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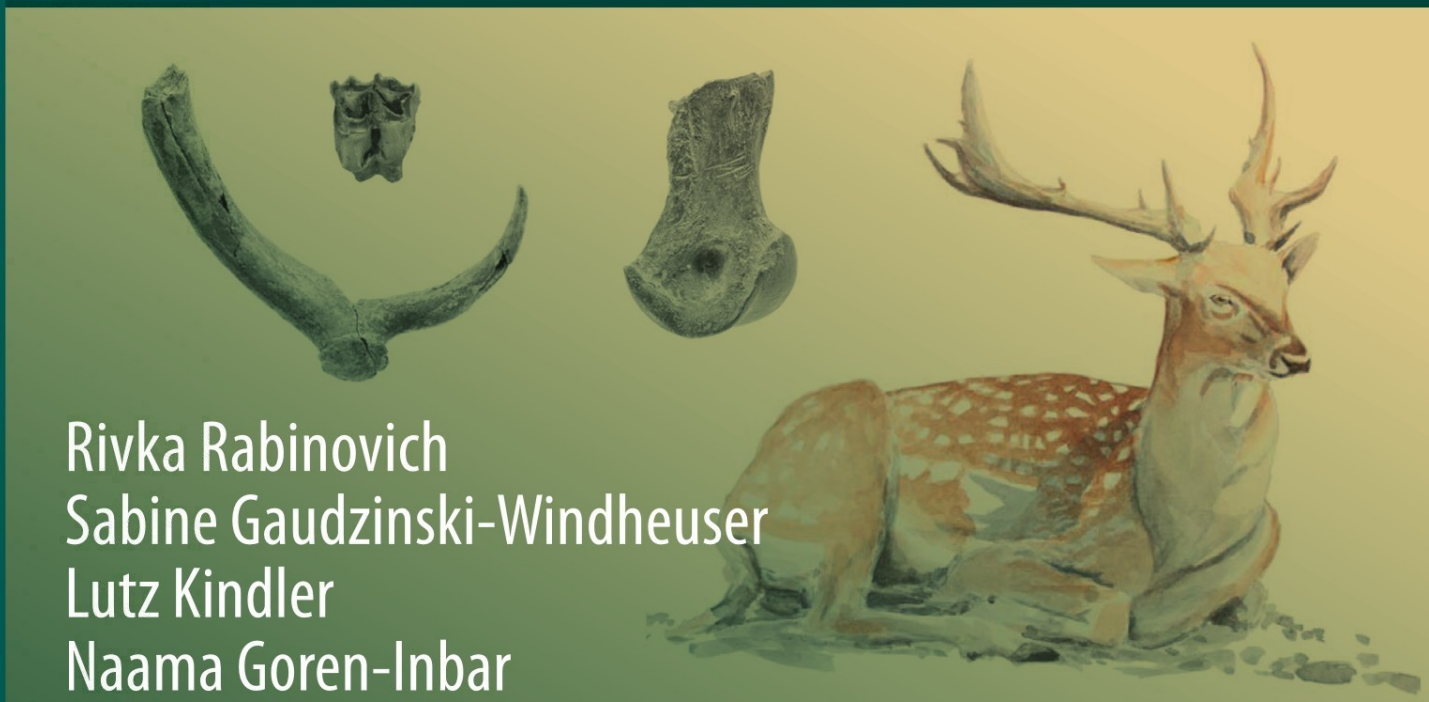

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The Acheulian Site of Gesher Benot Ya'aqov Volume III

Mammalian Taphonomy
The Assemblages of Layers V-5 and V-6

Springer

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Volume III

Vertebrate Paleobiology and Paleoanthropology Series

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Volume III

Mammalian Taphonomy. The Assemblages of Layers V-5 and V-6

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ISSN 1877-9077 e-ISSN 1877-9085
ISBN 978-94-007-2158-6 ISBN 978-94-007-2159-3 (eBook)
DOI 10.1007/978-94-007-2159-3
Springer Dordrecht Heidelberg London New York

Library of Congress Control Number: 2011916534

Cover illustration: Drawing of a Fallow Deer by Amir Balaban. Photographs of fossil bones from the Acheulian site of Gesher Benot Ya'aqov by Gabi Laron

Cover design: Noah Lichtinger

Printed on acid-free paper

Springer is part of Springer Science+Business Media (www.springer.com)

A Volume in the Gesher Benot Ya‘aqov Subseries

Coordinated by

Naama Goren-Inbar

Institute of Archaeology, The Hebrew University of Jerusalem

In memory of Dr. Eli Lotan, our student, colleague and mentor, whose scientific curiosity and vast scope of interests are engraved in the memory of all who knew him and mourn his loss.

Foreword

Each period and part of the globe has its landmark sites, the ones that seem to define what a particular period is all about or the nature of some important step or threshold in the cultural and biological evolution of our species. For the Plio-Pleistocene, all eyes of course are fixed on Africa, the continent where the human story began. And two sites in particular, FLK-Zinj in Olduvai and FxJj50 in Koobi Fora, are clearly the archaeological standards, the reference points for our understanding of this remote page in our evolutionary history, and the ones to which every other site of the same period is compared.

But once hominins began to leave Africa and spread into the rest of the Old World, a process that began about 1.8 Myr, the archaeological record of Israel moves center stage, and for almost every subsequent major development in the human career one or another site in Israel has become a standard by which such developments are characterized and evaluated. For example, for many years the earliest undisputable human habitation outside of Africa was the 1.4 Ma site of ‘Ubeidiya in the Jordan Valley, only recently surpassed by the spectacular and somewhat earlier remains discovered at Dmanisi in Georgia and the redating of the famous paleontological localities in Java where in the nineteenth century the first *Homo erectus* fossils were discovered.

Similarly, in the intense and fascinating debates that surround the origins of anatomically and behaviorally modern humans, there is hardly a student of prehistory anywhere who hasn't heard of the Middle Paleolithic caves of Skhul and Qafzeh. These classic sites occupy a central position in our ongoing attempts to understand where people with modern anatomy and cognitive capacities came from, and what role they may have played in the demise of Eurasia's beetle-browed Neanderthals.

The 21 ka site of Ohalo II, exposed during an extended drought by the retreat of the Sea of Galilee, provides us with startlingly early evidence for the beginning stages of the harvesting, grinding, and baking of wild cereal grains, marking the first of a series of dramatic steps toward the "broad spectrum revolution" and the emergence of the world's first sedentary farming villages.

And now the nearly 800 ka Israeli site of Gesher Benot Ya‘aqov (GBY), also located in the Jordan Valley and not all that far from ‘Ubeidiya, is emerging as a unique and spectacular record of human lifeways during this remote period of the early Middle Pleistocene. GBY, the focus of this timely and important study, not only provides evidence for a second major wave of human expansion out of Africa but, thanks to the painstaking work of project-director Naama Goren-Inbar, together with Rivka Rabinovich, Sabine Gaudzinski-Windheuser, Lutz Kindler, and their many collaborators, GBY is also yielding a record of unparalleled detail about the lifeways and capabilities of these ancient and hitherto poorly known hominins. For example, systematic plots of the spatial distribution of literally thousands of tiny burned flint microchips at GBY revealed the presence of "phantom" hearths, thereby providing some of the most compelling evidence that hominins already had control of fire more than three-quarters of a million years ago. Thanks to its largely waterlogged condition, GBY also preserves an unparalleled wealth of organic remains, including thousands of fruits, seeds, and pieces of

wood, some burned, as well as delicate fossil crabs, amphibians, fish, and molluscs. As the work on this marvelous organic record progresses, we are learning not only about the ancient lakeside environment in which these hominins lived, an invaluable framework in its own right, but we are gaining insights into the unexpectedly varied resource base available to these archaic human foragers. Through ongoing collaborative research with other archaeologists, paleontologists, paleobotanists, geologists, zoologists, isotope chemists, and a host of other specialists, the GBY team led by Naama Goren-Inbar is steadily piecing together a picture of this early period in human history that will serve as a standard for the Eurasian early Middle Pleistocene for many years to come.

The present volume, a detailed look at the bones of some 15 different taxa of medium- to large-sized mammals recovered during seven seasons of excavation at GBY, is an extremely important contribution to our knowledge about the lifeways of these Lower Paleolithic foragers. The site preserves a marvelous record of the animals that hominins procured and butchered on or near the shore of paleo-lake Hula nearly 800 ka. And there are some important insights and surprises here that readers will find of great interest. For example, while most scholars have long abandoned the idea that Middle Paleolithic humans (i.e., Neanderthals and their contemporaries elsewhere) were scavengers rather than hunters, opinion is much more divided about how their Lower Paleolithic predecessors obtained meat. Through the present study, GBY adds its voice to a steadily growing chorus of zooarchaeologists arguing that early Middle Pleistocene hominins, too, were capable hunters, at least by about a million years ago, if not before. At GBY this conclusion is drawn from several lines of evidence, most notably the presence of the full array of skeletal elements for a number of the more important taxa, suggesting that GBY's foragers had early access to whole carcasses, as well as the fact that many of the taxa are well represented by adults, even the elephants (*Palaeoloxodon antiquus*).

There is also a widespread view among paleoanthropologists that Lower Paleolithic sites tend to be heavily dominated by bones of megafauna and that regular use (hunting) of medium-sized ungulates like deer did not become commonplace until much later, perhaps as recently as 300 ka or 400 ka. While the remains of megafauna, both elephants and hippo, are clearly present at GBY, the smaller fallow deer (*Dama* sp.) was the principal mammalian resource exploited by the site's inhabitants, very likely hunted, not scavenged, and probably brought to the site intact, or nearly so. GBY's inhabitants were clearly familiar with the anatomy of their prey and, judging by the abundance of cutmarks and percussion marks, they thoroughly butchered and processed these animals for both meat and marrow.

As is necessary in any comprehensive, contemporary zooarchaeological study, the authors devote a lot of effort to taphonomic issues. This is absolutely essential for several reasons. Obviously, any study that wishes to contribute to our understanding of human behavior must first demonstrate that the bones preserved in an archaeological site of such great antiquity reflect the activities of humans and not the foraging proclivities of hyenas and other carnivores, or the selective transport and winnowing by the moving waters of the nearby lake. Moreover, while there are plenty of *bona fide* cutmarks and humanly induced impact fractures on the GBY bones, there are also lots of curious striations that are probably not a product of butchering or subsequent food processing. In order to figure out how these faunal assemblages came into being, and what produced the striations, the authors conducted an interesting series of tumbling, trampling, and burial experiments which are clearly described in the volume. The gist of their findings is that the GBY assemblages are largely the product of human activities. They find very little evidence that carnivores played more than a minor role in the formation of the assemblages and that density-mediated attrition of the more fragile bones has not seriously impacted the faunal remains. They also show quite convincingly that, despite GBY's proximity to an ancient lake, running water had little or no effect on the composition or spatial arrangement of the remains. As to the striations, they conclude that trampling of bones lying on or in the muddy matrix of the shoreline, by the site's human inhabitants and by animals coming to the lakeshore to drink, were the principal agents responsible for the damage.

This is an interesting and important volume, and an extremely valuable contribution to our growing understanding of the lifeways of Eurasian hominins in the more remote periods of the Paleolithic. Gesher Benot Ya'aqov adds to a steadily growing view that sees hunting of medium- to large-sized prey as an ancient human foraging strategy, emerging not in the Late Pleistocene or late Middle Pleistocene, but much earlier, perhaps as much as a million years ago, and possibly even earlier.

University of Michigan, Ann Arbor, Michigan John D. Speth
February 2009

Preface

Human colonization of the Old World is generally viewed to have been feasible due to the emergence of larger-brained hominins characterized by more advanced abilities than those of their ancestors. *Homo erectus* is considered to be the first hominin to have left Africa, and hence responsible for the earliest sorties "Out of Africa." The presence of early hominins in Eurasia, documented by hominin skeletal material and, more frequently, by the remains of their material culture, is evidence of their mobility along dispersal routes, of which corridors have been the most widely investigated.

While the dispersal routes and the mechanisms that enabled hominin colonization are still a matter of intensive debate, the evidence emerging from the Levantine Corridor and from the Acheulian site of Gesher Benot Ya'aqov is of undisputable importance. Recent excavations at the site, among the earliest in Eurasia (ca. 780 ka), uncovered a stratigraphic archive that aids in the reconstruction of the paleohabitats of the early occupants of Eurasia, along with providing unique insight into their behavior.

The site of Gesher Benot Ya'aqov is a unique phenomenon because of its cultural similarity to the African Acheulian Technocomplex—the only one of its kind in the Levant—expressed by techno-typological markers, and because of the waterlogged nature of its deposits that preserved early organic remains such as wood, bark, fruits and seeds. These aspects and others are further complemented by the impressive preservation of mammal bones, which will be described in this volume.

Though at times meager, the site's mammal paleontological collection is of great importance as it contributes to the study of the diverse biogeography of the Pleistocene Levant, as well as to the paleoecology of the northern Jordan Valley and the Hula Valley and its vicinity (segment of the Great African Rift System). By utilizing the Early and Middle Pleistocene data retrieved from Gesher Benot Ya'aqov and its subsequent analyses, we are now better able to reconstruct the paleo-Lake Hula environment and its unique ecological niche, along with shedding new light on the processes that allowed for the excellent bone preservation at the site.

Modern human interference serves as the greatest risk to the site. Boat trips stop here daily, as the excavation area acts as a ramp for dragging the boats out of the water. Despite this and destructive, unnecessary drainage activities that extensively destroyed the landscape (and which are slated to continue), the two remarkable excavation layers (V-5 and V-6; see below) remain exposed on the river bank. Over the course of our excavations, they have yielded a wealth of bones and stone artifacts. Such rich assemblages are undoubtedly due to the still mainly undecipherable social modes of hominin behavior and activities.

The site of Gesher Benot Ya'aqov stretches for some 3.5 km along the Jordan River. Recent excavations of its eastern bank are the first to have uncovered an extensive depositional sequence featuring several Acheulian archaeological horizons. This volume is dedicated to analysis and interpretation of the faunal assemblages that originated in two of these horizons, Layers V-5 and V-6. Stratigraphically and conformably located one above the other, they yielded the richest and most abundant fossil bone assemblages at the site. More precisely, it is the older of the two, Layer V-6, that contains the exceptionally well-preserved and varied

mammal assemblage, as it has been protected by the overlying layer (V-5), comprised of a multitude of shells (coquina) that had become thoroughly cemented by the river waters.

By the time excavation of the Layers V-5 and V-6 layers began, we had already accumulated substantial experience and moderate understanding of the nature of the site's Acheulian horizons. Despite this, what was revealed upon exposure of the two layers was unmatched by any other previous experience at the site nor by our own naïve and oversimplified predictions; here was an exceptionally high concentration of mammal and other animal bones, reflecting a rich biodiversity and a high degree of human-caused fragmentation and damaged-induced markings (cut marks, percussion marks, etc.).

Due to the different nature of the two layers' content in comparison to the rest of the excavated site, efforts were made to excavate them as extensively as possible, but when what was supposed to be the final season culminated in August 1997, it became clear that we were far from achieving our goal. As a result, we decided to add a previously unplanned field season in September 1997, that would become the seventh and final season, during which extensive effort were made to expose as much as possible of Layer V-6. While we never fully reached our objective of excavating the entire two layers, we succeeded in progressing further and gained a wealth of data.

The good bone preservation and the high number of damage marks seen on them, both natural and hominin-induced, call for the launching of a project aimed at their detailed study. It was only natural that we collaborate with Prof. Sabine Gaudzinski-Windheuser of the Römisch-Germanisches Zentralmuseum, who had served as the sole taphonomy analyst of the large mammal assemblage from the older 'Ubeidiya site. The Gesher Benot Ya'aqov team, composed of the authors of this volume, designed a project that ended up as both a zooarchaeological and an experimental taphonomic study. The aim was to gain insight into site-formation processes, and in particular to learn about the role of post-depositional processes. We do not claim to fully understand the extent of the social and subsistence drives that led to the assemblages' formation, but we do see this study as a thorough presentation of the data and its interpretation.

Acknowledgements

Many individuals and several foundations supported the Gesher Benot Ya'aqov project, and it is due to their contributions that we are able to present this volume.

Many participants took part in excavations, and the subsequent sieving and sorting of the bone-bearing sediments that originated in Layers V-5 and V-6. The fieldwork was carried out with the help of Idit Saragusti, Gonen Sharon and Nira Alperson-Afil, the all outstanding students of the Institute of Archaeology of the Hebrew University, who acquired vast archaeological experience in the course of the project and participated time and again over many years. The zooarchaeological study profited immensely from the dedication and knowledge of Rebecca Biton. Special thanks again to Nira for her invaluable analysis of the spatial organization of the artifacts and bones. We thank also Shoshana Ashkenazi, for contributing her ecological knowledge to the project, for her invaluable comments and suggestions, and for granting us permission to use her crab database. To Smadar Gabrieli, who undertook the conjoinable bone project. Thanks are due to Uzi Motro for his work on the statistical aspects of the study. Mona Ziegler contributed to the documentation, and Daniela Holst helped tirelessly in carrying out the experiments themselves. Thanks also to Anna Belfer-Cohen for her valuable comments. Nira Alperson-Afil produced the index, and Michal Haber edited this volume with outstanding dedication, insight, and expertise.

We thank Gabi Laron who photographed the archaeological material (Figs. 2.11, 3.1, 4.1, 4.2, 4.3, 4.4, 4.5, 4.7, 5.30, 5.31, 5.34, 5.35, 7.7, and 7.8), and Noah Lichtinger for her work on the digital illustrations. We thank Daniel Even-Tzur for supplying cement mixer for some of the experiments that took place in the Department of Evolution, Systematics and Ecology (ESE) of the Hebrew University.

We are particularly grateful to the following paleontologists who allowed us to use their innovative and as yet unpublished data, such as their taxonomic identifications and scientific records: Vera Eisenman (Equidae), Bienvenido Martínez-Navarro (Bovidae), Adrian Lister (Elephantidae and Cervidae), and Tal Simmons (Aves). Special thanks to Andy Current (Natural History Museum, London) past and present mentor to Rivka Rabinovich.

We extend our thanks also to the German-Israel Science Foundation and the Römisch-Germanisches Zentralmuseum, Germany, who made this entire study feasible; they granted us the means to conduct the study as well as providing Rivka Rabinovich and Naama Goren-Inbar a unique opportunity to collaborate with Sabine Gaudzinski-Windheuser.

Many thanks also to the Irene Levi Sala Care Archaeological Foundation, the Leakey Foundation, the Israel Science Foundation, the National Geographic Society, the Israel Science Foundation (Grant No. 300/06 to the Center of Excellence, Project Title: "The Effect of Climate Change on the Environment and Hominins of the Upper Jordan Valley between ca. 800 ka and 700 ka ago as a Basis for Prediction of Future Scenarios"), and the Hebrew University of Jerusalem, whose support and contributions to the excavations, analyses and research aided in the presentation of this study.

We wish to thank the administrative staff of the universities and research institutions, whose, work behind the scenes, greatly assisted us in completing the present study: Frida Lederman

and Benny Sekay of the Institute of Archaeology of the Hebrew University, Sarit Levi of the Department of ESE, the administrative staff of the Authority for Research and Development of The Hebrew University and Herbert Auschrat of the Römisch-Germanisches Zentralmuseum.

Many thanks are due to Eric Delson and Eric Sargis, editors of the *Vertebrate Paleobiology and Paleoanthropology* book series, who generously accepted our study for publication, and to the Springer editorial staff, particularly Tamara Welschot and Judith Terpos.

We are most grateful to A.K. Behrensmeyer and Peter J. Andrews, as well as to two anonymous reviewers, who read earlier versions of this manuscript and provided invaluable comments and corrections that improved the manuscript enormously.

Finally, we wish to thank two of our beloved friends and colleagues who were directly involved with the research of Gesher Benot Ya'aqov and this particular project, and who passed away during the final phases of writing this volume. Prof. Hezy (Jeheskel) Shoshani of the Department of Biology, Addis Ababa University, a world-renowned zoologist and a specialist in all that concerns extinct and extant elephants, was murdered in Ethiopia on June 3, 2008. His commitment, interest, and unmatched enthusiasm will always be remembered. Spurred by his endless curiosity and never-ending search for additional information, Hezy arrived at the site looking for elephant remains. Indeed, his wish came true and, as a great specialist of elephant hyoid bones, he identified several such bone elements and subsequently made them academically known.

Dr. Eli Lotan became a student of archaeology following his retirement from a long and very successful career as a veterinarian in the Jordan Valley. He earned both his BA and MA in Prehistoric Archaeology from the Institute of Archaeology at the Hebrew University of Jerusalem, becoming friend and colleague to students and teachers alike. He participated in numerous archaeological projects and, in due course, joined us at Gesher Benot Ya'aqov. Though the oldest team member, he was young in both body and spirit. Eli was responsible for most of the excavation and registration of the Jordan Bank, and contributed immeasurably to our observations in all that concerns the identification of fossil mammal bones in the field. His extensive knowledge and scientific curiosity, coupled with a pleasant nature and vast experience, were a source of great inspiration to us all.

Contents

List of Abbreviations Used in the Text and the Tables

Anm	animal-induced damage
AST	astragalus
BC	breadth of caput tali (after Kroll 1991)
BD	greatest breadth of the distal end (after von den Driesch 1976)
BFD	greatest breadth of the Facies articularis distalis (after von den Driesch 1976)
BG	breadth of the glenoid cavity (after von den Driesch 1976)
BOS SP	*Bos* sp.
BOVINI	Bovini gen. et sp. indet. cf. *Bison* sp., Bovidae gen. et sp. indet.
BP	greatest breadth of proximal end (after von den Driesch 1976)
BPW	greatest depth of proximal end (after von den Driesch 1976)
BSG	body-size group (with 6 options, as below)
BSGA	weight range (>1,000 kg, e.g., elephant)
BSGB	weight range (approx. 1,000 kg, e.g., hippopotamus, rhinoceros)
BSGC	weight range (80–250 kg, e.g., giant deer, red deer, boar, bovine)
BSGD	weight range (40–80 kg, e.g., fallow deer, caprinae)
BSGE	weight range (15–40 kg, e.g., gazelle, roe deer)
BSGF	weight range (2–10 kg, e.g., hare, red fox)
BT	greatest breadth of the trochlea (after von den Driesch 1976)
CAPR	*Caprini* indet.
CARN	Carnivore und.
CER	Cervidae sp.
CERP	Centre Européen de Recherches Préhistorique de Tautavel, France
CH1	crown height of first lobe of tooth
CH2	crown height of second lobe of tooth
D1	greatest depth of the lateral half (after Davis 1985)
DAMA	*Dama* sp.
DD	distal depth (after Eisenmann 1992)
DW	distal width (after Eisenmann 1992)
ELEP	*Palaeoloxodon antiquus*
FPH	femur proximal shaft longitudinally broken
FSH	femur shaft longitudinally broken
GAZ	*Gazella* cf. *gazella*
GB	greatest breadth (after von den Driesch 1976)
GBA	acetabulum width (after von den Driesch 1976)
GBY	Gesher Benot Ya'aqov
GL	greatest length (after von den Driesch 1976)
GLP	greatest length of the *processus articularis* (after von den Driesch, 1976)
GUI	General Utility Index
H	height of distal humerus (after Davis 1985)
HIPO	*Hippopotamus amphibius*

HOM	hominin (and hominin induced damage)
HSH	humerus shaft longitudinally broken
HUJ	Hebrew University Collections, Jerusalem, Israel
IQW	Institut für Quartärpaläontologie Weimar (Forschungsinstitut Senckenberg), Germany
JB	Jordan Bank (the area along the left bank of the Jordan River, where Layers V-5 and V-6 lie partially exposed on the surface, but are mainly submerged underneath the river and hence required underwater excavation, but not in accordance with the strike and dip of each layer)
LA	length of the acetabulum (after von den Driesch 1976)
LAR	length of the acetabulum on the rim (after von den Driesch 1976)
LG	length of the glenoid cavity (after von den Driesch 1976)
LM	lower molar
MANF	mandible fragment
MAU	minimum number of animal units
MB	greatest depth of proximal end (after von den Driesch 1976)
MCHDW	width of distal condyle metacarpal (after Davis 1985)
MCLC	diameter or height of distal condyle (metacarpal) (after Davis 1985)
MCSC	width of distal trochlea (metacarpal) (after Davis 1985)
MCSH	metacarpal shaft longitudinally broken
MGPF	University of Florence, Museum of Geology and Paleontology, Florence, Italy
MM	Musée de Préhistoire Régionale de Menton, Menton, France
MNE	minimum number of skeletal elements
MNHN	Muséum national d'Histoire Naturelle, Paris
MNI	minimum number of individual animals
MT	metatarsal
MTHDH	width of distal condyle (metatarsal) (after Davis 1985)
MTLC	diameter or height of distal condyle (metatarsal) (after Davis 1985)
MTPH	metapodial shaft longitudinally broken
MTSC	width of distal trochlea (metatarsal) (after Davis 1985)
MTSH	metatarsal shaft longitudinally broken
NHM	Natural History Museum, London
NISP	number of identifiable specimens
PD	proximal depth (after Eisenmann 1992)
PEL ISH	pelvis ischium
Ph 1	phalanx 1
Ph 2	phalanx 2
PH1PH	phalanx 1 proximal longitudinally broken
PH2D	phalanx 2 distal
PW	proximal width (after Eisenmann 1992)
RDS	radius shaft
RDSH	radius shaft longitudinally broken
RIBP	rib proximal
RIBSH	rib shaft longitudinally broken
SCB	scapula blade
SCD	scapula distal
SCDH	scapula distal longitudinally broken
SD	smallest breadth of diaphysis (after von den Driesch 1976)
SH	smallest height of the ilium shaft (after von den Driesch 1976)
SKFH	skull fragment
SPL	splinter
Str.	striation
SUS	*Sus scrofa*

TAU	The Zoological Collections, Tel Aviv University
TBD	tibia distal
TBSH	tibia shaft longitudinally broken
TFH	teeth fragments
TUSKFH	tusk fragment
VATLP	vertebra atlas proximal
VEL	vertebra lumbar
Ver	vertebra
Ver. Ar	vertebral articular surface
VTRS	spine
UNM	unidentified mammal bones

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