

The exploitation of small game: new taphonomic data from the Mesolithic rock shelter of Galgenbühel/Dos de la Forca (South Tyrol – Italy)

J. CREZZINI¹, F. BOSCHIN¹, P. BOSCATO¹ & U. WIERER²

¹Università di Siena, Dipartimento di Scienze Fisiche, della Terra e dell'Ambiente U.R. Preistoria e Antropologia, Via Laterina 8. 53100 Siena, Italia

e-mail: jacopo.crezzini@unisi.it; francesco.boschin@unisi.it; paolo.boscato@unisi.it

²Soprintendenza Archeologia, Belle Arti e Paesaggio per la città metropolitana di Firenze e le province di Pistoia e Prato, Piazza de' Pitti 1. 50125 Firenze, Italia
ursula.wierer@cultura.gov.it

(Received 09 October 2022; Revised 18 December 2022; Accepted 04 May 2023)



ABSTRACT: Galgenbühel/Dos de la Forca is an Early Mesolithic site located at Salorno (Province of Bolzano, Italy) and dated approximately between 8,500 and 7,500 cal. BC. The subsistence economy of the settlement relied on the exploitation of nearby wetlands and of the forested valley bottom; together with ungulates such as wild boar, red deer and chamois, the fauna comprises small carnivores and semi-aquatic mammals such as otter and beaver. The latter is the most abundant species, and a reasonable amount of its remains bear cut marks. Anthropogenic traces are also present on bones of wild cat, pine marten, badger and otter. We present a taphonomic study carried out on the bones belonging to small carnivores, rodents, and lagomorphs. A 3D digital microscope analysis was performed in order to distinguish the anthropic traces from non-anthropogenic modifications. Beside the results obtained from this exam, data from the evaluation of the cut mark positions on the bones and of the skeletal frequencies allowed the reconstruction of the methods adopted by hunter-gatherers in the treatment of beaver carcasses, and to understand the role of each species in their subsistence strategies.

KEY WORDS: GALGENBÜHEL/DOS DE LA FORCA, ALPS, BEAVER, CUT MARKS, 3D DIGITAL MICROSCOPE

RIASSUNTO: Galgenbühel/Dos de la Forca è un sito mesolitico situato a Salorno (Bolzano, Italia) e datato tra circa 8500 e 7500 a.C. cal. L'economia di sussistenza dell'insediamento si basava sullo sfruttamento delle vicine zone umide e del fondovalle boscoso. Insieme ad ungulati come cinghiali, cervi e camosci, la fauna comprende piccoli carnivori e mammiferi semiacquatici come la lontra e il castoro. Quest'ultimo rappresenta la specie più abbondante e una discreta quantità dei suoi resti presenta segni di taglio. Tracce antropiche sono presenti anche su ossa di gatto selvatico, martora, tasso e lontra. In questo lavoro presentiamo uno studio tafonomico riguardante i resti ossei appartenenti ai piccoli carnivori, ai roditori ed ai lagomorfi. L'utilizzo della microscopia digitale 3D ha avuto un ruolo chiave nel riconoscimento dei segni di taglio di origine antropica. Tali risultati, insieme alla valutazione delle posizioni dei *cut marks* sulle ossa e delle frequenze scheletriche di ogni specie indagata, hanno permesso di ricostruire i metodi adottati dai cacciatori-raccoglitori nel trattamento delle carcasse di castoro e di comprendere il ruolo di ogni *taxon* nelle strategie di sussistenza dei mesolitici.

PAROLE CHIAVE: GALGENBÜHEL/DOS DE LA FORCA, ALPI, CASTORO, *CUT MARKS*, MICROSCOPIA DIGITALE 3D

INTRODUCTION

The Early Mesolithic rock shelter Galgenbühel/Dos de la Forca (Salorno, Bolzano), is located above a detrital cone at 225 m a.s.l. at the foot of a steep rock face that borders the Adige valley. Radiocarbon dates (between 8,425-8,089 BC cal. and 7,705-7,478 BC cal.) indicate the human frequentation of the shelter from the late Preboreal to the mid-Boreal (Figure 1). The recovered artefacts comprise lithic industry ascribable to the Sauveterrian technocomplex (Wierer, 2008). The site is remarkable for the exploitation of aquatic resources of the near wetland as fish, freshwater molluscs, pond turtles and semi-aquatic mammals. The macromammal assemblage comprises a vari-

ety of small game species, some of which are quite numerous (Wierer et al. 2018; Crezzini et al. 2014). Among these the beaver is the best represented species (Figure 2).

MATERIALS AND METHODS

The taphonomic examination of the mammal bone assemblage from Galgenbühel/Dos de la Forca revealed the presence of anthropic traces on the bones of *Castor fiber*, *Felis silvestris*, *Martes martes*, *Lutra lutra* and *Meles meles*. The investigation of these traces on the wild cat remains has demonstrated its exploitation not only for its fur but for nutritional purposes, too (Crezzini et al.,

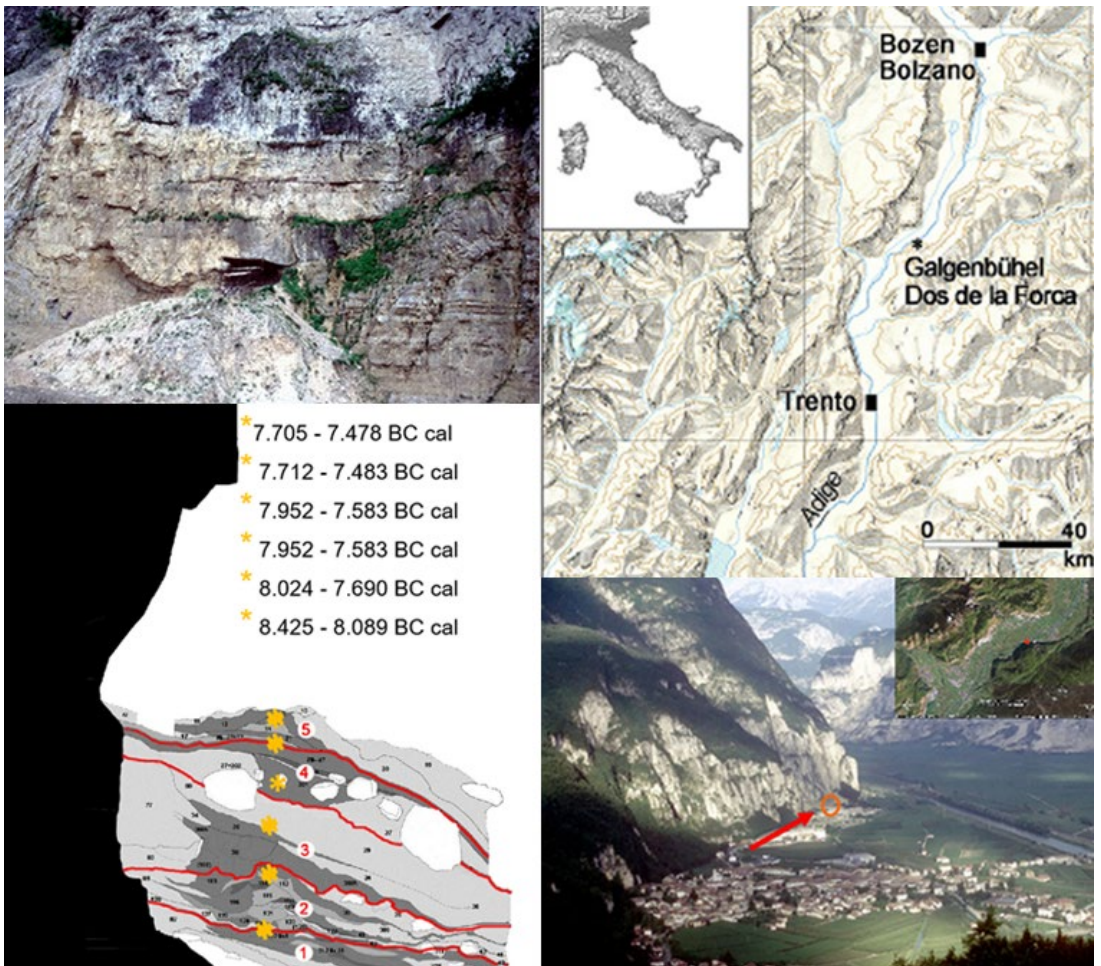


FIGURE 1

The location and the stratigraphy of the site.

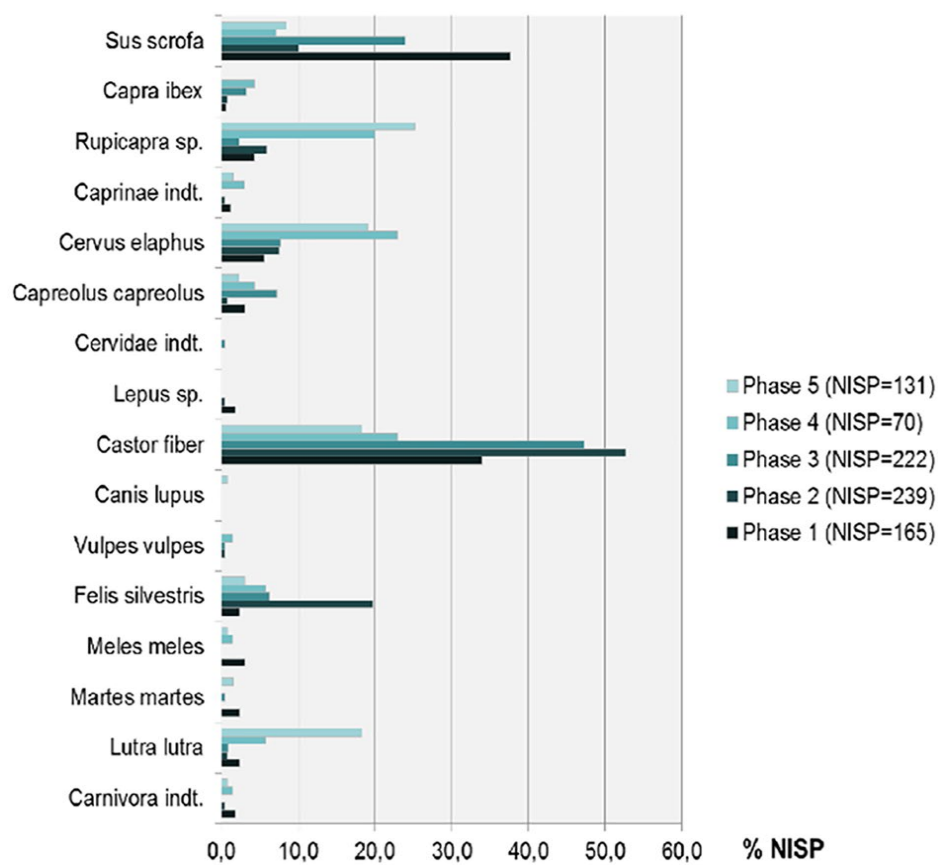


FIGURE 2

The macrofaunal association.

2014). In this work, we present the examination of the skeletal frequencies and the distribution of the anthropic traces on the bones belonging to the other small carnivores, rodents and lagomorphs. A 3D digital microscope analysis was performed in order to distinguish the anthropic traces from non-anthropic modifications (Boschin & Crezzini, 2012). The characteristic values of each of them (following Boschin & Crezzini, 2012) have been compared with an experimental database of cuts produced during butchering experiments on small mammal carcasses. These experiments were conducted using stone tools made from the same chert varieties of the archaeological artefacts.

RESULTS

The assemblage of the recovered beaver bones comprises elements from all body parts except for Archaeofauna 34(1) (2025): 337-345

the vertebrae. Vertebrae are, on the other hand, well represented among the taxonomically unidentified bones. Cut marks have been detected on several bones. Surely, the high-quality pelt of the beaver explains for the skinning marks found on the lateral side of two mandibles. Disarticulation marks are found on the upper part of the skeleton, such as striae on two clavicles, both in similar positions (Figure 3). Cut marks on the medial side of a rib suggest the action of evisceration or filleting. Cut marks documented on the forelimbs are possibly evidence for the removal of muscles as shown by the distal cuts on the humerus (Figure 4) and by the disarticulation marks on an ulna and a radius. Much more numerous are the cut marks on the hindlimbs of the beaver, with signs of disarticulation on a tibia, on the metatarsals and on the phalanges (Figures 5 and 6) (Wierer *et al.*, 2018).

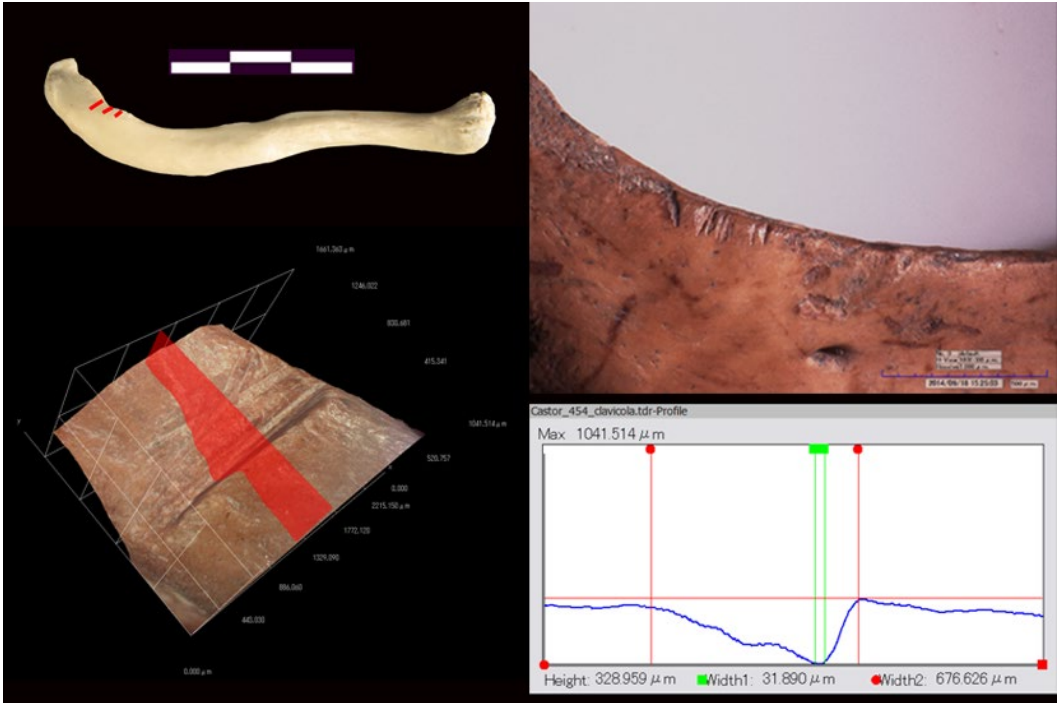


FIGURE 3

Castor fiber: Cutmarks on a clavicle (position of cut marks indicated on modern bone).

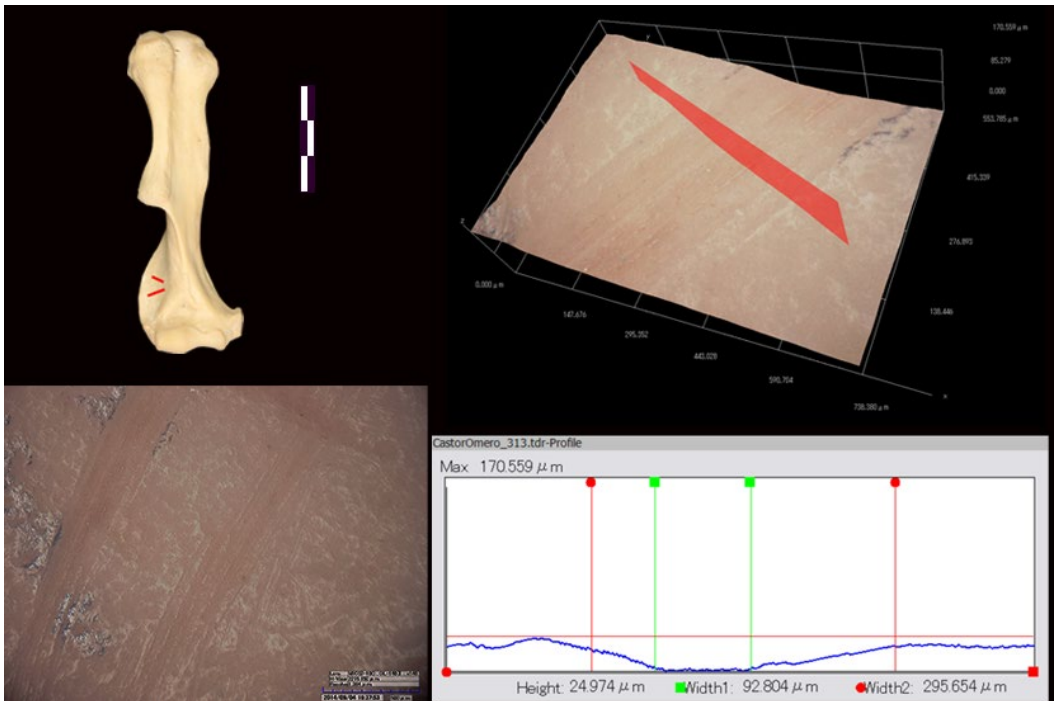


FIGURE 4

Castor fiber: Cutmarks on the distal part of a humerus.

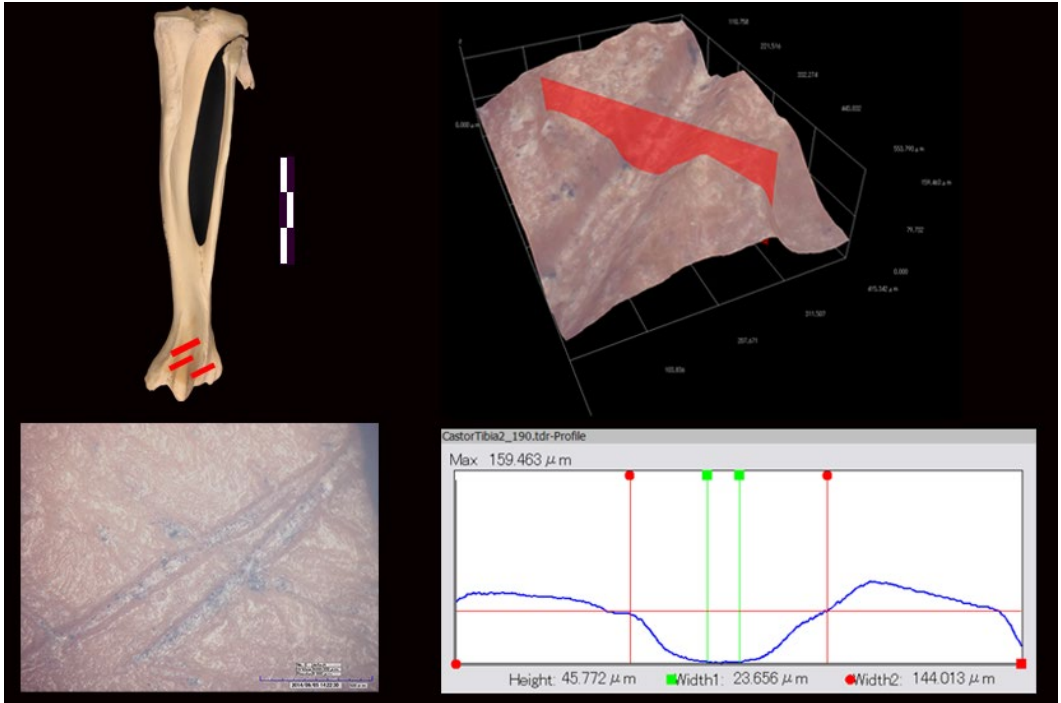


FIGURE 5
Castor fiber: Cutmarks on a tibia.

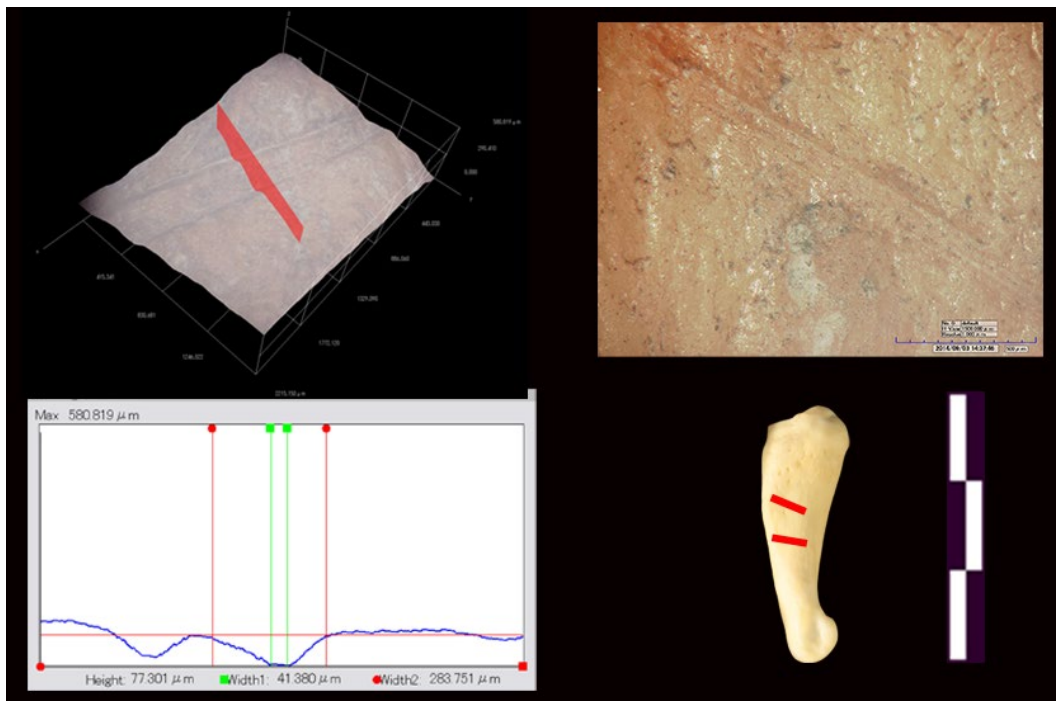


FIGURE 6
Castor fiber: Cutmarks on a first phalange.

The otter remains are represented mostly by cranial and limb bones. Three bones from the hindlimbs show cut marks located on the neck of the proximal articulation of a femur, on a tibia and on the ventral side of a metatarsal (Figure 7). They seem all related to the dismemberment, which could indicate meat consumption, besides the exploitation of the pelt. Regarding the badger, two of the few bones bear traces of human action. Due to their location on the maxilla and on the diaphysis of the metatarsal, both seem related to the skinning of the animal. The experimental butchering of a badger carcass produced similar marks on the maxilla during the skinning (Figure 8).

The only parts preserved from *Martes martes* are cranial bones and teeth. Figure 9 shows a cut on the medial side of a nearly intact mandible. Its location is nearly identical to the one detected on a mandible of *Felis silvestris* interpretable as disarticulation mark (Crezzini *et al.*, 2014).

The evaluation of the morphometrical values related to some marks (sensu Boschín & Crezzini, 2012) on hare and fox bones excludes the anthropogenic origin of these modifications.

DISCUSSION AND CONCLUSIONS

The utilization of the 3D video microscope for the analyses of bone surfaces was of fundamental importance for the correct identification and the quantification of the *striae* produced on the bones of small game. The evaluation of the morphometric features of the traces allowed their more precise definition. A detailed comparative analysis of the marks found on small game species with those on the bones of larger mammals shows interesting differences. With respect to the parameter DC, which expresses the depth of the cut (Boschin & Crezzini, 2012), marks on the small game show a minor depth (Figure 10). They are indeed more “feeble”, most probably by the lower force necessary for processing small carcasses. We also observed that the cut marks are less frequent on the bones of small mammals with respect to macromammals. This is probably due to the possibility to dismember small animals simply by “twisting” the bones in their joints (Figure 11). These results advise for caution in evaluating the degree of exploitation of the small game by a quantification of the marks and in evaluating the agent of accumulation on the base of the presence/absence of cut marks on small prey species in general.

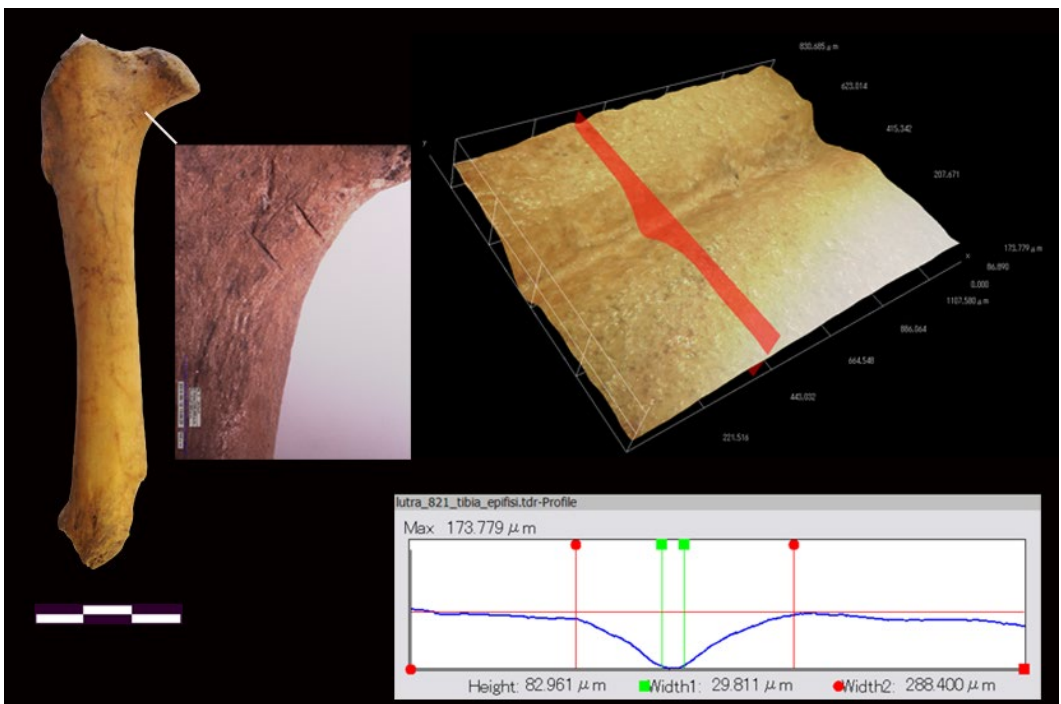


FIGURE 7

Lutra lutra: Cutmarks on a tibia.

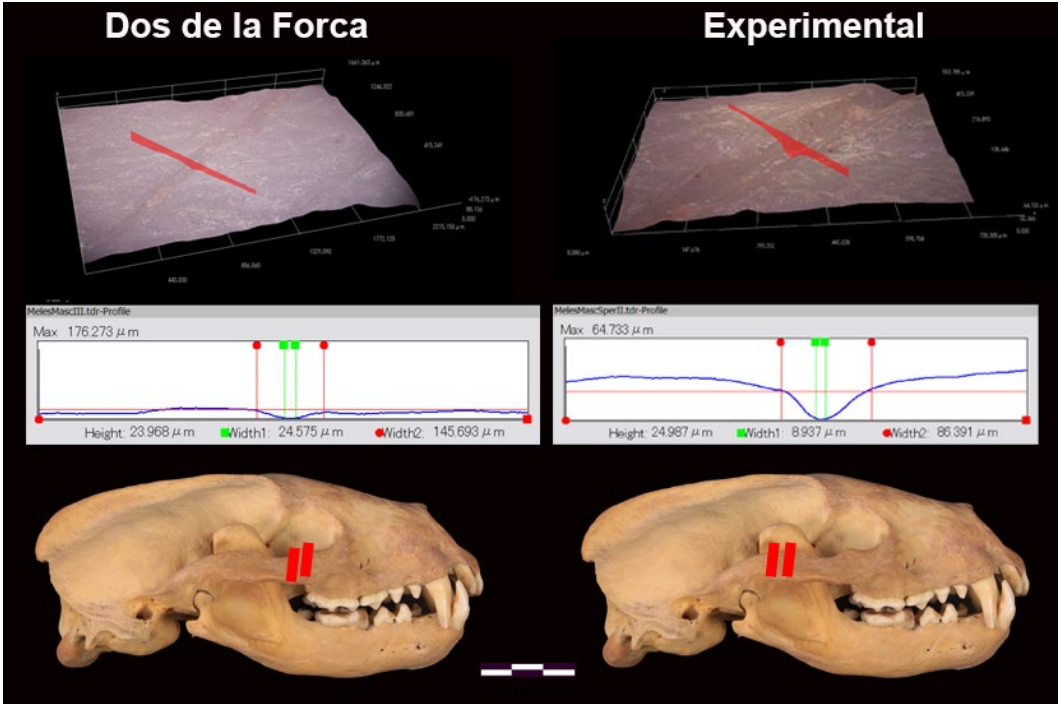


FIGURE 8

Meles meles: Cutmarks on the maxilla (position indicated on a modern cranium).

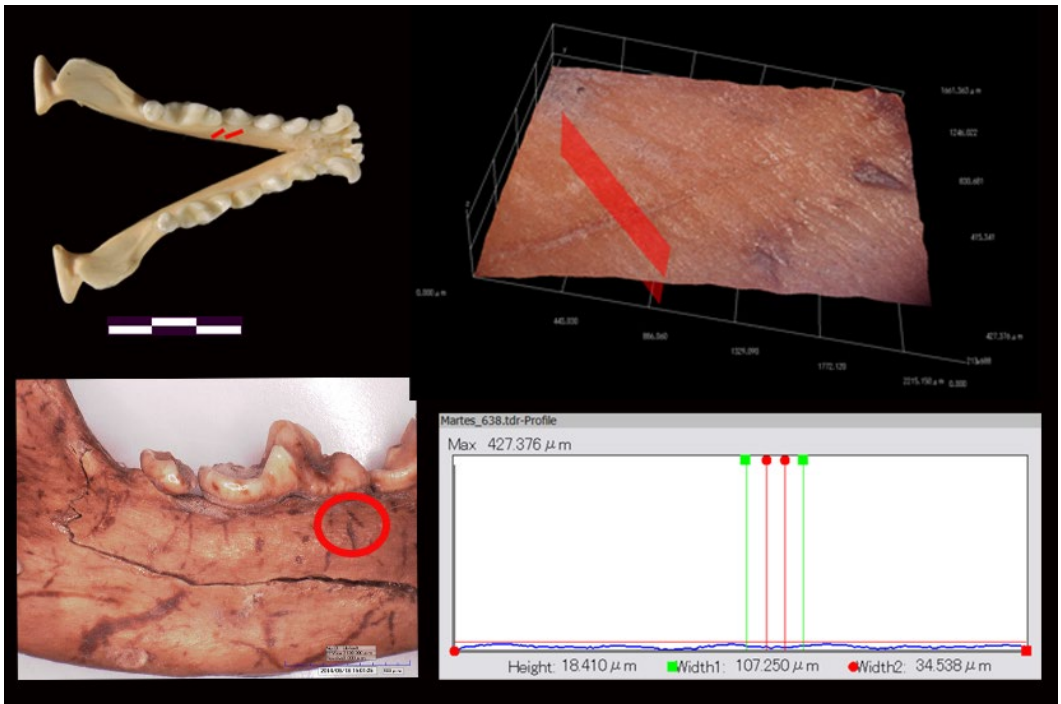


FIGURE 9

Martes martes: Cutmarks on the medial side of a nearly intact mandible.

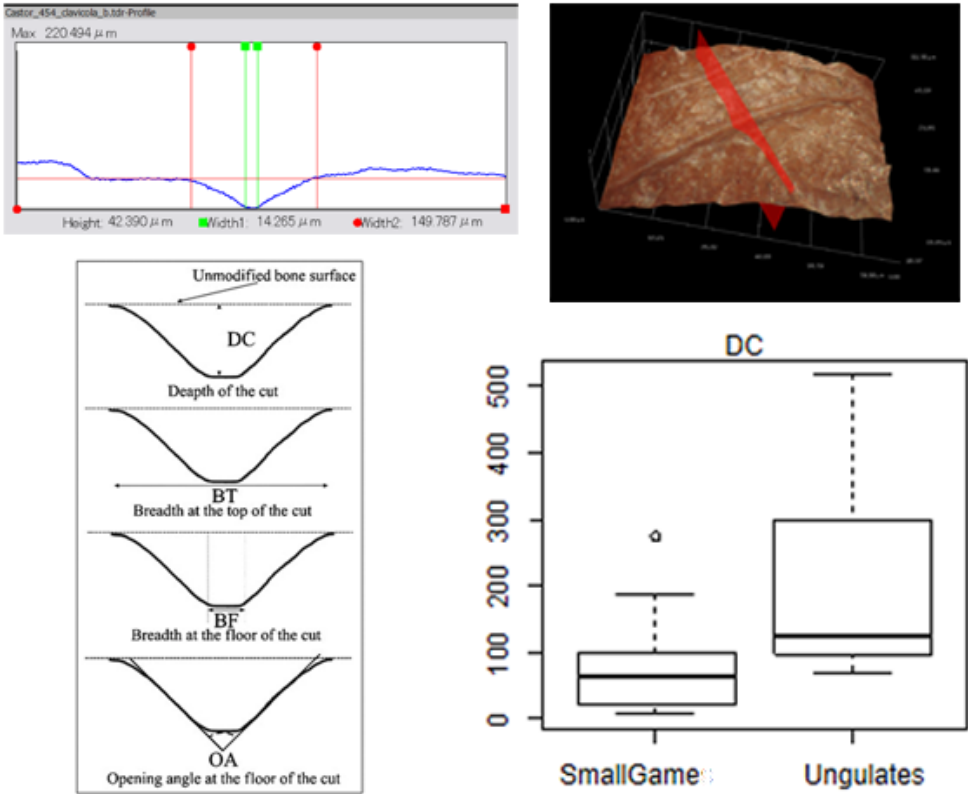


FIGURE 10

Comparison between the depth of cut marks (DC, *sensu* Boschini & Crezzini, 2012) recorded in small game and in the ungulate remains.

Exploitation of small game VS Exploitation of ungulates

	NISP	Cutmarks
Large/Medium game	363	11%
Small game	458	6%



Experimental actions of “twisting” on a limb of badger

FIGURE 11

Percentage of large/medium and small game remains with cutmarks and experimental proofs of “twisting”.

This work is part of the research project “Leben am Wasser. Ressourcen, Technik und Mobilität im Mesolithikum am Beispiel der Fundstelle Galgenbühel in Salurn (Südtirol)” funded by the Autonomous Province of Bolzano/South Tyrol, Higher Education Support, University and Research Office. The project is headed by the South Tyrol Museum of Archaeology. Project partner is the Archaeological Heritage Office of Bolzano.

REFERENCES

- BOSCHIN, F. 2020: Holocene macromammal remains from Grotta dell'Edera/Stenašca, Trieste Karst *Arheološki vestnik. Ljubljana, Slovenija* 71: 321-357.
Doi: 10.3986/AV.71.11.
- BOSCHIN, F. & CREZZINI, J. 2012: Morphometrical analysis on cut marks using a 3D digital microscope. *International Journal of Osteoarchaeology* 22: 549-562.
- CREZZINI, J.; BOSCHIN, F.; BOSCATO, P. & WIERER, U. 2014: Wild cats and cut marks: exploitation of *Felis silvestris* in the Mesolithic of Galgenbühel/Dos de la Forca (South Tyrol, Italy). *Quaternary International* 330: 52-60. DOI: 10.1016/j.quaint.2013.12.056.
- WIERER, U. 2008: Which blanks for which tools? Techno-typological analyses of the Sauveterrian industry at Galgenbühel (Italy). In: Aubry, T.; Almeida, F.; Araújo, A.C. & Tiffagom, M. (eds.): *Space and Time: Which Diachronies, Which Synchronies, Which Scales/Typology Vs. Technology. Proceedings of the XV UISPP World Congress, Lisbon: 197-206*. B.A.R. (International Series) 1831. Oxford.
- WIERER, U.; BETTI, L.; BOSCATO, P.; BAZZANELLA, M.; BOSCHIN, F.; CREZZINI, J.; GALA, M.; GIROD, A. & TAGLIACOZZO, A. 2018: Living near the water. Environment, wetland economy and fishing techniques of the Mesolithic site Galgenbühel/Dos de la Forca in the Adige Valley (South Tyrol, Italy) In: Cupillard, C.; Griselin, S. & Séara, F. (eds.): *Au coeur des sites mésolithiques: entre processus taphonomiques et données archéologiques. Actes de la table-ronde internationale de Besançon (F) 29-30 octobre 2013: 241-257*. Presses universitaires de Franche-Comté.

Vallese-Oppeano 4C: archaeozoological analysis of an Early Bronze Age pile-dwelling site in the Veronese Po Plain. Vallese di Oppeano 4C: analisi archeozoologica dell'insieme faunistico proveniente da un abitato palafitticolo dell'antica Età del Bronzo nella pianura veronese. <i>Gianluca Arnetta, Federica Gonzato & Ursula Thun Hohenstein</i>	141-153
http://www.doi.org/10.15366/archaeofauna2025.34.1.014	
Economia di sussistenza nel sudest iraniano tra IV e II millennio a.C. Nuovi dati archeozoologici da Shahr-I Sokhta (Iran) nell'ambito del progetto MAIPS. <i>Alberto Potenza</i>	155-166
http://www.doi.org/10.15366/archaeofauna2025.34.1.015	
The impact of data from early fusing and basipodial bones on adult body size estimate: methodological insights from Upper Palaeolithic sites in southern Italy. L'uso degli standard biometrici in archeozoologia: spunti metodologici da siti del Paleolitico superiore dell'Italia meridionale. <i>Clarissa Dominici & Francesco Boschin</i>	167-173
http://www.doi.org/10.15366/archaeofauna2025.34.1.016	
Gli animali nell'alto medioevo toscano tra fonti scritte e dati archeozoologici. Animals between written sources and archaeozoological data in Tuscany in the early middle ages. <i>Lisa Dall'olio</i>	175-183
http://www.doi.org/10.15366/archaeofauna2025.34.1.017	
Zooarchaeological analysis of the faunal remains from a <i>pozzo di butto</i> of the Palazzo Ugurgieri in the historic centre of Siena. <i>J. Crezzini & J. Bruttini</i>	185-192
http://www.doi.org/10.15366/archaeofauna2025.34.1.018	
Due set di metapodiali e falangi con esemplari iscritti dall'area artigianale C1 del Bostel di Rotzo (VI): elementi rituali o funzionali?. <i>Luigi Magnini, Cinzia Bettineschi, Veronica Venco, Francesco Pieragostini, Anna Michielin, Elena Griggio & Armando De Guio</i>	193-203
http://www.doi.org/10.15366/archaeofauna2025.34.1.019	
The faunal assemblage of Piano dei Cardoni: a Neolithic context on the island of Ustica (Italy). <i>Vito Giuseppe Prillo, Claudia Speciale, Roberto Miccichè, Ilenia Arienzo & Antonio Carandente</i>	205-212
http://www.doi.org/10.15366/archaeofauna2025.34.1.020	
Jesolo (VE, Italy): a lagoon site from the Late Antiquity to the Middle Ages. Preliminary results of an archaeozoological and archaeobotanical study. Il sito lagunare di Jesolo (VE) tra Tarda Antichità e Medioevo: risultati preliminari delle analisi archeozoologiche e archeobotaniche. <i>Silvia Garavello, Alessandra Cianciosi & Alessandra Forti</i>	213-225
http://www.doi.org/10.15366/archaeofauna2025.34.1.021	
Leisure and Feasts at HORTI LAMIANI: faunal evidence from some samples unearthed at Emperor Caligula's Villa in Rome. HORTI LAMIANI tra diletto e banchetti: evidenza faunistica da alcuni campioni provenienti dalla Villa di Caligola a Roma. <i>Gabriele Soranna</i>	227-240
http://www.doi.org/10.15366/archaeofauna2025.34.1.022	
Resti animali da contesti rituali etruschi da Orvieto (Umbria, Italia). <i>Barbara Wilkens</i>	241-252
http://www.doi.org/10.15366/archaeofauna2025.34.1.023	
Gli animali tra vita quotidiana e attività cultuali nel complesso santuario preistorico di Grotta dei Cervi, Porto Badisco (Otranto – LE, Italy). <i>Claudia Minniti & Ida Tiberi</i>	253-263
http://www.doi.org/10.15366/archaeofauna2025.34.1.024	
The faunal remains of the Roman villa of San Marco on the island of Elba: diet and livestock economy in the late Republican and early Imperial periods. <i>Claudia Abatino & Fabio Manfredelli</i>	265-274
http://www.doi.org/10.15366/archaeofauna2025.34.1.025	
A preliminary investigation of cattle (<i>Bos taurus</i>) size and shape changes between the Copper Age and the Bronze Age in Northern Italy. <i>Francesca Fapanni, Lenny Salvagno, Alfonsina Amato, Fabio Bona & Umberto Tecchiati</i>	275-285
http://www.doi.org/10.15366/archaeofauna2025.34.1.026	
Fauna a bordo: relitti sulle rotte siciliane dall'età greca all'età tardo antica. <i>Carolina Di Patti & Rosaria Di Salvo</i>	287-295
http://www.doi.org/10.15366/archaeofauna2025.34.1.027	
Resti faunistici dall'Edificio 1 del sito etrusco di Gonfienti. <i>Giulia Peri, Chiara Capalbo & Paul P.A. Mazza</i>	297-308
http://www.doi.org/10.15366/archaeofauna2025.34.1.028	
Announcements	309- 313