius	kv. 37/27	D.b.2534				
Bp	34.0	35.0				
Bd	56.0	54.5				
GL	259.0	259.8				
SD	–	24.0				
DD	–	14.5				
Metacarpus I	*D.b.392*	D.b.884				
Bp	*21.5*	22.0				
Bd	*19.0*	18.5				
GL	*78.0*	70.5				
SD	*11.0*	11.0				
DD	*9.0*	9.5				
Metacarpus II	*D.b.48*	*D.b.104*	*D.b.105*	*D.b.293*	*D.b.568*	
Bp	*17.0*	*17.0*	*12.0*	*15.5*	*17.0*	
Bd	*20.5*	*21.5*	*19.0*	*22.0*	*22.0*	
GL	*86.5*	*89.0*	*80.5*	*89.5*	*86.0*	
SD	*12.5*	*14.0*	*13.0*	*15.0*	*15.0*	
DD	*10.0*	*10.0*	*10.5*	*11.0*	*10.0*	
Metacarpus III	D.b.47	D.b.102	D.b.302	D.b.437	D.b.1158	D.b.2532
Bp	16.0	16.5	16.0	–	16.0	–
Bd	19.0	19.0	19.5	–	19.0	17.0
GL	86.0	91.0	78.0	–	76.5	86.0
SD	13.0	13.5	12.0	12.0	11.5	12.5
DD	12.0	10.5	11.0	10.0	10.0	11.0
Metacarpus IV	*D.b.103*	D.b.2531				
Bp	*17.5*	18.0				
Bd	*20.0*	20.0				
GL	*85.0*	25.5				
SD	*15.0*	13.0				
DD	*11.5*	9.5				

continued....

Pril. 11.1C / Annex 11.1C (nadaljevanje / cont.)

Ursus arctos	**Measures**					
Metacarpus V	D.b.43	D.b.398	D.b.1220			
Bp	–	23.0	26.5			
Bd	–	22.0	22.0			
GL	91.0	85.0	81.5			
SD	15.5	15.0	14.5			
DD	17.0	10.5	11.5			
Patella	*D.b.46*	D.b.1744				
GL	*53.5*	54.5				
GB	*34.0*	37.0				
Tibia	D.b.2536					
SD	30.0					
DD	33.0					
Calcaneus	kv. 96/5	D.b.30	D.b.38			
GL	–	90.0	74.0			
GB	50.0	49.5	40.0			
Metatarsus I	49/81	D.b.490	D.b.1749	D.b.1750		
Bp	–	23.0	21.5	20.0		
Bd	18.0	20.5	15.0	16.0		
GL	63.0	71.0	52.0	52.0		
SD	9.5	10.0	10.0	9.0		
DD	8.0	10.0	8.0	9.0		
Metatarsus II	D.b.436	D.b.881				
Bp	12.0	15.0				
Bd	19.0	18.0				
GL	80.0	74.0				
SD	12.5	12.0				
DD	9.0	10.0				
Metatarsus III	D.b. 9	D.b.140	D.b.273			
Bp	18.5	–	19.0			
Bd	–	–	20.0			
GL	–	–	87.0			
SD	14.0	10.5	14.0			
DD	10.0	10.0	12.0			
Metatarsus IV	*D.b.517*					
Bp	*19.0*					
Bd	*22.0*					
GL	*94.0*					
SD	*15.0*					
DD	*12.0*					

Pril. 11.1D: Mere ostankov volka (*Canis lupus*). Podatki, ki se nanašajo na najdbe iz OIS 5a–5d, so zapisane poševno. Vse mere so v mm.
Annex. 11.1D: Measurements of the remains of wolf (*Canis lupus*). Data relating to finds from OIS 5a–5d are in italics. All measurements are in mm.

Canis lupus	**Measures**			
Mandibula	D.b. 1980 (8)	D.b.353	D.b.1400	
P_1-P_4	–	55.0	56.0	
P_2-P_4	44.0	46.0	49.0	
M_1-M_3			51.0	
P_1-M_3			104.0	
HM_1			31.0	
HP_2	–	24.5	30.0	

continued...

Pril. 11.1D / Annex 11.1D (nadaljevanje / cont.)

Canis lupus	**Measures**			
Dentes	D.b.1161	D.b.1400	D.b.1464	
P^4 L	–	–	26.0	
P^4 B	–	–	10.0	
P^4 GB	–	–	14.0	
M^2 L	10.0	–	–	
M^2 B	8.0	–	–	
M_1 L	–	33.0	–	
M_1 B	–	11.0	–	
M_2 L	–	12.5	–	
M_2 B	–	7.5	–	
Atlas	D.b.50	D.b.395		
Lad	15.5	18.0		
BFcr	40.0	38.0		
H	28.0	30.5		
GL	–	47.0		
GB	–	97.0		
Scapula	D.b. 2576			
GLP	37.0			
LG	31.0			
BG	21.0			
SLC	32.0			
Humerus	D.b.1846	D.b.2605		
Bd	37.0	–		
BT	28.5	27.0		
SD	15.0	–		
DD	16.5	–		
Radius	*D.b.174*	D.b.2622		
Bp	*21.5*	–		
Bd	–	29.0		
SD	*15.0*	–		
Metacarpus I	D.b.472			
Bp	6.5			
Bd	8.0			
GL	30.0			
SD	–			
DD	–			
Metacarpus II	D.b.2698			
Bp	9.0			
Bd	11.0			
GL	69.0			
SD	8.0			
DD	6.5			
Metacarpus III	D.b.1978 (Šeb.)	D.b.106	D.b.1844	
Bp	9.5	9.5	9.0	
Bd	11.5	11.0	10.0	
GL	81.0	86.5	75.0	
SD	7.0	7.5	8.0	
DD	6.0	7.0	7.0	
Metacarpus IV	kv. 36/13			
Bp	9.0			
Bd	11.0			
GL	86.0			
SD	9.0			
DD	7.5			

continued....

Pril. 11.1D / Annex 11.1D (nadaljevanje / cont.)

Canis lupus	**Measures**			
Metacarpus V	D.b.473			
Bp	14.0			
Bd	12.0			
GL	68.0			
SD	7.0			
DD	6.0			
Femur	D.b.129			
Bp	54.0			
DC	25.0			
SD	17.0			
Astragalus	*D.b.66*			
GL	*35.0*			
Calcaneus	D.b.24	*D.b.51*	D.b.1156	D.b.1296
GL	64.5	*57.0*	55.0	59.0
GB	27.0	*25.5*	22.0	23.0
Metatarsus II	D.b.1980 (3-7)	D.b.1002		
Bp	7.0	7.0		
Bd	11.0	10.5		
GL	77.5	79.0		
SD	7.0	7.0		
DD	7.0	7.0		
Metatarsus III	D.b.60	*D.b.576*	D.b.2577	D.b.2579
Bp	7.0	*9.0*	13.0	–
Bd	12.0	*10.0*	12.0	–
GL	91.5	*84.0*	103.0	–
SD	8.0	*7.0*	10.0	8.0
DD	8.0	*6.0*	7.5	9.0
Metatarsus IV	D.b.304	D.b.463	kv. 32 iz. 16	
Bp	11.0	12.0	11.5	
Bd	11.0	12.0	9.5	
GL	96.0	105.0	88.0	
SD	8.0	9.0	8.5	
DD	7.5	8.5	7.0	
Metatarsus V	D.b.397	D.b.459	D.b.806	
Bp	11.0	13.0	12.0	
Bd	10.0	11.0	11.0	
GL	81.0	91.5	80.0	
SD	7.0	6.0	7.0	
DD	6.5	8.0	6.0	

Panthera spelaea	**Measures**	
Astragalus	*D.b.554*	
GL	*57.0*	
Metatarsus III	*D.b.564*	
Bp	*17.0*	
SD	*24.0*	
Bd	*20.0*	
GL	*143.0*	
Phalanx II	*D.b.588*	D.b.1783
Bp	*18.0*	28.0
SD	*17.0*	–
Bd	*11.5*	26.0
GL	*45.0*	33.0

◁◁

Pril. 11.1E: Mere ostankov jamskega leva (*Panthera spelaea*). Podatki, ki se nanašajo na najdbe iz OIS 5a–5d, so zapisane poševno. Vse mere so v mm.

Annex. 11.1E: Measurements of the remains of cave lion (*Panthera spelaea*). Data relating to finds from OIS 5a–5d are in italics. All measurements are in mm.

Pril. 11.1F Mere ostankov navadnega dihurja (*Mustela putorius*). Vse najdbe so iz OIS 3. Vse mere so v mm.
Annex. 11.1F: Measurements of the remains of European polecat (*Mustela putorius*). All finds are from OIS 3. All measurements are in mm.

Mustela putorius	Measures	
Maxilla	D.b. 1308/2	
P^4 L	8.0	
P^4 B	4.0	
M^1 L	6.0	
M^1 B	3.5	
Axis	D.b. 1280	
LCDe	16.0	
LAPa	16.0	
H	16.0	
BFcr	11.0	
SBV	8.0	
BPacd	11.0	
Scapula	D.b. 1308	D.b. 1593
GLP	9.0	9.0
BG	5.0	5.0
SLC	6.5	–
Radius	D.b. 1294/2	D.b. 1294/3
Bp	5.0	5.0
Bd	7.0	7.0
GL	34.0	33.5
Ulna	D.b. 1294	D.b. 1346
BPC	5.0	5.0
GL	45.0	–
Femur	D.b. 1083	D.b. 1308/5
Bp	–	11.0
DC	–	6.0
SD	–	4.0
Bd	12.0	11.5
GL	–	52.0
Tibia	D.b. 1279	D.b. 1308/4
Bp	11.0	10.5
Bd	8.0	8.5
Dd	6.0	6.0
GL	55.0	55.0
Calcaneus	D.b. 1294/4	
GL	13.0	
GB	8.0	
Astragalus	D.b. 1308/3	
GL	10.0	

Pril. 11.1G: Mere ostankov jelena (*Cervus elaphus*). Vse najdbe so iz OIS 3. Vse mere so v mm.
Annex. 11.1G: Measurements of the remains of red deer (*Cervus elaphus*). All finds are from OIS 3. All measurements are in mm.

Cervus elaphus	Measures	
Metacarpus	D.b.147	
SD	25.5	
DD	19.0	
Bd	41.0	
Metatarsus	D.b.430	
SD	25.5	
DD	22.5	
Bd	42.0	
GL	276.5	
Phalanx II	D.b. 1	D.b.146
Bp	–	19.5
SD	16.0	15.5
Bd	18.0	15.0
GL	44.0	42.0
Phalanx III	D.b.303	
Ld	44.0	
MBS	17.0	

Pril. 11.1H: Mere ostankov kune zlatice (*Martes* cf. *martes*). Podatki, ki se nanašajo na najdbe iz OIS 5a–5d, so zapisane poševno. Vse mere so v mm.
Annex. 11.1H: Measurements of the remains of pine marten (*Martes* cf. *martes*). Data relating to finds from OIS 5a–5d are in italics. All measurements are in mm.

Martes martes	**Measures**								
Cranium	D.b.1081								
BOC	17.0								
BFM	10.0								
HFM	8.0								
HOT	18.5								
HS	19.0								
Mandibula	*D.b.439*	D.b.440	D.b.441	D.b.521	D.b.1308	D.b.1525	D.b.2075	D.b.2465	
Tot. L	–	59.5	–	–	–	–	–	–	
P_1-M_3	*34.0*	33.0	–	–	–	31.5	–	–	
M_1-M_3	*15.0*	15.0	–	–	–		–	–	
P_1-P_4	*20.0*	19.0	–	–	–	20.0	19.0	–	
HP_2	*10.5*	9.0	9.0	9.0	8.0	8.0	10.5	9.0	
HM_1	*12.0*	11.0	–	–	–	–	–	11.0	
Dentes	Kv. 41b/13	*D.b.439*	D.b.1572	D.b.1585	D.b.1781	D.b.2075	D.b.2464	D.b.2497	D.b.2509
M^1 L	9.0	–	9.0	9.0	9.0	–	8.0	–	–
M^1 B	6.0	–	6.5	6.0	6.5	–	6.5	–	–
M_1 L	–	*11.5*	–	–		11.5	–	11.5	11.0
M_1 B	–	*5.0*	–	–		4.5	–	5.0	4.5
Atlas	D.b.757	D.b.1872	D.b.2508						
GL	13.0	–	–						
LAd	–	7.0	7.0						
H	13.0	12.5	13.0						
BFcr	21.5	21.0	20.5						
BFcd	14.0	14.0	–						
Axis	D.b.2494								
LCDe	19.0								
LAPa	15.0								
BFcr	13.0								
H	15.5								
Humerus	D.b.448	D.b.449	D.b.1773	D.b.2455					
Bp	13.0	–	14.0	–					
Dp	14.0	–	–	–					
SD	5.0	5.5	–	–					
Bd	17.0	–	–	16.5					
BT	11.0	–	–	12.0					
Ulna	D.b.443	D.b.1875							
BPC	6.5	9.0							
Radius	D.b.444	D.b.445	D.b.450	D.b.1315	D.b.1774	*D.b.1843*	D.b.2463		
Bp	7.5	7.5	–	6.0	–	*8.0*	6.5		
SD	4.0	3.5	–	–	–	*3.5*	3.5		
Bd	–	10.0	10.0	–	9.0	*9.0*	–		
GL	–	62.0	–	–	–	*62.0*	–		
Femur	*D.b.148*	*D.b.442*	D.b.447	D.b.451	D.b.1764	D.b.2084	D.b.2085	*D.b.2461*	
Bp	–	*17.5*	17.0	–	16.0	–	17.0	*16.0*	
DC	–	*8.0*	8.5	–	8.0	9.5	8.0	*7.0*	
SD	–	*5.5*	5.5	5.5	–	–	5.5	–	
Bd	*14.0*	–	–	–	–	–	15.0	–	
GLC	–	–	83.5	–	–	–	86.0	–	
GL	–	–	82.0	–	–	–	86.0	–	
Tibia	D.b.1763	D.b.2475							
Bp	15.5	15.0							
Calcaneus	D.b.768	D.b.821	D.b.1771						
GB	9.0	10.5	10.5						
GL	18.5	–	20.5						
Astragalus	D.b.1580	D.b.2060							
GL	12.5	14.5							

continued...

Pril. 11.1F / Annex 11.1F: (nadaljevanje / cont.)

Martes martes	**Measures**								
Metatarsus III	D.b.151								
Bp	*4.0*								
Bd	*4.0*								
SD	*3.0*								
DD	*2.0*								
GL	*35.0*								

Pril. 11.1I: Mere ostankov gamsa (*Rupicapra rupicapra*). Podatki, ki se nanašajo na najdbe iz OIS 5a–5d, so zapisane poševno. Vse mere so v mm.
Annex. 11.1I: Measurements of the remains of chamois (*Rupicapra rupicapra*). Data relating to finds from OIS 5a–5d are in italics. All measurements are in mm.

R. rupicapra	**Measures**									
Dentes	D.b.710	D.b.1898								
M_3 L	21.0	–								
M_3 B	8.0	–								
dP_4 L	–	15.0								
dP_4 B	–	6.5								
Radius	D.b.1093									
Bp	33.0									
BFp	31.0									
SD	19.0									
DD	10.0									
Ulna	D.b.1096									
BPC	18.0									
Femur	*D.b.570*									
DC	*22.0*									
Tibia	D.b.607	D.b.1521								
Bd	26.0	31.0								
Dd	–	19.5								
Calcaneus	D.b.137									
GB	23.0									
Astragalus	*D.b.555*	*D.b.563*	*D.b.587*	*D.b.595*	D.b.634	D.b.1519				
Bd	–	*20.0*	*22.0*	–	19.0	18.0				
GLl	*29.5*	*32.0*	*34.0*	–	29.0	30.0				
GLm	*28.0*	*31.0*	*32.0*	*31.0*	27.0	28.0				
Dl	*16.0*	*17.0*	*18.5*	*18.0*	17.5	17.0				
Dm	–	–	*18.5*	–	16.5	–				
Phalanx I	D.b.163	D.b.1110	*D.b.1446*	D.b.1447	D.b.1514	D.b.1842	D.b.1847	D.b.1894	D.b.2106	D.b.2107
Bp	14.5	14.0	–	14.0	14.5	14.0	–	–	15.5	11.0
Bd	–	–	*13.0*	–	–	12.0	13.0	12.0	–	–
GL	–	–	–	–	–	49.0	–	–	–	–
SD	–	–	–	–	–	9.0	–	–	–	–
DD	–	–	–	–	–	8.0	–	–	–	–
Phalanx II	D.b.1990 (10-13)	*D.b.109*	*D.b.591*	D.b.742	D.b.1205	D.b.1448	D.b.1510	D.b.1729	D.b.1731	
Bp	14.0	*15.0*	–	–	11.0	13.0	13.0	15.0	14.0	
SD	8.0	–	*8.0*	–	8.0	–	–	10.0	–	
Bd	10.0	–	*8.5*	–	7.5	–	–	12.0	–	
GL	30.0	–	*31.5*	35.5	24.0	–	–	51.0	–	

Capra ibex	**Measures**		
Tibia	D.b. 1091	D.b. 1181	D.b. 1520
Bd	34.0	34.0	31.0
Dd	26.5	–	23.0
Phalanx II	D.b. 1162	D.b. 1317	
Bp	18.0	16.0	

◁◁

Pril. 11.1J: Mere ostankov alpskega kozoroga (*Capra ibex*). Vse najdbe so iz OIS 3. Vse mere so v mm.
Annex. 11.1J: Measurements of the remains of alpine ibex (*Capra ibex*). All finds are from OIS 3. All measurements are in mm.

Pril. 11.2A: Razporeditev kranialnih in postkranialnih najdb alpskega svizca (*Marmota marmota*) iz Divjih bab I po plasteh. V kategoriji "other" (= ostalo) so vključeni naslednji skeletni elementi: clavicula, costae. Legenda: LU – plast neznana, OIS 3 – interpleniglacial (natančnejša časovna umestitev ni mogoča).
Annex 11.2A: Distribution of cranial and post-cranial finds of alpine marmot (*Marmota marmota*) from Divje babe I by layers. The category "other" includes the following skeletal elements: clavicula, costae. Legend: LU – layer unknown, OIS 3 – Interpleniglacial (a more exact temporal classification is not possible).

Layer	Cranium	Maxilla	Mandibula	Dentes	Atlas / Axis	Vertebrae	Scapula	Humerus	Radius	Ulna	Ossa carpalia	Metacarpalia	Phalanges	Ossa coxae	Femur	Patella	Tibia	Fibula	Ossa tarsalia	Metatarsalia	Metapodia	Other	TOTAL
2-5	6	4	8	56	2		2	14	4	3		2	29	4	6		8	2	14	5	13	4	186
6																							–
6-7													1										1
7													2								1		3
7-8						1								1									2
8			1	4			1					1	7	2	1		4	1	1	1	4		28
8-10													1										1
9																							–
10				1								1											2
OIS5				1																			1
LU			2	3		1								1	1	1			1				10
Σ	6	4	11	65	2	2	3	14	4	3	–	4	40	8	8	1	12	3	16	6	18	4	234

Pril. 11.2B: Razporeditev kranialnih in postkranialnih najdb rjavega medveda (*Ursus arctos*) iz Divjih bab I po plasteh. V kategoriji "other" (= ostalo) so vključeni naslednji skeletni elementi: costae, os penis. Legenda: LU – plast neznana, OIS 3 – interpleniglacial (natančnejša časovna umestitev ni mogoča), OIS 5 – zgodnji glacial (natančnejša časovna umestitev ni mogoča).
Annex 11.2B: Distribution of cranial and post-cranial finds of brown bear (*Ursus arctos*) from Divje babe I by layers. The category "other" includes the following skeletal elements: costae, os penis. Legend: LU – layer unknown, OIS 3 – Interpleniglacial (a more exact temporal classification is not possible), OIS 5 – Early Glacial (a more exact temporal classification is not possible).

Layer	Cranium	Maxilla	Mandibula	Dentes	Atlas / Axis	Vertebrae	Scapula	Humerus	Radius	Ulna	Ossa carpalia	Metacarpalia	Phalanges	Ossa coxae	Femur	Patella	Tibia	Fibula	Ossa tarsalia	Metatarsalia	Metapodia	Other	TOTAL
1-7											1					1							2
1-13													1										1
2-5			4	37		1					4	4	13						1	3		1	68
3-7				1																			1
6	1			2												1							4
6-7																							–
7				2		1																	3
7-8																							–
8			2	17	1	3			4		2		5			1				1			36
8-10				2																1			3
9																				1			1
9-13												2											2
10				11							1	2	1				2						17
10-11				1																			1
10-13																				2			2
11			1	2									1										4
11-12				1																			1
11-13				1																			1
OIS3			1																	1			2
12																						1	1
12-13				3									1									1	5
13				2								3	4						1				10
13-14				2																1			3
13-16												1	1										2

continued...

Pril. 11.2B / *Annex 11.2B* (nadaljevanje / cont.)

Layer	Cranium	Maxilla	Mandibula	Dentes	Atlas / Axis	Vertebrae	Scapula	Humerus	Radius	Ulna	Ossa carpalia	Metacarpalia	Phalanges	Ossa coxae	Femur	Patella	Tibia	Fibula	Ossa tarsalia	Metatarsalia	Metapodia	Other	TOTAL
14				1								2	3										6
14-16																				1			1
16				1																			1
17																							–
17a													2								1		3
17-19												1											1
OIS5			1	1								1	1										4
LU				2								4							1				7
Σ	1	–	9	89	1	5	–	–	4	–	8	20	33	–	–	3	2	–	3	11	1	3	193

Pril. 11.2C: Razporeditev kranialnih in postkranialnih najdb volka (*Canis lupus*) iz Divjih bab I po plasteh. V kategoriji "other" (= ostalo) so vključeni naslednji skeletni elementi: costae, os penis. Legenda: LU – plast neznana, OIS 5 – zgodnji glacial (natančnejša časovna umestitev ni mogoča).
Annex 11.2C: Distribution of cranial and post-cranial finds of wolf (*Canis lupus*) from Divje babe I by layers. The category "other" includes the following skeletal elements: costae, os penis. Legend: LU – layer unknown, OIS 5 – Early Glacial (a more exact temporal classification is not possible).

Layer	Cranium	Maxilla	Mandibula	Dentes	Atlas / Axis	Vertebrae	Scapula	Humerus	Radius	Ulna	Ossa carpalia	Metacarpalia	Phalanges	Ossa coxae	Femur	Patella	Tibia	Fibula	Ossa tarsalia	Metatarsalia	Metapodia	Other	TOTAL
1-7												1											1
2-5		1	2	13	1	2			1		3	2	27		1			2	6	3		1	65
3-7																				1			1
6				2									4		1						1		8
6-7				2																			2
7				1							1		2							1		1	6
7-8												1											1
8			1	6	1	1					1	1	4							4	3	1	23
8-10													2							2			4
9																			1				1
9-13						1					1												2
10				5		2	1				5	4	6						2	1			26
10-11																							–
10-13													1										1
11								1															1
11-12																						1	1
12																			1				1
12-13																							–
13						1							2										3
13-14																							–
14						1																	1
14-16																							–
16																							–
17									1														1
17a																				1			1
17-19																							–
18																							–
20																							–
21																	1						1
OIS5				1																2			3
LU					1	2		1	1	1		2	1				1		1	1		1	13
Σ		1	3	30	3	10	1	2	3	1	11	11	49	–	2	–	2	2	11	16	4	5	167

Pril. 11.2D: Razporeditev kranialnih in postkranialnih najdb navadnega dihurja (*Mustela putorius*) v vzorcu iz Divjih bab I po plasteh. V kategoriji "other" (= ostalo) so vključeni naslednji skeletni elementi: costae, clavicula.
Annex 11.2D: Distribution of cranial and post-cranial finds of European polecat (*Mustela putorius*) in the sample from Divje babe I by layers. The category "other" includes the following skeletal elements: costae, clavicula.

Layer	Cranium	Maxilla	Mandibula	Dentes	Atlas / Axis	Vertebrae	Scapula	Humerus	Radius	Ulna	Ossa carpalia	Metacarpalia	Phalanges	Ossa coxae	Femur	Patella	Tibia	Fibula	Ossa tarsalia	Metatarsalia	Metapodia	Other	TOTAL
2-5		2	2	1	1	14	2		2	2		2	2	2	2		2	2	2	1	1	4	46
6																							–
6-7																							–
7																							–
7-8																							–
8			1	1																			2
8-10																					1		1
9																							–
10																							–
10-11																							–
11				1																			1
Σ	–	2	3	3	1	14	2	–	2	2	–	2	2	2	2	–	2	2	2	1	2	4	50

Pril. 11.2E: Razporeditev kranialnih in postkranialnih najdb kune zlatice (*Martes* cf. *martes*) iz Divjih bab I po plasteh. V kategoriji "other" (= ostalo) so vključeni naslednji skeletni elementi: costae. Legenda: OIS 5 – zgodnji glacial (natančnejša časovna umestitev ni mogoča).
Annex 11.2E: Distribution of cranial and post-cranial finds of pine marten (*Martes* cf. *martes*) from Divje babe I by layers. The category "other" includes the following skeletal elements: costae. Legend: OIS 5 – Early Glacial (a more exact temporal classification is not possible).

Layer	Cranium	Maxilla	Mandibula	Dentes	Atlas / Axis	Vertebrae	Scapula	Humerus	Radius	Ulna	Ossa carpalia	Metacarpalia	Phalanges	Ossa coxae	Femur	Patella	Tibia	Fibula	Ossa tarsalia	Metatarsalia	Metapodia	Other	TOTAL
2-5	1		4	12	1			1	1			4	5		3		1		3	3	1		40
5-6													1						1		1		3
6						1		1					1										3
6-7						1			1	2		1	2					1	1	1			10
7					7							1	2						1		1		12
7-8			1																				1
8			2	5		4		1		2			4		1		2			1			22
8-10				1	1				1				1										4
9																							–
10			3	3		2						1	2							1			12
10-11				1																			1
10-13				1																			1
11				2								1											3
11-12				1																			1
12					1																		1
12-13													1										1
13				2					1						1								4
13-14																							–
14																			1	1			2
14-16																							–
16				1					2	1					2								6
16-17								2	1						1							3	7
17			1																	1			2
OIS5			1												1		1						3
Σ	1	–	12	29	10	8	–	5	7	5	–	8	19	–	9	–	4	1	7	8	3	3	139

Pril. 11.2F: Razporeditev kranialnih in postkranialnih najdb gamsa (*Rupicapra rupicapra*) iz Divjih bab I po plasteh. V kategoriji "other" (= ostalo) so vključene sezamoidne kosti. Legenda: OIS 5 – zgodnji glacial (natančnejša časovna umestitev ni mogoča), LU – plast neznana.
Annex 11.2F: Distribution of cranial and post-cranial finds of chamois (*Rupicapra rupicapra*) from Divje babe I by layers. The category "other" includes sesamoid bones. Legend: OIS 5 – Early Glacial (a more exact temporal classification is not possible), LU – layers unknown.

Layer	Cranium	Maxilla	Mandibula	Dentes	Atlas / Axis	Vertebrae	Scapula	Humerus	Radius	Ulna	Ossa carpalia	Metacarpalia	Phalanges	Ossa coxae	Femur	Patella	Tibia	Fibula	Ossa tarsalia	Metatarsalia	Metapodia	Other	TOTAL
2-5			1	21			1		3	1	11	1	12	1			1		4	4			61
5-7				1																1			2
6				1															1				2
6-7				2							1		1								1	1	6
7				1																			1
7-8																							–
8				1							5		6						1				13
8-10																							–
8-13													1										1
9																							–
10															1				1		1		3
10-11																							–
10-13													1										1
11																					1		1
11-12																							–
12																							–
12-13																							–
13				2																			2
13-14																							–
14													1										1
14-16																							–
16																							–
17																							–
17a											3				1				2				6
17-19																							–
18													1									1	2
20												1							2				3
21													1										1
OIS5													1						1				2
LU				1									1				1					1	4
Σ	–	–	1	30	–	–	1	–	3	1	20	2	26	1	2	–	2	–	12	5	3	3	112