



VNIVERSITAT^º DE VALÈNCIA

THE INVESTIGATION OF CHALCOLITHIC-BRONZE AGE HUMAN REMAINS FROM RIBERA ALTA (VALENCIA)

**Doctoral Program 3157 in Geography and History of the
Mediterranean from Prehistory to the Modern Age**

Başak KIZGUT

January 2025

**Dr. Valentín VILLAYERDE BONILLA
Dr. María Jesús DE PEDRO MICHÓ**



VNIVERSITATIS VALÈNCIA

The Investigation of Chalcolithic-Bronze Age Human Remains from Ribera Alta (Valencia)

Doctoral Program in Geography and History of the Mediterranean from
Prehistory to the Modern Age

Başak KIZGUT

Dr. Valentín VILLAYERDE BONILLA

Dr. María Jesús DE PEDRO MICHÓ

January 2025

ACKNOWLEDGEMENT

Since I began my PhD journey in 2018, many things have changed. There were moments of pause, like taking a year off, navigating recurring visa issues, traveling between two countries, and enduring a global pandemic. Life brought unexpected challenges, and burnout often felt inevitable. Through it all, what kept me grounded was imagining the day I would see my work come to completion.

I am deeply grateful to my two PhD advisors, Dr. Valentin Villaverde Bonilla and Dr. Maria Jesus De Pedro Micho, for their guidance and support throughout this process. Dr. Villaverde's unwavering confidence in my abilities, even during moments of doubt, was a constant source of encouragement. His trust in my potential gave me the motivation to persevere and strive for the best.

Dr. De Pedro Micho, thank you for sharing this journey with me and for offering your insights and guidance along the way. Your contributions have played an important role in shaping this work, and I greatly appreciate your support during this process.

I am also deeply grateful to María Paz de Miguel Ibañez and Alfred Sanchis for their invaluable insights during our discussions on my material analyses. To Yolanda, Celeste, and all the wonderful museum staff who treated me as family throughout my work, I extend my heartfelt thanks. Your warmth and kindness made a difference during this journey.

To my dear friend Nicole: sharing this experience as two PhD students navigating challenges together is something I will always treasure. Thank you for your friendship and support.

Life is full of surprises. When we moved to Valencia for what we thought would be a temporary stay, we couldn't have imagined meeting such incredible people. Pilar and Jose Luis, your

presence during the most uncertain moments, particularly in the midst of the pandemic, gave me a sense of safety and home. Pilar, opening not only your house but also your heart to us meant the world. You are my family here, and I will forever be grateful for the circumstances that brought us together.

Finally, my greatest thanks go to my husband, Ersin. In 2018, we embarked on this journey together, leaving behind our home and jobs in pursuit of a dream, not knowing what lay ahead but believing it would be worth it. Over the last seven years, we have faced unexpected obstacles, mourned the loss of loved ones, questioned our existence, and created new paths when old ones were blocked. Yet, through it all, we stood side by side, supporting each other in every way. Thank you for always believing in me, even when I doubted myself, and for encouraging me to keep going. Your presence is the greatest gift in my life.

TABLE OF CONTENT

LIST OF TABLES	VII
LIST OF MAPS	IX
LIST OF FIGURES	X
SUMMARY	1
INTRODUCTION	3
OBJECTIVES	7
Chapter I: The Prehistory of the Valencia Region	8
1.1. Neolithic	13
1.2. Chalcolithic	16
1.3. Bell Beaker	20
1.4. Bronze Age	23
Chapter II: Chronological and Cultural Framework of Ribera Alta	27
Chapter III: Material and Methods	29
3.1. Material	29
3.1.1. Cau Raboser	32
3.1.2. Cova del Monedero (Avenc dels Dos Forats)	34
3.1.3. Cova de la Caiguda	41
3.1.4. Cova de la Xarta	42
3.1.5. Cova dels Gats	43
3.1.6. Cova del Pic	53
3.1.7. La Muntanya Assolada	59
3.1.8. Cau de la Serp	65
3.2. Method	65
3.2.1. Determination of sex	65
3.2.2. Estimation of Age	74
3.2.3. Paleopathology	76
3.2.4. Bone preservation index	79

3.2.5. Calculate the dental pathologies	80
3.2.6. Terminology	80
Chapter IV: Results	82
4.1. Cova del Cau Raboser	83
4.1.1. Cau Raboser de Dalt	84
4.1.2. Cau Raboser de Baix	100
4.2. Cova del Monedero (Avenc dels dos Forats)	121
4.3. Cova de la Caiguda	127
4.4. Cova de la Xarta	139
4.5. Cova dels Gats	150
4.6. Cova del Pic	169
4.7. La Muntanya Assolada	201
4.8. Cau de la Serp	218
Chapter V: Discussion	224
5.1. Results with paleopathological conditions and their possible meanings	224
5.1.1. Cau Raboser Dalt	225
5.1.2. Cau Raboser Baix	226
5.1.3. Cova del Monedero	227
5.1.4. Cova de la Caiguda	228
5.1.5. Cova de la Xarta	229
5.1.6. Cova dels Gats	230
5.1.7. Cova del Pic	231
5.1.8. Cau de la Serp	232
5.2. Results within archaeological perspectives in Valencia region	241
5.3. Valencia in the context of Mediterranean Iberia	245
5.4. Comparison with other populations and eras	248
5.5. Methodological Restrictions and Future Directions	253
Chapter VI: Conclusion	254
RESUMEN	257

Introducción	257
Objetivos	259
Prehistoria de la Región de Valencia	260
Metodología	264
Resultados	268
Discusión y Conclusión	270
BIBLIOGRAPHY	273

LIST OF TABLES

Table 3.2.1.1.: Pelvis characters recreated from WEA (1980).	70
Table 3.2.1.2.: Cranium characters recreated from WEA (1980).	73
Table 4.1: ¹⁴ C results	82
Table 4.1.1.1.: Human remains of Cau Raboser de Dalt	90
Table 4.1.1.2.: Individuals of Cau Raboser de Dalt	91
Table 4.1.2.1.: Human remains of Cau Raboser de Baix	113
Table 4.1.2.2.: Individuals of Cau Raboser de Baix	113
Table 4.1.2.3.: Most frequency remains of Cau Raboser de Baix	114
Table 4.2.1.: Human remains of Cova del Monedero	124
Table 4.3.1.: Human remains of Cova de la Caiguda	131
Table 4.3.2.: Individuals of Cova de la Caiguda	131
Table 4.4.1.: Human remains of Cova de la Xarta	143
Table 4.4.2.: Individuals of Cova de la Xarta	144
Table 4.5.1.: Human remains of Cova dels Gats	163
Table 4.5.2.: Individuals of Cova dels Gats	163
Table 4.5.3.: Most frequency remains in Cova dels Gats	164
Table 4.6.1.: Human remains of Cova del Pic	191
Table 4.6.2.: Individuals of Cova del Pic	192
Table 4.6.3.: Most frequency remains in Cova del Pic	192
Table 4.7.1.: Human remains of La Muntanya Assolada	209
Table 4.7.2.: Individuals of La Muntanya Assolada	209
Table 4.7.3.: Most frequency remains of La Muntanya Assolada	209
Table 4.8.1.: Human remains of Cau de la Serp	218

Table 4.2.: Total number of remains _____	220
Table 4.3.: Antemortem tooth-loss _____	221
Table 5.4.1.: Dental caries rates in prehistoric sites _____	249
Table 5.4.2.: Antemortem tooth loss rates in prehistoric sites _____	250
Table 5.4.3.: Hypoplasia rates in prehistoric sites _____	251

LIST OF MAPS

Map 3.1.1.: Alzira and Carcaixent, Ribera Alta, Valencia Region_____ 30

Map 3.1.2.: 1. Cova de la Caiguda, 2. Cova del Monedero, 3. Cau Raboser, 4. Cau de la Serp,
5. Cova del Pic, 6. La Muntanya Assolada, 7. Cova de la Xarta, 8. Cova dels Gats ____ 31

LIST OF FIGURES

Figure 4.1.1.1.: Around 3 years old individual _____	91
Figure 4.1.1.2.: Approximately 10-year-old individual _____	92
Figure 4.1.1.3.: 18 months $\pm$ 6 months _____	92
Figure 4.1.1.4.: Approximately 10-year-old individual _____	93
Figure 4.1.1.6.: Adult maxilla, front angle _____	94
Figure 4.1.1.5.: Adult maxilla, occlusal angle. _____	93
Figure 4.1.1.7.: Adolescent individual _____	94
Figure 4.1.1.8.: Enthesopathy in phalanges _____	95
Figure 4.1.1.9.: Arthritis in phalange _____	95
Figure 4.1.1.10.: Dental carries _____	96
Figure 4.1.1.11.: Dental hypoplasia _____	96
Figure 4.1.1.12.: Osteoarthritis in thoracic vertebra _____	97
Figure 4.1.1.13.: Lack of fusion in lumbar vertebra _____	97
Figure 4.1.1.14.: Variation in cervical vertebra _____	98
Figure 4.1.1.15.: Animal bones _____	98
Figure 4.1.1.16.: Animal bones _____	99
Figure 4.1.1.17.: Unidentified burnt remains _____	99
Figure 4.1.1.18.: Remains of “75247” _____	100
Figure 4.1.2.1.: Dentals of around 8-year-old _____	115
Figure 4.1.2.2.: Talus and tibia epiphysis belong to nearly 12-year-old individual _____	115
Figure 4.1.2.4.: Mandible of the male individual _____	116
Figure 4.1.2.3.: Bone remain of perinatal or natal individual _____	116
Figure 4.1.2.6.: Maxilla _____	117
Figure 4.1.2.5.: Maxilla _____	117

Figure 4.1.2.7.: Osteoarthritis and osteophytes on vertebrae	118
Figure 4.1.2.8.: Osteophytes on vertebra	118
Figure 4.1.2.9.: Ante-mortem tooth loss on maxilla	119
Figure 4.1.2.10.: Cribra femoralis on femur neck	119
Figure 4.1.2.11.: Animal remains belong to Leporidae	120
Figure 4.1.2.12.: Animal remains belong to Bovidae	120
Figure 4.2.1.: Mandibula	125
Figure 4.2.2.: The distal and proximal parts of left ulna	125
Figure 4.2.3.: Erosion in thoracic vertebra	126
Figure 4.3.1.: Non-adult individual	132
Figure 4.3.2.: Male Adult, complete cranium	132
Figure 4.3.3.: The occipital bone, ectocranial	133
Figure 4.3.4.: The occipital bone, endocranial	133
Figure 4.3.5.: Porotic hyperostosis and cribra orbitalia	134
Figure 4.3.6.: Osteoma on crania	134
Figure 4.3.7.: Antemortem tooth-loss on maxilla	135
Figure 4.3.8.: Antemortem tooth-loss on mandibula	136
Figure 4.3.9.: Osteophyte on vertebrae	136
Figure 4.3.10.: Osteophyte on vertebrae	137
Figure 4.3.11.: Joint degeneration on costae	137
Figure 4.3.12.: An osseous on lambdoid suture	138
Figure 4.3.13.: Animal bones, Bovidae and Leporidae	138
Figure 4.4.1.: 2-year-old non-adult	144
Figure 4.4.2.: 8-year-old non-adult individual	145
Figure 4.4.3.: Perinatal individual	145
Figure 4.4.4.: Adult individual	146

Figure 4.4.5.: Maxillae and mandibula of adult individual	146
Figure 4.4.6.: Dental caries on interfaces	147
Figure 4.4.7.: Dental caries on lingual side	148
Figure 4.4.8.: Dental hypoplasia	148
Figure 4.4.9.: Osteophytes on costae	149
Figure 4.4.10.: Animal bones	149
Figure 4.4.11.: Copper remains	150
Figure 4.5.1.: 3-year-old individual of Cova dels Gats	164
Figure 4.5.2.: Antemortem tooth-loss on mandible	165
Figure 4.5.3.: Antemortem tooth-loss on maxilla	165
Figure 4.5.4.: Dental hypoplasia	166
Figure 4.5.5.: Dental caries on occlusal	166
Figure 4.5.6.: Dental caries on interface	167
Figure 4.5.7.: Impaction of canine	167
Figure 4.5.8.: The remains of Suidae	168
Figure 4.5.9.: The pot remain	168
Figure 4.6.1.: Approximately 3-year-old individual	193
Figure 4.6.2.: Approximately 6-month-old	193
Figure 4.6.3.: Approximately 8-year-old individual	194
Figure 4.6.4.: Approximately 6-year-old individual	194
Figure 4.6.5.: Male individual	195
Figure 4.6.6.: Female individual	195
Figure 4.6.7.: Schmorl's Nodule on thoracic vertebra	196
Figure 4.6.8.: Cribra femoralis on femur neck	196
Figure 4.6.9.: Caries in occlusal surface	197
Figure 4.6.11.: Caries on distal side	198

Figure 4.6.12.: Os lambda on lambdoid suture	198
Figure 4.6.13.: Vastus notch on patella	199
Figure 4.6.14.: Double foramen on cervical vertebra	199
Figure 4.6.15.: Animal bones in Cova del Pic	200
Figure 4.6.16.: Animal bones in Cova del Pic	200
Figure 4.7.1.: Teeth of infant individual	210
Figure 4.7.2.: The remains of juvenile individual	210
Figure 4.7.3.: Right coxae of “24254”	211
Figure 4.7.4.: The mandibula of “24254”	211
Figure 4.7.5.: Atlas of “24254”	212
Figure 4.7.6.: Fusion of axis and C3	213
Figure 4.7.7.: Fusion of axis and C3	213
Figure 4.7.8.: Fusion of cervical vertebrae	214
Figure 4.7.9.: Fusion of cervical vertebrae	214
Figure 4.7.10.: Dental hypoplasia	215
Figure 4.7.11.: Dental caries on interface	215
Figure 4.7.12.: Variation, foramen on coronoid fossa	216
Figure 4.7.13.: Osteophytes on phalanges	216
Figure 4.7.14.: Two crania pieces of 43462	217
Figure 4.7.15.: Leporidae remains	217
Figure 4.8.1.: The remains of Cau de la Serp	219
Figure 4.8.2.: The dental remains of Cau de la Serp	219
Figure 5.2.1.: Representation of the Valencian Chalcolithic Period	243

SUMMARY

Bioarchaeology uses methods from archaeology and biological anthropology to study human skeletal remains and biological materials, focusing on health, diet, diseases, genetics, and social structures of past populations.

This study focuses on human skeletal remains from the Chalcolithic and Early Bronze Age sites from Alzira and Carcaixent in the Ribera Alta, Valencia region, analyzing demographic composition, dental pathologies, and bone preservation to understand the health, diet, and social organization.

The human remains analyzed in this study were recovered from nine archaeological sites: Cau Raboser de Dalt, Cau Raboser de Baix, Cova del Monedero (Avenc dels dos Forats), Cova de la Caiguda, Cova de la Xarta, Cova dels Gats, Cova del Pic, La Muntanya Assolada and Cau de la Serp. These sites yielded minimum number of 50 individuals categorized as 21 non-adults, 29 adults, and among the adults eight of them identified as male whereas six of them identified as female. Due to poor conditions of the remains, the sexes of the 15 adult individuals could not be estimated.

The preservation conditions of the skeletal remains changed in every archaeological site, however, all of them demonstrate poor conditions. The preservation index for all remains was calculated as 26.58%, whereas was calculated between 9 and 14% for long bones. Due to lack of the remain and information, it could not be said anything for Cau de la Serp.

According to the findings dental pathologies; dental caries 6.91%, hypoplasia 7.98%, and antemortem tooth loss was observed 16.6% prevalences. Dental caries rate, reflecting that carbohydrate-rich dietary. Furthermore, indicating physiological stress during childhood with hypoplasia rates. Additionally, antemortem tooth loss suggesting a combination of dietary factors, occupational stress, and aging process. The vertebral pathologies including osteoarthritis, osteophytes, Schmorl's node were detected in these societies, pointing to physical

labor and repetitive stress. Porotic hyperostosis, cribra orbitalia, and cribra femoralis were observed, suggesting iron-deficiency anemia or other nutritional defects.

The radiocarbon results from Cau Raboser de Dalt, Cau Raboser de Baix, Cova del Monedero, Cova de la Xarta, Cova del Pic were dated back to early 3th millenium BCE. La Muntanya Assolada was unexpectedly dated to the 4th millennium BCE, even though this site was dated back to the Bronze Age. This result suggesting earlier use of the site. The radiocarbon discrepancy at La Muntanya Assolada highlights the need for further investigation into its dual use as a burial site across different periods.

The burial contexts revealed a lack of grave goods indicating social hierarchy. Both males and females, as well as children, were buried in the same spaces with similar practices. This suggests an egalitarian social structure, contrasting with sites like Los Millares, where evidence of hierarchy is more apparent. Additionally, when comparing Valencian societies to other periods and populations, the caries rates in these groups correspond with dietary changes, offering valuable insight into the Neolithic transition in the Valencia region.

The findings demonstrate the physiological stress experienced by these agrarian communities during the transition to agriculture. The prevalence of dental pathologies aligns with broader patterns observed in Mediterranean Iberia. While the reliance on carbohydrate-rich foods like cereals contributed to dental caries, the inclusion of wild resources likely mitigated transition effects

INTRODUCTION

Anthropology tries to understand what human is by exploring the biological and cultural diversity of our species across time and space. Anthropology is an interdisciplinary field that draws on various sources of data methods of analysis to understand human diversity and complexity. This discipline has many subfields that focus on different aspects of human diversity and evolution, such as: biological (physical) anthropology which includes paleoanthropology and bioarcheology.

Paleoanthropology is a field of scientific study that focuses on the study of human evolution and human ancestors through the examination of fossilized remains. The primary objective of paleoanthropology is to understand the origins, evolution and diversity of human beings and their hominin ancestors. Researchers in this field investigate a wide range of topics, including the anatomical and behavioral adaptations of early humans, the development of tool use and cultural practices, the spread of *Homo sapiens* across different regions, and the genetic relationships between different human populations.

Bioarcheology is an interdisciplinary field that combines the methods and principles of archaeology and biological anthropology to study human skeletal remains and other biological materials from archaeological contexts. It focuses on analyzing and interpreting the biological aspects of past populations to gain insights into their health, diet, lifestyles, diseases, genetics, and social structures. Through the analysis of skeletal remains, bioarcheologists can infer information about individual's age, sex, stature, and overall health. Examine indicators of trauma, stress, malnutrition, and disease, which can shed light on the overall well-being and living conditions of past populations. Bioarcheology also incorporates isotope analysis, DNA analysis to investigate aspects like ancient diets, migration patterns, genetic relationships, and kinship with communities.

When reviewed the historical process, the late 18th century and the first half of the 20th century emerge as a period in which skeletal studies aimed to determine races (Little and Sussman, 2010). Scientists attempted to classify human populations into discrete racial categories based

on physical characteristics, such as skin color, skull shape. During this period, anthropology was seen as a technical field, and only measurements were taken from skeletons, especially from crania, to support the rising concept of race (Üstündağ, 2015). This approach was influenced by social and cultural biases of the time. The measurement of skull dimensions (craniometry), and phrenology, the study of the shape of skull as an indicator of personality traits, determine the potential criminals, were popular methods in early days of this field (Sutton, 2021).

However, this perspective underwent a change with the establishment of biological anthropology in America and its adoption of a different school from Europe. Doubts about the reliability of race determination based on measurements taken from cranial skeletons, expressed by scientists like Washburn, opened a door for anthropology to experience its own renaissance (Washburn, 1951).

In the latter half of the 20th century, forensic anthropology emerged as a notable subfield. Biological anthropologists applied their expertise in skeletal anatomy and human variation to assist in the identification of human remains, particularly in criminal investigations and mass disasters. Krogman's seminal work, "A Guide to Identification of Human Skeletal Remains," commissioned by the FBI in 1939, holds a significant place as a milestone in this evolving field (Little and Sussman, 2010). Following this publication, subsequent research efforts have predominantly focused on the examination of cranial and pelvic morphology as means of determining biological sex. Notably, researchers such as Stewart (1948), Washburn (1948, 1949), Thieme and Schull (1957), Brues (1958), Phenice (1969), and Coleman (1969) have made noteworthy contributions, further enriching this period with their respective studies. As a result of the impact of forensic investigations and the decreasing significance of race studies, it is evident that biological-oriented research has emerged as a prominent area of inquiry within the field of anthropology. Specifically, there has been a notable emphasis on studies aimed at determining age and sex through the analysis of skeletal remains, which serves to reinforce this paradigm shift.

Paleopathology studies have had a transformative impact on the approach of biological anthropology in the 20th century. By examining skeletal and mummified remains,

paleoanthropologists have provided crucial insights into the health and well-being of past populations, leading to significant changes in the field. These changes include a shift from focusing on individual variation to population-level patterns, the reconstruction of ancient disease profiles, insights into lifestyle, diet, and occupational stress, the identification of ancient pathogens and evolutionary implications, and the integration of interdisciplinary approaches. Several researchers, such as Aufderheide and Martin (1998), Brothwell (1981), Buikstra have made significant contributions to the field of paleopathology through their studies on human remains.

Jane E. Buikstra has played an important role in shaping bioarcheology as a distinct subfield within archaeology. She is recognized for her pioneering work on the analysis of human skeletal remains from archaeological contexts, focusing on the interpretation of health, diet, and lifestyle in past populations. Buikstra (1977) developed and popularized the concept of "bioarcheology," emphasizing the integration of biological and archaeological data to understand the lives of ancient peoples (Armalegos, 2003; Sutton, 2021). Clark Spencer Larsen is another influential researcher who has significantly contributed to the discipline. His research has focused on the study of human biological adaptation and health from an evolutionary perspective. Larsen's work encompasses a broad range of topics, including skeletal and dental analysis, paleopathology, paleodemography, and human growth and development. He has conducted extensive fieldwork and collaborations worldwide, contributing to our understanding of population dynamics, migration patterns, and health disparities throughout human history.

Interdisciplinary collaboration is now a key part of modern biological anthropology. Physical (or biological) anthropologists often work with experts in genetics, archaeology, linguistics, psychology, and other fields. This teamwork helps us better understand human biology, behavior, and cultural evolution. Ethical concerns are also very important today. Researchers focus on respecting cultural sensitivity, indigenous rights, and getting informed consent for their work.

These changes show a shift towards a more detailed and multidisciplinary understanding of human biology, behavior, and evolution. Biological anthropology keeps growing by incorporating new advancements in genetics, technology, and collaborations across fields to explore complex questions about human history and development.

OBJECTIVES

To explore Chalcolithic and Early Bronze Age societies in the Valencia region by analyzing human skeletal remains, with a focus on understanding their health, diet, social organization, and burial practices.

- To assess the demographic composition of the studied populations, including age and sex distribution.
- To investigate dental and vertebral pathologies as indicators of health, diet, and occupational stress.
- To evaluate the preservation conditions of human remains and their implications for bioarchaeological research.
- To contextualize the findings within broader Mediterranean prehistoric patterns, emphasizing dietary and social transitions.
- To use radiocarbon dating to establish the chronological framework of the studied sites.
- To correlate bioarchaeological data with archaeological findings for a multidisciplinary understanding.

Chapter I: The Prehistory of the Valencia Region

Prehistoric human skeletal studies in the Valencia Region have emerged as a significant field of research, offering noteworthy details into the lives and characteristics of ancient populations. These comprehensive studies revolve around the meticulous analysis of skeletal remains spanning various prehistoric periods, most notably the Mesolithic and Neolithic eras. The overarching objective is to unravel multifaceted aspects encompassing demography, health, diet, cultural practices, and social organization prevalent in ancient societies.

A primary focus of these investigations is the exploration of the demographic composition of prehistoric populations. By scrutinizing skeletal remains, researchers skillfully estimate population size, unveil age distributions, and discern sex ratios. Such crucial demographic information significantly enhances the understanding of social structures and dynamics in ancient communities.

Furthermore, these studies venture into the realm of health and disease patterns in prehistoric populations. Through meticulous examination of skeletal markers, such as diseases, injuries, and nutritional deficiencies, researchers glean valuable insights into the overall health status and living conditions of individuals in the past. Notably, the identification of specific diseases, including infectious ailments and degenerative conditions, constitutes a profound contribution in comprehending the prevalence, impact, and adaptive responses to health challenges within prehistoric societies.

Reconstructing dietary practices is a central aspect of studying prehistoric human skeletons in the Valencia region. Leveraging stable isotopic analysis of skeletal remains, researchers effectively discern the sources of nutrition and dietary preferences among ancient populations. This highly nuanced examination of isotopic signatures, notably carbon and nitrogen ratios, facilitates the inference of diverse food consumption, ranging from terrestrial to marine-based diets, further illuminating dietary shifts over time.

Moreover, these studies engage in a comprehensive exploration of cultural practices and burial customs through the analysis of prehistoric skeletal remains. By examining burial contexts, grave goods, and mortuary practices, researchers glean critical insights into the beliefs, rituals, and social organization that underpinned prehistoric communities. This multifaceted investigation constitutes a pivotal aspect in reconstructing social structure, kinship systems, and the treatment of the deceased within ancient societies.

The integration of archaeological context, radiocarbon dating, and morphological analysis of skeletal remains engenders a holistic understanding of prehistoric human populations in the Valencia Region. The seamless amalgamation of multidisciplinary approaches, spanning archaeology, anthropology, bioarcheology, and isotopic analysis, culminates in a profoundly nuanced interpretation of prehistoric lifeways and cultural dynamics.

The prehistory of the Valencia region offers a rich tapestry of human development, marked by significant cultural, technological, and societal transformations from the Paleolithic through the Mesolithic periods. Understanding these foundational eras is essential for contextualizing the subsequent Neolithic period and the profound changes it brought to human societies in this area of the Iberian Peninsula.

During the Paleolithic era, early human populations exhibited remarkable resilience and adaptability, thriving in a wide range of habitats—from arctic tundra to lush forests and expansive grasslands. This period witnessed the evolution of stone tool industries, characterized by technological innovations that enhanced hunting, gathering, and resource exploitation. Mastery of flint knapping techniques allowed for the creation of sharp-edged tools used in cutting, scraping, and piercing, significantly augmenting early human capabilities.

Artistic expressions from this era, such as cave paintings, engravings, and portable art, reveal a sophisticated symbolic language and offer valuable insights into the beliefs, rituals, and interactions of early humans with the natural world. Sites like Cova Forada, Cova del Parpalló, and Cova Negra have yielded important archaeological findings, including skeletal remains studied by researchers such as Lozano et al. (2013), Garralda (1975), Arsuaga et. al. (2007), and Bermúdez (1992). These studies provide glimpses into dental health, dietary practices, gender determination, and morphological characteristics of ancient populations, enhancing understanding of Neanderthal behaviors and human evolution in the region.

Transitioning into the Mesolithic period, approximately 10,000 to 5,000 BCE (subject to regional variations), societies in the Valencia region underwent profound adaptations in response to significant environmental changes following the last Ice Age. The recession of glaciers and the onset of a warmer climate facilitated the expansion of forests and the emergence of new ecological niches (Fortea, 1971; Lillios, 2020). Consequently, human subsistence strategies, settlement patterns, social structures, and cultural practices transformed to accommodate these new conditions.

A defining characteristic of the Mesolithic was the development of more refined stone tool technologies. While stone tools remained vital, they became smaller, more specialized, and intricately crafted. Microliths, minute stone flakes or blades, gained prominence and were utilized as components of composite tools like arrows, harpoons, and fishing implements. These technological advancements enhanced the efficiency of hunting, gathering, and fishing practices, reflecting a sophisticated adaptation to the diversified resources available in the post-glacial environment.

Mesolithic societies predominantly engaged in hunting, gathering, and fishing activities. The increased availability of forested areas presented new opportunities for exploiting woodland resources, including small game animals, nuts, fruits, and edible plants. The use of watercraft such as canoes or rafts expanded, facilitating fishing endeavors and transportation across bodies of water. Communities were generally characterized by small, mobile groups with semi-sedentary or nomadic lifestyles, establishing temporary camps or seasonal settlements near resource-rich areas like rivers, lakes, or coastal regions.

Cultural expressions during this period witnessed the emergence of new forms of artistic expression, symbolizing important cultural phenomena. Cave paintings, rock art, and portable art objects like engraved bone or antler pieces reveal an increasing emphasis on the depiction of animals and human figures (Lillios, 2020). These artistic expressions offer valuable insights into the belief systems, rituals, and social identities of Mesolithic communities.

Archaeological evidence from the Valencian Mesolithic comes from various sites, including caves, rock shelters, and open-air settlements. La Cocina Cave (Dos Aguas) holds significant importance in illustrating the transition from the Mesolithic to the Neolithic period in the region (Juan-Cabanilles et al., 2023; Molina-Balaguer et al., 2023). Initially discovered and documented by Pericot (1945) and further studied by Fortea (1971), the cave's stratigraphy has yielded a diverse assemblage of artifacts such as stone tools, pottery fragments, and animal remains.

Detailed analyses of the stone tools from La Cocina Cave have provided key findings into the technological advancements and subsistence strategies employed by Mesolithic communities. The identification of various tool types, including microliths and scrapers, suggests specialized activities like hunting and gathering (Martí Oliver et al., 2009; Juan Cabanilles et al., 2023). Studies of animal remains have shed light on dietary practices and the exploitation of local fauna, revealing hunting practices, resource utilization, and environmental conditions of the Mesolithic period.

The examination of sediment layers and paleoenvironmental data from La Cocina Cave has been instrumental in reconstructing the climatic, vegetational, and landscape changes that characterized the Mesolithic era (Fortea, 1971; Martí-Oliver et al., 2009; Garcia et al., 2016; Lillios, 2020). These findings are crucial for understanding the ecological context in which prehistoric communities adapted their lifestyles.

Further studies focusing on diet and cultural practices have provided deeper insights into the Mesolithic populations of Valencia. Salazar (2016) conducted isotopic analyses comparing

Mesolithic and Neolithic populations, revealing no significant isotopic differences despite a higher consumption of marine products during the Mesolithic. In the Coves de Santa Maira, Morales et al. (2016) examined anthropic marks on human remains, identifying three individuals with marks such as tooth and lithic impressions. The presence of these marks suggests the occurrence of occasional or institutional cannibalism within the population.

Additionally, Garcia, Richards, and Subirà (2006) investigated the paleodiet of El Collado using stable isotope analysis. Their findings indicated that the inhabitants consumed marine protein, albeit at a lower rate compared to other Mesolithic sites in Europe. These studies shed light on the dietary practices and cultural aspects of the Valencian prehistoric period, highlighting regional variations in subsistence strategies.

The Paleolithic and Mesolithic periods in the Valencia region were times of significant adaptation and innovation. Early human populations navigated changing environmental landscapes, developing new technologies, subsistence strategies, and cultural practices that laid the groundwork for the Neolithic revolution. These early societies adapted to their surroundings through advancements in tool-making, hunting, gathering, and artistic expression, while also exhibiting complex social and ritual behaviors. The transition from foraging to farming, marked by the Neolithic's onset, represented a major shift in human history, as communities began to adopt agriculture, domesticate animals, and establish permanent settlements. These developments reshaped the trajectory of human societies in the region and set the stage for more complex cultural and economic systems.

1.1. Neolithic

The Neolithic period is characterized by significant socio-cultural changes, marked by the development of agriculture, permanent settlements, and technological advancements that reshaped human societies. With this period human societies shifted from hunter-gatherer lifestyle to agrarian practices. This transition, influenced by climatic changes, led to the emergence of open-air settlements, farming, and the domestication of the animals. Also, the Neolithic period is often recognized as a time when significant demographic shifts occurred, marked by a rapid increase in population size (e.g. Bocquet-Appel and De Miguel Ibañez, 2002).

The shift to agriculture and expanding settlements also left a clear mark on the environment, with deforestation, livestock rearing, and resource use shaping vegetation, wildlife, and ecosystems (Bernabeu Auban and Badal García, 1992). Furthermore, rituals played a key role in Neolithic societies, evident in megalithic structures, burial customs, and ceremonial offerings. These practices reveal aspects of their spiritual beliefs and social organization.

The original theory proposes that the Neolithic revolution spread to Europe from immigrated societies originating in the Near East (Childe, 1925; Clark, 1965 from Pardo Gordó et al., 2017). Some scholars, including Pardo Gordó et al. (2017), argue that the archaeological evidence is insufficient to fully support this immigrant farmer theory. In their study the researchers evaluate the radiocarbon Iberian dataset from human, animal, plants, and charcoal remains to understand the Neolithic spread in the Iberian Peninsula. The authors test three modes of Neolithic: neighborhood spread, leapfrog spread, and the Ideal Despotic Distribution model from human behavioral ecology. According to the results, the neighborhood spread mode does not show any significant relationship with ecological suitability for cereal agriculture, and the spread of Neolithic practices in Iberia is the best explained by a progressive movement from east to west (Pardo Gordó et. al., 2017).

It is suggested that the first domestic plants and animals appeared in Iberia, especially Mediterranean coast, approximately 6th millennium (Martí Oliver, 1983; Fernandez et. al., 2007; Lillios, 2020). Blanco González describes this period for Iberian Peninsula (in Álvarez,

Blanco and Rivero, 2020). The author mentions new forms of occupying the landscape, with more stable and enduring open-air settlements. Also, adds carbonized remains of domesticated plants; such as, wheat, barley, lentils, peas, demonstrate a shift from wild varieties to cultivated forms. Additionally, remains of domestic animals include goats, sheep, pigs, and bovines imply the importance of the meat reserve starting from the Early Neolithic (Álvarez, Blanco and Rivero, 2020).

During this period, a variety of ceramic styles appeared along the Mediterranean coast (Bernabeu Aubán et al., 2011). This diversity suggests multiple influences on the region. One theory proposes that the first farmers migrated to the Mediterranean from the Ligurian coast of Italy, as links have been found between certain vessel types, such as Impressed ceramics, in these areas (Cruz 2012; Guilaine, 2017).

According to Tarradell (1962), while the earliest Neolithic phase in the Valencian region remains uncertain, a more defined stage is evident, marked by caves containing decorated ceramics, including the distinctive cardial ceramics made with shell impressions. Tarradell noted that although many sites suggest this phase, none have been studied under ideal conditions.

The material culture of the Valencian Neolithic is characterized by the development of pottery vessels, which exhibit distinct regional styles and decorative motifs (Cardial Valenciano), and an increased utilization of polished stone, wood and bone stools (e.g. Tarradell, 1962; Álvarez, Blanco and Rivero, 2020; Lillios, 2020). Additionally, it can be seen bone objects; such as, awls, spatulas, needles, ornaments, combs etc. (Schuhmacher, 1996; Fernandez et. al, 2007). Furthermore, in this period it was discovered usage of marble, limestone and slate bracelets by the farmers in Valencia and Andalusia (Martínez Sevilla, 2016 from Lillios, 2020).

The earliest evidence of cardial ceramics in the Valencia region, dating to approximately 6700 BCE, comes from sites such as Cova de l'Or (see Martí Oliver, 1977; Martí Oliver et. al., 1980), Cova de les Cendres (e.g. Bernabeu Aubán and Molina Balaguer, 2009), and Cova de la Sarsa. Bosch Gimpera (1932) suggested a connection between North African Neolithic ceramics and

cardial ceramics, proposing that Neolithic developments in Iberia were influenced by North Africa (Lillios, 2020).

Neolithic populations in the Valencian region used natural caves for funeral practices. Some of the earliest evidence comes from sites like Cova de Sant Martí and Cova de la Sarsa (Bernabeu Aubán et al., 2001). Additionally, it should be noted that the importance of these caves lies not only in their larger size and number of individual burials but also in their distinctive material records; such as, symbolic ceramics, musical objects, slate bracelets which imported from southern part (Bernabeu Aubán, 2010). Furthermore, animal and vegetation remains indicate that stored cereals and consumption of meat, primarily young ovicaprids (Bernabeu Aubán, 2010).

The Valencian region of Spain provides data into the osteological and paleopathological aspects of the Neolithic populations. In the Cova de la Sarsa (De Miguel Ibañez, 2008), anthropological studies revealed a minimum of 10 individuals, including both sexes and a child, exhibiting pathologies such as cribra orbitalia, dental diseases, degenerative arthritis, cranial trauma, and trepanation. Similarly, the Cova del Cara-sol de Vernissa (Garcia et. al., 2020) yielded 14 individuals, 10 adults, and 4 non-adults, with dental issues, including caries and antemortem tooth loss.

In Limoneres (García Atiénzar et. al., 2020) was recovered three fragments of human. It had not found any pathological conditions. Despite the limited remains, at least one adult individual, possibly male were detected. According to the isotope analysis, these individuals showed typical Neolithic diet; terrestrial and protein-based, with no evidence of marine or freshwater resource consumption.

Finally, radiocarbon dating of selected human remains from Les Llometes (Salazar et. al., 2016) revealed its use as a burial site from the 5th millennium cal BCE to the end of the 4th millennium cal BCE.

In the Neolithic period in the Valencian region of Spain, several archaeological studies have shown on the osteological and paleopathological characteristics of the human remains. The Cova de la Sarsa and Cova del Cara-sol de Vernissa yielded a significant number of individuals with various pathologies, including dental diseases, cranial trauma, and degenerative arthritis. Moreover, Limoneres societies show terrestrial diet. Additionally, the radiocarbon dating of human remains from Les Lloletes revealed its use as a burial site during a specific timeframe.

1.2. Chalcolithic

The Chalcolithic period, also known as the Copper Age or Eneolithic, refers to transitional period in human history between the Neolithic and the Bronze Age. It is characterized by the emergence and the use of copper tools and objects alongside stone tools. This metal, abundant in its natural occurrence and relatively amenable to extraction, assumed a fundamental role in configuring the trajectory of human societal development. The significance of the Chalcolithic Age encompasses not only the increased utilization of copper but also the dramatic transformation of human socio-cultural life.

The adoption of copper technology brought about transformative changes in various aspects of human life. Economically, the ability to mine, smelt, and work copper provided opportunities for specialization and trade. This enhanced connectivity among communities, facilitating the exchange of goods and ideas over greater distances. Moreover, the emergence of skilled metallurgists laid the foundation for a distinct artisan class, further contributing to societal stratification. Copper's malleability not only served practical purposes but also enabled intricate artistic expressions. Copper ornaments, jewelry, and adornments showcased the craftsmanship of ancient societies. These artifacts not only reflected personal aesthetics but also held symbolic and cultural significance, often denoting social status, religious beliefs, or tribal affiliations.

In the context of the Chalcolithic era in Iberia, approximately 3300-2200 BCE., the region was characterized by a sub-boreal climate, featuring dry and warm weather patterns (e.g Bini et. al.,

2019). This climatic phase was concomitant with widespread deforestation, inducing substantial environmental transformations. The deforestation phenomenon led to the proliferation of herbaceous vegetation and ruderal plants, instigating a fundamental shift in the landscape (Álvarez, Blanco, and Rivero, 2020). These ecological alterations held profound repercussions for the contemporary communities, exerting substantial influence over their subsistence strategies, ways of life, and access to essential resources. Simultaneously, an examination of the archaeological and anthropological evidence from the Chalcolithic era in Iberia yields valuable insights into the daily lives of the populace inhabiting this region during this transformative period. (Schirrmacher et. al., 2020).

During the initial millennia of the third millennium BC, a pivotal paradigm shift in the societal dynamics of the human communities dwelling in the Valencia region came to the fore. This transformational juncture saw these communities, previously reliant on caves as their primary dwelling spaces, undergo a marked metamorphosis. Venturing away from their subterranean shelters, they embarked on a notable trajectory towards a novel mode of existence. This transition materialized through the establishment of settlements adorned with fragile huts (Marti Oliver, 1983).

In Valencia region Chalcolithic period has divided two steps by the researchers (e.g. Bernabeu, 1979); first step represents before the Bell Beaker vase period, second is called Transitional Bell Beaker Horizon (Horizonte Campaniforme de Transición) (see the chapter Bell Beaker) (Fernandez et. al., 2007). In the first step, broadly speaking, the Chalcolithic era can be distinguished by a diverse array of burial rituals and the prevalent establishment of outdoor settlements, reflecting a gradual shift away from cave habitation (Muñoz, 1985). Regardless Copper Age populations use the caves as burial sites (Lillios, 2020). In general, it can be said that the Chalcolithic is characterized by a multiplicity of burial rituals and the widespread establishment of open-air settlements, gradually moving away from inhabiting caves (Muñoz, 1985). Within this context, Ereta del Pedregal, one of the most significant archaeological sites within the Valencian region. Its importance is rooted in two fundamental aspects: the abundant collection of artifacts and dwelling structures it has provided, and its exceptional, thoroughly documented chronological continuum that extends from the Late Neolithic era to the Bronze

Age within this specific geographic region (e.g. Fletcher et al, 1961; Bernabeu, 1984a; Juan-Cabanilles, 1994; Fernández et. al., 2007).

In Western Mediterranean, copper deposits have not emerged until the Beaker period, around 2400 BCE, leading to the classification of this period as the Late Neolithic rather than the Chalcolithic (e.g. Bernabeu, 1982a; also see; Fernandez et. al., 2007; Lillios, 2020). The evident absence of pre-Bell Beaker metallurgical activity documentation is of scholarly concern, as the scant copper artifacts discovered within mortuary settings are theorized to have been brought from regions further to the south (Fernández et. al., 2007). In spite of the relative scarcity of abundant mineral resources in the Valencia region, the notable existence of metallic artifacts within the archaeological context implies a plausible scenario of either the importation or assimilation of metallurgical practices originating from neighboring cultures. Among these influences, there arises the potential linkage to the Los Millares Culture. However, according to Bernabeu (1984a), this influence is observed primarily in the southeastern region, as supported by the archaeological evidence.

When delineating the material culture of the Chalcolithic period in Valencia, Bernabeu (1979) has categorized ensemble of ornaments into two distinct groups. The first group (Exclusive Type), according to his classification, bears unique features not observed in other regions; such as exemplified by the presence of flat, cylindrical buttons or Pastora-type needles. The second group, Characteristic Type, those which, although some similarities with objects found in other regions exist, the Valencian area stands out due to the sheer variety and abundance of specimens within these particular groups. These categories encompass grooved pendants, ocular idols, flat discoidal buttons, and buttons featuring superimposed perforations. Despite of that, in this area, can be shown wide range of lithic industry, such as daggers, arrowheads, polished stones, large-sized blades, scrapers etc. On the other hand, the bone industry occupies a prominent role within the realm of adornments and accessories during this period. Notable artifacts include necklaces crafted from bone, as well as implements like horn combs, bracelets, shell pendants, serving as illustrative exemplars (see more e.g. Tarradell Mateu, 1961; Martí Oliver and Gil Sancho, 1978; Bernábeu, 1979 etc.).

Analyzing animal and plant remains within this context has been a relatively limited endeavor. The available data indicates a prevailing occurrence of ovicaprids concerning livestock, followed by suids and bovids. Hunting practices, with a particular focus on deer, persist. Notably, a noteworthy shift from the preceding period is discerned in the proportion of adult animals among those sacrificed. This transformation suggests that activities encompass not solely the production of meat and related byproducts but also encompass the utilization of animals in agricultural tasks requiring traction. Remains of horses, however, are notably scarce in the archaeological record (Fernandez et. al., 2007).

Overlooking anthropological studies conducted during the Chalcolithic period in Valencia provides a profound avenue for comprehending the intricate socio-cultural dynamics and human practices that characterized this era.

In the study conducted by Broseta and Martinez (1981) on Covacha Botia, a detailed analysis was performed on 42 human bone remains and 120 isolated human teeth. The researchers identified a minimum of 4 to 5 individuals and managed to establish their ages as well. These individuals included a 1 to 2-year-old non-adult, a 6 to 7-month-old non-adult, a 6 to 7-year-old non-adult, one adult, and one adolescence.

Similarly, Bernabeu (1981) carried out a study on human remains from Cova del Garrofer (Ontinyent, Valencia), specifically in Sectors K, I-J, and L. The findings of this study indicated a presence of at least five to six individuals within the cave.

In a separate investigation, Marti Oliver (1981a) examined human remains from Cova Santa (Vallada, Valencia), focusing on Sector A and Sector B. This study revealed a minimum of nine individuals, comprising three non-adults and six adults. Moving to the Cova de la Pastora (McClure et. al., 2011), isotopic analysis of human remains spanning the Late Neolithic to the Bronze Age indicated a consistent diet for men and women. Furthermore, four crania from Cova de la Pastora show evidence of trepanation. A young adult individual has a trepanation on the frontal lobe, another adult individual on the right parietal region, an older adult individual also on the right parietal region, and a final adult individual on the left parietal region (Roca de Togores and Soler, 2010).

Another study from Cova d'En Pardo (Soler, Roca de Togores, and Ferrer, 2010) mentioned human remains. In the right chamber of the cave minimum 30 individuals have been identified. From the left chamber minimum 12 individuals have been recovered. In two crania, which belong to different sexes, demonstrate signs of trauma. The male cranium has two injuries on the frontal bone, consistent with an assault using a sharp or blunt object, while the female cranium likely suffered an injury caused by a blunt object. According to the researchers these injuries evidence of violence in this period.

A more recent study conducted at Cova de l'Or (Roca de Togores and Soler, 2021) involved the examination of 47 human remains discovered during archaeological excavations spanning from 2013 to 2019. Employing fundamental anthropological methods, such as those outlined by Brothwell (1981) and Buikstra and Ubelaker (1994), the researchers concluded that the cave served as a funerary space, characteristic of the Neolithic Final/Chalcolithic period. The authors noted the absence of clear evidence regarding cannibalism, although subtle indicators were observed.

1.3. Bell Beaker

The Bell Beaker Culture refers to widespread archaeological phenomenon that existed during the Late Chalcolithic and Early Bronze Age in Europe, approximately between 2800 and 1800 BCE, third millennium BCE. It is characterized by the presence of distinctive pottery vessels, which are bell-shaped with distinctively, V-perforated buttons, archer equipment, copper axe, copper dagger, gold ornaments etc. (Fernandez et. al., 2007; Garrido Pena, 2007; Garcia Puchol et. al., 2013; Lillios, 2020). One notable development is the emergence of Beaker ceramics, a relatively uniform yet regionally diverse assemblage of pottery discovered in both burial sites and settlements across much of Western and Central Europe, as well as North Africa during this period (Lillios, 2020).

During this period, significant socio-cultural changes have been demonstrated. The prevailing hypothesis suggests that the Beaker phenomenon is linked to specific rituals and elite symbolism, providing evidence of social transformation (Sherratt, 1987; Garrido Pena, 2005 from García Puchol et al., 2013). In historical perspective many researchers wanted to find that the origin place of this phenomenon. After the finding of the Beaker ceramics, some scholars thought it belongs to a particular social group or ethnicity (Garrido Pena, 2007). In early theories suggested that these ceramics originated from Anatolia and Egypt (e.g. Montelius, 1900; Petrie, 1901; Déchelette, 1908 from Garrido Pena, 2007). However, Garrido Pena (2007) mentions in his research that these theories were not supported a long time, and shifted West-origin-based line. According to the new thesis Bell Beaker culture was founded in Iberia Peninsula, and spread the Europe. The main reason of this idea is Beaker ceramics dominantly were founded in Iberia region, and some scholars, such as Bosch Gimpera, Siret, Castillo supported this idea (Garrido Pena, 2007; Lillios, 2020). The Iberian-originated view was denied by some researchers from Northern Europe and they claimed that Central Europe is the base of the Beaker culture as evidence the other elements of the Beaker culture, such as: V-perforated buttons, archer's bracers are not Iberian-originated (such as: Childe, 1930 from Garrido Pena, 2007, and Lillios, 2020).

However, the theory of Sangmeister (1963) said that the earliest Maritime Beaker vessel style is originated from central Portugal, and transferred to the coast of Britain via Atlantic Ocean then expanded to the Central Europe, and reached the Southern Europe again. Throughout this transmission Beaker style evolved, and the other elements were founded (Sangmeister, 1963 from Garrido Pena, 2007; and Lillios, 2020).

In the 1970s, the paradigm shifted: rather than focusing on the origins of the Beaker culture, scholars began prioritizing an understanding of the Beaker phenomenon. Clarke (1976) proposed that Bell Beaker ceramics and associated artifacts were not ordinary household items but rather luxury goods that were expensive to produce. These items were likely owned exclusively by individuals of high social and economic status within these groups, serving as prestigious elements with significant symbolic value. According to Clarke, these elite groups used the ceramics in rituals or feasts to demonstrate and reinforce their power. In this way,

these objects reflect the social hierarchies within their societies (Clarke 1976, from Garrido-Pena; Lillios, 2020).

Bell Beaker materials were initially identified in the Valencia region at Villa Filomena and around the municipality of Bèlgida (Bernabeu, 1984b). Between the late 1960s and mid-1970s, Valencian Eneolithic research adopted a two-phase structural framework, with the later phase marked predominantly by Bell Beaker ceramics (Bernabeu, 1979; Bernabeu, 1984b; Fernandez, 2007).

In historical studies by Valencian researchers, Sangmeister's (1963) "Reflux Horizon" theory was influential, suggesting a transitional phase between the Eneolithic and the Bronze Age. This phase has been termed the Transitional Bell Beaker Horizon (Bernabeu, 1984b). However, Harrison (1974) argued that, due to the absence of Beaker ceramics in Bronze Age sites, no sequence existed from the Neolithic to the Bronze Age, and he dated the Beaker period between 2200 and 1400 BCE. This dating aligned with Fletcher's (1966) hypothesis on the persistence of Beaker culture during the early Valencian Bronze Age (cited in Bernabeu, 1984b), though the absence of Beaker pottery presented challenges to this theory. Martí Oliver (1981b) addressed this issue, suggesting that associated elements of the Beaker materials indicated the onset of the transition to the Bronze Age (Bernabeu, 1984b).

This issue was resolved with the discoveries at Ereta del Pedregal, which yielded Bell Beaker ceramics, "V"-shaped buttons, metal daggers, and other relevant artifacts (Fletcher, 1961; Fletcher, Pla, and Llobregat, 1963; Pla, Martí, and Bernabeu, 1983; Bernabeu, 1984b). Ereta del Pedregal holds significance in demonstrating continuity from the Final Neolithic to the Early Bronze Age, supporting the Transitional Bell Beaker Horizon concept. Additionally, the Valencian site El Promontorio has illustrated the transition from the Eneolithic to the Bronze Age with Bell Beaker ceramics and associated ornaments (Ramos Fernandez, 1981).

Also, it should be noted that, Harrison (1974) listed 18 Bell Beaker sites in Valencia region, whereas Bernabeu (1984b) listed 48 Bell Beaker sites, most of them settled in Jucar.

In the study by Jover and De Miguel Ibañez (2002) two prehistoric sites Peñon de la Zorra and Puntal de los Carniceros (Vinalopo Valley, Valencia) were investigated. They found minimum five individuals from the Cueva del Puntal de los Carniceros (four adults, one non-adult), and six individuals from the Cueva Peñon de la Zorra (three adults, three non-adults). Their results revealed characteristic features of funerary practices and inhumation evidence of Bell Beaker period. In the Sima de la Pedrera (Benicull, Valencia) (Aparicio, 1978) a minimum of seven individuals, three of which are adults and four of which are non-adults (two 1-year-olds, a 4-year-old, and a 12-year-old) were discovered.

In La Vital (Gandia, Valencia) (Garcia Puchol et. al. 2013) four individual burials were found (two male, one female and one unidentified). The human remains were in pits of Bell Beaker style, each of which having different size and shape. According to the anthropological and paleopathological studies about La Vital (Roca de Togores, 2012), four individuals (three male, one female) were discovered. The results show that all individuals are young adult. Furthermore, three individuals have dental pathology.

In Covacha de Ribera (Pla Ballester, 1958) one complete cranium, some unidentified bone fragments, and eight inferiors of mandibulas were discovered.

1.4. Bronze Age

The Bronze Age in the Iberian Peninsula is marked by significant cultural and technological changes. Although it is often divided into three phases, defining these phases in terms of time and culture can be difficult. For instance, Fernández et al. (2007) situate the Early Bronze Age between 1900/1800 and 1600/1500 BC, whereas De Pedro Michó (2010), Álvarez, Blanco, and Rivero (2020) propose an earlier start around 2200 BC. These variations reflect the diverse regional developments within Iberia and the difficulty of establishing uniformity in its prehistorical framework.

One of the most transformative elements of the Bronze Age was the gradual transition from stone to metal tools. This shift, which included the replacement of polished stone axes and knapped flint blades with copper-based weapons like swords, daggers, and halberds, marked a significant technological advancement. The use of copper alloys, especially with arsenic, and the introduction of single-valve molds contributed to a broader typological variety in metal artifacts, signaling the rise of metallurgy across the peninsula (Tarradell Mateu, 1963; Fernández et al., 2007). Goldsmithing also emerged during this time. These technological shifts went hand-in-hand with changes in burial practices. The collective burials of earlier periods were gradually replaced by individual inhumations, primarily in cists or simple pits. Alongside these social transformations, ceramic production evolved, incorporating new forms while retaining some traditional ones.

Environmental factors also played a crucial role in shaping the economic and social landscape of the Iberian Bronze Age. Regions such as the southeast and the Mediterranean coast experienced significant transformations due to increased drought, which led to modifications in agricultural practices and subsistence strategies. These changes, particularly evident in coastal areas, gradually spread to inland regions such as La Mancha, facilitated by trade and social interaction through the Guadalquivir Valley (Martí Oliver, De Pedro Michó, & Enguix Alemany, 1995). As human communities diversified, their development was heavily influenced by both environmental conditions and external contacts, particularly trade routes in the Mediterranean. However, disruptions in the eastern Mediterranean led to a break in long-distance exchanges during this period.

In the Valencian region, the Bronze Age left a significant architectural and cultural legacy, particularly in the use of stone for building settlements. These settlements, often located on elevated terrains, were characterized by unshaped stone walls used for the foundations of houses, defensive walls, and terraced platforms, leaving a lasting impact on the landscape (Bonet Rosado & Mata Parreño, 1992; Martí Oliver et al., 1995). Early research into the Bronze Age of this region, led by figures like Ballester, Jornet, Pericot, Ponsell, and Botella, linked the Valencian region to the broader Argaric culture, particularly in the southern areas, through key excavations like San Antón de Orihuela in 1937 (Furgús, 1937; Martí Oliver, De Pedro Michó, & Enguix Alemany, 1995; Martí Oliver and De Pedro Michó, 1997; De Pedro Michó, 1998).

In terms of lithic technology, sickle teeth made from flakes or blades are common, as are knives, denticulated blades, and foliate arrowheads with tangs and barbs. Polished stone tools include grinding stones, axes, adzes, hammers, smoothers, and a few mauls and even rarer mortars and two-part casting molds. Bone tools like puncheons, spatulas, and needles are also present, as well as ornaments, such as: archer's wrist-guards, necklace-beads, bracelets, and buttons with a "V" perforation (e.g. Pla Ballester, 1958; Tarradell, 1962; Corral Cañon, 1984; Hernandez Perez, 1997a and 1997b; Fernández et al., 2007 etc.).

By the mid-20th century, the abundance of Bronze Age settlements in the Valencian lands became widely accepted, although many sites were identified primarily through fragments of handmade, undecorated ceramics. Exceptions to this included notable studies by Esteve (1943) at Molinàs de Borriol and early publications by Alcácer (1945). A second wave of research during the 1950s, led by scholars like Fletcher, Alcácer, Pla, and Soler, expanded knowledge of Valencian Bronze Age sites, culminating in Tarradell's (1962, 1969) comprehensive work that distinguished the Valencian Bronze Age from the Argaric culture. Tarradell proposed that the boundary between these two cultures lay between the Segura and Vinalopó rivers, with the northern limit marked between Castellón and the Ebro River. His synthesis, which emphasized small, remote settlements and conservative material culture, shaped research for the next two decades (Martí Oliver, De Pedro Michó, & Enguix Alemany, 1995; De Pedro Michó, 1998; De Pedro Michó, 2010). Overall, archaeological findings from Alzira; such as, Escoles Pies and Cova d'Alfonso, reflect a regional diverse settlement patterns and connections with broader cultural networks (Martí Oliver and De Pedro Michó, 1997).

Since the 1970s, numerous excavations have been conducted, leading to a significant increase in research, which allowed for a more precise delineation of the characteristics of this period. Previously, it had often been defined in relation to the better-known Argaric culture. Researchers, such as Bernabeu, Martí, Enguix, Gil-Mascarell, Fernández, Vega, Gusi, Hernández Pérez, De Pedro Michó, Simón, and Navarro Mederos, have dedicated their efforts to studying this area. B. Martí Oliver recently conducted a detailed study on the history of research during this period (Fernández et. al., 2007).

By the 1980s, however, a new phase of research emerged, challenging earlier models that portrayed Bronze Age Valencian society as static and impoverished. Studies revealed that settlement density was higher than previously thought, with many sites demonstrating a continuity of habitation and permeability between regions. Settlements in the Valencian Bronze Age showed architectural and cultural similarities with neighboring regions like La Mancha, indicating a greater degree of interaction and exchange than earlier believed (Hernández, 1985; Martí & Bernabeu, 1992; Martí Oliver et al., 1995).

The term of “Valencian Bronze” proposed by Tarradell Mateu (1963, 1969), according to him Bronze Age in the Valencian region shows cultural continuity until the process of Iberianization (Jover, Lorrio and Diaz, 2016). However, this theory is not fully supported by the archaeological evidence. Furthermore, some researchers such as Llobregat (1975) found the possibility of a direct influence from Phoenician colonizers particularly in the southern part of the region (Jover, Lorrio and Diaz, 2016).

In the anthropological research about Coveta Emparetà (Bocairent, Valencia) by Garcia Borja et. al. (2016) the methodology of Paleopathology Association (1991) was used to identify sex and age. In the study minimum eight individuals (four adults, four non-adults) were found. Two of these adults were male, and one of them was female, remaining one of them undetermined. According to the authors, life expectancy is not very high. Due to condition of remains, a detailed paleopathological investigation could not be done. Finally, there is no evidence for existence of hierarchy in Coveta Empareta.

In Coveta Frare (Garcia et. al., 2013) 18 bone fragments were found belonging to different parts of anatomy. These fragments are thought to associated with a minimum four individuals. In this study benefited from analyses of nitrogen and carbon isotopes and radiocarbons to understand paleodiet and chronology of people of Coveta Frare. According to the results, two individuals belong to the Chalcolithic (Pre-Bell Beaker) Era, while others belong to Early- Full Bronze Age. Paleodietary studies show that all four individuals consumed a fairly homogeneous protein diet based on C3 terrestrial resources.

Additionally, the perinatal human remains from El Mas del Corral (De Miguel Ibañez and Siles González, 2020) suggest that these individuals were born prematurely and did not survive. The researchers also noted that these remains date back to the Late Bronze Age or Early Final Bronze Age, based on radiocarbon results.

Chapter II: Chronological and Cultural Framework of Ribera Alta

The district of Ribera Alta is a county located in the province of Valencia. It is situated in the eastern part of the Valencia and is known for its agricultural productivity, historical heritage, and cultural attractions. It is bordered on the north by la Hoya de Buñol and l'Horta de Valencia, on the south by Costera and la Safor, on the east by Ribera Baja and, on the west by la Canal de Navarres (López Terrada, 1995). The Ribera Alta has an area of 1011 square meters.

Ribera Alta is characterized by a fertile plain formed by the river Júcar and its tributaries. The geomorphology of the Ribera Alta has favored irrigation through an intricate network of canals that distribute water efficiently. Historically, the agricultural transformation of this region was possible thanks to works developed during historical periods. The combination of fertile soil, abundant water, and favorable climate has turned the Ribera Alta into a key region for agricultural production (Ruiz, Carmona and Mateu, 2006).

The region has a long history dating back to ancient times, with evidence of human presence and settlements since prehistoric periods (Pardo Gordó, De Pedro Michó, and Martí Oliver, 2020). The earliest evidence of human presence in the Ribera Alta region dates back to the Paleolithic period, with indications of hunter-gatherer communities (Burguera, 1921 from Pardo Gordó, De Pedro Michó, and Martí Oliver, 2020). The Ribera Alta region presents significant archaeological evidence from the Upper Paleolithic, including sites like Abric de la

Senda Vedada (Villaverde, 1984) and Cova del Volcà del Far (Davidson, 1989). The research of Davidson suggests these communities adapted to their environment through specialized subsistence strategies, particularly deer hunting, as observed in faunal remains (Davidson, 1989). While direct evidence of plant use is unavailable, comparative data from nearby regions indicate a diet that may have included stored seeds and legumes (Aura et al., 2005). These findings contribute to understanding the adaptive strategies of hunter-gatherer groups in this period (see more details in Pardo Gordó, De Pedro Michó, and Martí Oliver, 2020).

The literature indicates that the Ribera region was not a primary area for the earliest agrarian societies (Pardo Gordó, De Pedro Michó, and Martí Oliver, 2020). In the Ribera Alta region, the oldest Neolithic evidence, Cardial pottery, was discovered at Cova de Pertecates (Martínez and Villaverde, 2013). Clearer evidence from the 5th millennium BCE includes decorated ceramics from Cova del Lledoner (Bernabeu, 1982b). These communities relied not only on agriculture but also on hunting and gathering (see more details in Pardo Gordó, De Pedro Michó, and Martí Oliver, 2020).

During the Chalcolithic period multiple burial caves have been noticed in this region. Martí and De Pedro (1999) distributed these sites across five areas (Pardo Gordó, De Pedro Michó, and Martí Oliver, 2020). The areas include the Cullera mountain range, the Xúquer alluvial plain, the Reialenc area in the northwestern Carcaixent mountains, and the Barranc de l'Estret and Serra de Corbera, partially within Alzira. The region shows typical characteristic of Valencian Chalcolithic period with the findings. Additionally, the vegetation were documented include strawberry trees, wild olive, heather, mastic trees, pines, rockrose, holm oaks (García Puchol et. al., 2010), demonstrating a thermo-mediterranean climate.

The multiple caves are situated in Ribera Alta region listed by Soler Diaz (2002). Among them Cova de la Mallá Verda, Cova del Cau Raboser, Cova del Pic, Cova del Monedero, Cova de la Caiguda, Cova D'Alfons, Coveta del Gat, Cova del Barranc de les Moreres, Cova Avellanera are mentioned in the research. From these caves including flint arrowheads, ceramics, bead necklaces and perforated shells, copper daggers were identified (e.g. Enguix Alemany, 1973; Martí Oliver and Gil Sancho, 1978; Martínez, 1981).

The Final Bronze Age (1100–1000 BCE) in the Ribera del Xúquer region saw the consolidation of plain settlements like Cases de Moncada and Alteret de la Vint-i-Huitena, alongside some elevated sites like La Muntanya Assolada. Limited evidence suggests increasing social complexity but provides little detail on agriculture or livestock to explain these societies agrarian life structures (Bernabeu et. al., 2013; García Borja and Pérez Jorda, 2013; Pardo Gordó, De Pedro Michó, and Martí Oliver, 2020).

Subsequent centuries saw the influence of diverse civilizations and cultures on the Ribera Alta region, including the Iberians, Romans, Visigoths, and Muslims. Each of these epochs left imprint on the cultural landscape, evident through the preservation of architectural remnants, pottery fragments, artistic expressions, and assorted artifacts (Balaguer Comes, 2020; Ferrer Clari, 2020; Vendrell Betí, 2020).

Over the course of history, the Ribera Alta region has been shaped by its geographical features, natural resources, and the complex interactions of different cultural influences. Today, evidence of its rich history and cultural heritage can still be seen in archaeological sites, architectural landmarks, and the preservation of traditional practices.

Chapter III: Material and Methods

3.1. Material

In this study, human remains from Cau Raboser, Cova del Monedero (or Avenc dels Dos Forats), Cova de la Caiguda, Cova de la Xarta, Cova del Pic, Cova dels Gats, La Muntanya Assolada, and Cova de la Serp—all situated in the Ribera Alta region—have been analyzed (Map 3.1.1. and Map 3.1.2.). Among these archaeological sites, Cova dels Gats and La Muntanya Assolada are located in the Alzira district, while the others are situated in Carcaixent district.



Map 3.1.1.: Alzira and Carcaixent, Ribera Alta, Valencia Region



Map 3.1.2.: 1. Cova de la Caiguda, 2. Cova del Monedero, 3. Cau Raboser, 4. Cau de la Serp, 5. Cova del Pic, 6. La Muntanya Assolada, 7. Cova de la Xarta, 8. Cova dels Gats

3.1.1. Cau Raboser

This excerpt is sourced from the work of Martí Oliver and Gil Sancho (1978):

The Cau Raboser (Dalt and Baix), is situated in the northwest foothills of les Muntanyes del Realeng, near the entrance of Barranc de l'Anell, and at an elevation of approximately 60 meters above the bottom of the ravine. The primary features of the site can be observed on the plan we provide. It consists of a small rock shelter with an approximately square footprint, narrow and elongated vertically. In its lower section, another small cavity with minimal height opens, connected by two narrow tunnels. These have been respectively designated as Chamber A and B, Bottom Crevice, and Left Crevice.

The Left Crevice deserves special attention: it comprises a narrow tunnel that begins slightly above the floor of Chamber B, rapidly increasing in height and size as it extends into the mountain. The crevice floor is scattered with large stones, among which we observed the presence of ceramic fragments, human skull remains, and other bones. Its steep incline and the abundance of materials among the fallen boulders suggest the existence of an upper site that awaits further exploration for verification.

As indicated by the inventory of recovered materials, Cau Raboser is a Chalcolithic or transition to Valencian Bronze Age burial cave. Discoveries in the small Chamber B confirm an initial individual burial, while the scattered materials, particularly those from the Left Crevice, suggest the presence of other interments. The entirety of the materials can be considered typical for this type of site, with the exception of the notched point and the fins and globular pearls. The former is notable for its rarity in such a context, while the latter are remarkable for their novelty within the wide array of Chalcolithic Valencian ornaments.

In the vicinity of the cave and on the floor of Chamber A, the discovery of a fragment of a cranial vault, a vertebra, a fragment of a mandible, and other human remains, along with a small piece of handmade pottery, provided the initial indications of being in the presence of a prehistoric burial. Moreover, human remains were found in Chamber B and Left Crevice.

According to archaeological records, the Cau Raboser can be Chalcolithic/Eneolithic sepulchral cave or Transition to Valencian Bronze Age.

The list of the archaeological material which found in Cau Raboser (from Martí Oliver and Gil Sancho, 1978);

Chamber A: 18 small fragments of pottery corresponding to a vessel body, appearing rough and eroded. Black paste with limestone and mica temper, brownish color on the exterior and darker on the interior, and handmade; one pottery fragment with similar characteristics to the above and possibly a rim; 24 small shells of *Nassa*, *Conus*, and *Natica*, perforated for use as necklace beads; one fragment of *Dentalium*, a necklace bead; seven small discoidal bone beads; five small discoidal stone beads.

Chamber B: One leaf-shaped arrowhead, it is flat, covering, bifacial retouch, white flint with cortex. 32 x 15 x 5 mm; one Levantine-type notched arrowhead, complementary retouches, very marginal, on the proximal half of the left edge and the distal right part, light yellow flint 48 x 11 x 4 mm; three pottery fragments from the rim and body of a vessel with straight walls, black paste with abundant limestone temper, brownish-yellow color on the surface, smoothed; one pottery fragment corresponding to the rim and body of the vessel, blackish paste with small-sized temper, retains traces of a fine layer of white slip or concretion on both surfaces; 22 small pottery fragments, typical; characteristics similar to the previous ones; 72 small shells of *Nassa*, *Conus*, and *Natica*, perforated for use as necklace beads; 26 small discoidal bone beads; five small discoidal beads made of limestone and slate; one polished flat bone fragment; fragment of a pointed narrow blade or needle.

Left Crevice: One handmade ceramic fragment corresponding to the rim and body of a slightly curved vessel, black clay with abundant large limestone and mica tempering, surface color is dark brownish-black; one handmade ceramic fragment corresponding to the rim, body, and base of a hemispherical bowl, black clay with abundant tempering, surfaces are grayish-brown; one handmade ceramic fragment corresponding to the rim and body of a straight-walled vessel, blackish clay with abundant limestone and mica tempering, interior highly eroded, exterior

reddish in color; several ceramic fragments corresponding to the body, similar characteristics to the previous ones; one flint arrowhead with fins and a tang, bifacial, flat, invasive retouch, white-gray flint, 40x 20x 3mm.; one flint arrowhead with fins and a tang, incomplete, bifacial, flat, covering retouch, white-yellow flint, 21x 7.5x 3 mm.; one unretouched flint flake; one limestone bead or globular bead; one limestone bead with fins; perforated *Columbella* shell, used as a necklace bead; 44 small shells from *Nassa*, *Conus*, and *Natica*, perforated for use as necklace beads; five small disc-shaped bone beads; seven small disc-shaped beads made of limestone and slate.

In conclusion, the analysis of the retrieved materials from Cau Raboser underscores its character as an Eneolithic or transitional-to-Valencian-Bronze sepulchral cave. The discoveries within the small Chamber B provide evidence of an initial individual burial, while the diverse scattered artifacts, particularly those originating from the Left Crack, indicate the presence of additional interments. The overall assortment of materials aligns with expectations for such sites, excluding the notched point and the distinctive winged and globular beads, which stand out for their atypicality in this context. The former presents an uncommon feature, and the latter introduces a novel element to the extensive array of ornaments in Valencian Eneolithic. Despite these exceptional findings, it is crucial to acknowledge that Cau Raboser contributes to a limited cluster of sepulchral caves, a topic to which will briefly allude.

3.1.2. Cova del Monedero (Avenc dels Dos Forats)

The geological feature in question is a sinkhole cavity characterized by several narrow entrances that emerge at ground level within a plateau region situated amidst the Realeng mountain range. This geological formation is positioned approximately midway between the known cave sites of Cau Raboser and Xarta. Delving into one of these vertical tunnels culminates in the discovery of a modest chamber, from which a network of interconnected passageways radiates (from Martí-Oliver and Gil-Sancho, 1978).

The description of the cave defined by García-Puchol et. al. (2010) as follows:

The cavity that occupies us is located in a gentle slope between the Pla de la Bossarta and the Barranc de l'Anell, at a height of 186.62 m s.n.m. This current opening corresponds to a collapse of the ceiling, hence its access through a vertical wall of about four meters of maximum height. Once on firm ground, two openings are observed corresponding to two rooms located to the northwest and southeast respectively. The room to the northwest is easily accessed once the vertical wall of the entrance has been overcome, although it has come to have a direct passage from the outside, currently practically filled. It is a small space (5x7 m), with a low ceiling and subcircular floor, in which the stalagmitical development in walls and ceiling stands out. Two hard-to-traffic crawlers are also documented.

The southeastern cavity exhibits more extensive dimensions, measuring approximately 18x6 meters. Its entrance is characterized by intricacy, commencing with a small aperture. Progressing beyond this entrance, one encounters an initial area featuring a notably steep incline, rising to an elevation of approximately two meters. Presently, this region is adorned with an assortment of differently sized blocks, amidst which the brown sediment indicative of the current floor becomes visible. Roughly four meters inward from the entrance, situated to the left-hand side, there exists a passage that is nearly entirely obstructed, with observable dimensions measuring 5x1.5 meters.

From this point, access is gained to an intermediate chamber, with a floor lower in relation to the adjacent chambers, leading to the largest chamber. This latter chamber is naturally illuminated by various cavities created as a result of the detachment of several stone blocks. Navigating through it is relatively comfortable due to the height attained in this section of the ceiling (see García Puchol et. al., 2010).

The archaeological investigation carried out at the Cova del Monedero (Avenc dels Dos Forats) cave was completed on September 2008, under the supervision of Global Alacant on behalf of Realengo y Mas de l'Oli S.L. (see for details García Puchol et. al., 2010). As a result of three inquiries conducted this cave, archaeological layers belonging to different periods were identified. Garcia-Puchol and her colleagues investigated these layers, and described as follows:

Accordingly, the first inquiry represented three different units. Unit 1, the uppermost layer, was about 10 cm thick and showed signs of significant disturbance, containing a variety of artifacts spanning different time periods, including prehistoric discoidal beads, handmade ceramics, and more. Unit 2, extending to a depth of approximately 50-60 cm, contained a mix of faunal remains, human bones, and ceramic fragments from various historical periods, such as the Islamic and Ibero-Roman eras. Unit 3, reaching around 50 cm, featured prehistoric materials, including pottery, adornments, and flint tools, possibly from the Late Neolithic/Chalcolithic period.

The second inquiry was divided seven units. In Unit 2, was founded Islamic period pottery remains. Unit 3, approximately 10 cm thick, contained the remnants of a disassembled combustion feature of uncertain historical age. Unit 4 was characterized by a dark brown clayey matrix, approximately 20 cm thick. Unit 4 and Unit 5 contained prehistoric materials from the Late Neolithic/Chalcolithic to Bronze Age periods.

This third inquiry, at a depth of around 65 cm from the surface, provided archaeological evidence near the entrance of the passage. The excavation in Unit 1 unveiled a clayey matrix with a dark brown color, clear signs of disturbance, and poor compactness, containing various prehistoric artifacts. Unit 2, extending 25 cm, exhibited similar features but exclusively contained prehistoric materials. Unit 3 was composed of a clayey sediment with a reddish-brown color, minimal fractions, and greater compactness (10 cm), yielding prehistoric items, including discoidal beads and handcrafted ceramics. The Unit 4 (final unit) consisted of a more reddish clayey matrix with a significant charcoal concentration. Excavated to a depth of approximately 2-3 cm, it remained archaeologically rich and yielded a human mandible fragment (García Puchol et. al., 2010).

Furthermore, within the scope of the study, investigators examined paleoeconomic, paleoenvironmental, and material culture aspects to elucidate the socio-economic characteristics of the population during this epoch.

Alapont-Martin (refer to García-Puchol et al., 2010 for further details) conducted an examination of human remains. The findings indicate a minimum count of 10 individuals, encompassing 6 adults, one adolescent aged between 15 and 20 years, two children aged between 5 and 10 years, and one infant aged between 3 months and 1 year. This comprised a total of 253 elements, including fragments, complete bones, and isolated teeth. Of this total, 77 are isolated teeth, and 44 are complete preserved bones, mostly phalanges, carpals, metacarpals, tarsals, and metatarsals—small, robust bones abundant in the human skeleton, difficult to fragment and destroy. Regarding bone fragments, 30 corresponded to the skull, 33 to the rest of the axial skeleton, infracranial, and 253 to the appendicular skeleton.

The researcher described that some human bone fragments showed signs of having been in contact with fire. Moreover, in four human bone fragments, an artificial modification consisting of cuts, percussion marks, and fractures unequivocally caused by direct and intentional human intervention have been detected by Alapont-Martin and his colleagues.

As per the findings of this study, the primary observations indicate that the majority of markings identified on human bones are post-depositional and can be ascribed to carnivorous animals and rodents. Authentic human-induced modifications have been definitively recognized in only 4 out of the 253 human bone elements cataloged, highlighting their infrequent nature. The documentation of specific bone fragments affected by fire appears to be an isolated incident, resulting from post-depositional exposure to subsequent bonfires that irregularly and somewhat directly impacted the bones. It is essential to stress that the indications of cremation or boiling in the bones do not exclusively suggest cannibalism. Additionally, the authors noted that the intricate processes of dismemberment and flesh removal from the body, necessitating a nuanced understanding of human anatomy, indicate that the site was never utilized during the Neolithic-Chalcolithic period for habitation, as a hunting refuge, and certainly not as a processing and cooking locale. On the contrary, the presence of idols with evident ideological significance and personal adornments, such as necklaces, alongside human skeletal remains, firmly situates the archaeological record within an exclusively funerary context.

The examination of the paleodiet at Cova del Monedero or Avenc dels Dos Forats was undertaken by Culleton and McClure (García-Puchol et al., 2010). The findings reveal that

isotope measurements do not exhibit statistically significant differences between Cova del Monedero and Cova de la Pastora. This suggests analogous dietary adaptations in these two locations during the Chalcolithic, at least within the limited sample under consideration. As previously mentioned in the context of radiocarbon calibration, the carbon isotope values ($\delta^{13}C$) align with a predominantly terrestrial C3-based diet, with no indications of marine food products. Nitrogen isotopes from this cave imply a diet characterized by a substantial proportion of animal protein.

The ceramics from the prehistoric period were investigated by Molina-Balaguer (for more details, refer to García-Puchol et al., 2010). According to the researcher, the collection, totaling 608 fragments, displays a poorly preserved state. The study primarily emphasizes the difficulty in differentiating ceramics associated with the Chalcolithic and Bronze Age periods at the archaeological site. The idea that simple forms might be characteristic of the Chalcolithic era, while only intricate forms should be connected to the Bronze Age, is deemed impractical. Overall trends indicate a consistent composition of collections across all surveyed sectors, underscoring the challenge of identifying chronological distinctions. The significant disturbance, notably observed in Sector 2, implies the incorporation of Bronze Age ceramics into Chalcolithic contexts. Given the inherent complexities in conclusively identifying these chronologically distinct artifacts, the palimpsest nature of the assemblage adds further intricacy to the recognition process. A tentative hypothesis suggests that the preservation dichotomy in Sector 3 could be attributed to the diverse origins of fragments: some originating from Chalcolithic funerary deposits and others integrated due to Bronze Age human activities.

According to Miret-Estruch (in García Puchol, 2010), the excavations at Cova del Monedero (Avenç dels Dos Forats) have yielded a limited collection of carved lithic objects, primarily made of flint, with a possible flake on limestone and slight modifications on quartzite and Triassic sandstone. The carved stones catalog mainly comprises retouched pieces (arrowheads), along with other classified carving products. There are a total of 16 carved objects, including six flakes, one blade fragment, one chunk or core, three fragments of tabular flint, one perforator, and four arrowheads. The stratigraphic distribution indicates no significant areas of higher density or specialization, mainly found in upper levels with evidence of disturbance.

According to Miret-Estruch (see more details in García Puchol et. al., 2010) flint is the predominant raw material, except for a possible limestone flake introducing lithological diversity. The flint specimens, whether retouched or not, originate from various sources, potentially located in the foothills of the Sistema Ibérico, north of Riu Túria. Local flint from Serra Grossa, 10 km from Cova del Monedero, is used for some artifacts. Two tabular flint fragments and a possible third have been found, with uncertain origin but possibly related to Ereta del Pedregal. The preservation of the carved lithic industry is suboptimal, characterized by a high fracture index, unintentional thermal alterations, and indications of active fire use.

The arrowheads' original supports are flakes in three cases, a common feature in industries with bifacial flat retouch. Noteworthy artifacts include a deviated perforator with inverse retouch, a medial fragment of a blade, and two non-retouched lithic pieces—a Triassic sandstone compressor and a quartzite nodule with possible traces of ochre. The compressor, sharing characteristics with Paleolithic and Epipaleolithic specimens, is distinguished by its larger module compared to microlaminar industries. The raw materials suggest a mix of allochthonous and possibly local sources (from Miret-Estruch, for more details, refer to García-Puchol et al., 2010).

In Cova del Monedero, a collection of personal adornments emblematic of the late Neolithic/Chalcolithic periods is identified. Notably, certain items like grooved pendants and lignite beads represent the farthest documented instances of their kind on the Mediterranean side of the Iberian Peninsula, signifying the demarcation imposed by the Júcar/Xúquer River during this epoch. The inclusion of specific elements in the assemblage attests to extensive interactions during the concluding phases of the Chalcolithic among communities in the southern Iberian Peninsula and, to a lesser extent, those in more northerly regions (from Pascual-Benito in García-Puchol et. al., 2010).

Martí-Oliver and Gil-Sancho (1978) provided a detailed account of the artifacts recovered from Cova del Monedero. Among the items documented were a sheet of silex characterized by direct, flat, and oblique retouching, possessing features such as continuity, invasiveness, and bilaterality. This white silex exhibited speckles, a slight patina, and signs of erosion, measuring 78 x 14 x 3 cm.

Additionally, the collection features a bone punch with a flat-convex section, a fragment of a punch on cone bone, a biconical necklace bead made of calaite, and a perforated *Columbella* shell bead. Various atypical handmade ceramic fragments were also uncovered in the excavation.

Complementary research by Pascual-Benito (as detailed in García-Puchol et al., 2010) delved into the analysis of adornments. The researcher identified items such as a biperforated plate, a silver earring, pins, and pendants crafted from marine gastropods, along with a few bone awls. It is noteworthy that the findings encompass two idols made from animal bones, specifically, one fragment of a flat idol with lateral notches and a complete ocular idol fragmented into two parts.

As highlighted, particular artifacts are linked to subsequent cave visits: the silver earring and bone punch dating to the Bronze Age, and the glass bead from a later period, as inferred from their stratigraphic positioning. This temporal overlay of elements is a recurrent feature in communal burial caves from the Chalcolithic, often appearing in limited quantities, exemplified, for instance, in the Cova de la Pastora (Pascual-Benito in García-Puchol et. al., 2010).

Analogous to other burial sites, the discrepancy between distinctive elements in the burial inventory, such as grooved pendants, gold beads, or ocular idols, and the actual number of individuals in a tomb implies that not all community members were accorded such "privilege" or recognition. This raises implications of social inequality. However, the multitude of unregulated interventions, post-depositional processes, deposit characteristics, and the restricted scope of intervention hinder a conclusive understanding of whether these elements denote affiliation with an elite or a specific social group based on gender or age (from Pascual-Benito in García-Puchol et. al., 2010).

The comprehensive analysis of the artifacts, human remains and isotope data from Cova del Monedero/ Avenc dels Dos Forats provides important insights into the late

Neolithic/Chalcolithic communities in the Mediterranean region of the Iberian Peninsula. The funerary context reveals a complex pattern, with certain individuals adorned with unique items, suggesting potential social distinctions within the community. The stable isotope analyses further contribute to show that indicating dietary patterns consistent with a predominantly terrestrial C3-based diet, with evidence of a substantial intake of animal protein. The nuanced interpretations of isotope data, considering various models, highlight the challenges in reconstructing prehistoric diets accurately.

3.1.3. Cova de la Caiguda

This excerpt is sourced from the work of Martí-Oliver and Gil-Sancho (1978):

The Cova de la Caiguda is situated at the entrance of Barranc de l'Anell, in close proximity to Cau Raboser but on the opposite side of the ravine, this cave is characterized by a small entrance in the form of a narrow horizontal tunnel leading to a cavity with a notable incline, notable for its numerous columns and formations. Several explorations conducted within the cave's small recesses resulted in the discovery of human remains, including a fully intact skull. The findings also included an abundance of fragments from handmade, undecorated pottery. Notably, among the discoveries was a fragment corresponding to the rim and body of a globular-shaped vessel adorned with a unique decoration consisting of a horizontal band featuring circular impressions delineated by incised lines (from Martí-Oliver and Gil, 1978).

3.1.4. Cova de la Xarta

This excerpt is sourced from the work of Martí-Oliver and Gil-Sancho (1978):

In the vicinity of the Barranc de Xarta, within the region known as Partida de la Basseta, a diminutive cavity can be found. This cavity is nestled on the left side of the ravine, close to its base, where it nears the merging point with the Barranc de l'Estret. The unearthing of this cavity can be credited to the diligent efforts of Mr. Robledo and Mr. Gallego, with a portion of the uncovered artifacts subsequently entrusted to the S.I.P. by Mr. Víctor Oroval. Among the materials preserved from this site, which is believed to have once served as a burial ground, are as follows:

- One copper dagger with a serrated tang,
- One square-sectioned copper punch,
- One square-sectioned ring made of copper or bronze,
- One flint arrowhead with fins and a peduncle. Exhibits flat, covering, bifacial retouch. Made of 10 yellowish-brown flint,
- Two small cardium shells with perforated natis,
- One triangular-shaped bone tablet, partially broken at one of its ends, displaying a highly polished and glossy surface (from Martí-Oliver and Gil-Sancho, 1978).

3.1.5. Cova dels Gats

This excerpt is sourced from the work of Martínez Pérez (1986):

The site is situated within the municipal boundaries of Alzira, on the southwest slope of an outcrop of the Pla de Gallo (Les Valletes). This outcrop runs parallel to the regional road from Tavernes de Valldigna to Xiva, at kilometer 17, near the Bru orchard, and is located almost at the summit. According to cadastral sheet 770, scale 1:50,000, 1st edition of 1951, the Lambert coordinates are X= 883,607 and Y= 508,000.

The site, referred to as “Cova dels Gats,” is characterized by a crevice approximately 15 meters deep and 20 meters long, partially obstructed by large fallen rocks that are wedged between its two walls.

The width at the surface is approximately 2 meters, with the crevice widening as it deepens. The crevice is divided into two sections by a large stalagmitic spur that emerges from the bottom. The right side continues as a chasm to the bottom, while the left side is blocked by fallen rocks wedged between the left wall and the spur, forming chambers and passages that allow descent to the end of both crevices. These chambers and crevices were utilized by people of the Chalcolithic/Bell Beaker era for burial purposes.

Access to the chasm is possible through two openings. The first, located at the western end of the crevice, is currently blocked by large rocks, likely due to the work of those who urbanized the hills. This was the main entrance historically used. The second opening, situated 2 meters from the first, provides more difficult access, requiring a vertical descent of about 3 meters.

The locations where archaeological material has been found are as follows (in Martínez Pérez, 1986):

a) **Chamber I:** Situated directly in front of the main entrance, approximately two and a half meters from it, on the left side as one accesses the bottom. This chamber measures about 3.5 meters in length and 1.5 meters in average width. The majority of remains were uncovered in this chamber, leading to significant damage.

b) **Chamber II:** Located to the left of Chamber I and separated by a wedged stone block, this chamber lies 1.5 meters lower than Chamber I and is connected by a small crevice. It measures approximately 4 meters in length, 2 meters in width, and 1 meter in height. Some remains were discovered here, with certain areas remaining undisturbed by amateurs.

c) **Chamber III:** A small crawl space at the end of the left crevice, forming a tiny limestone cave devoid of soil, where a set of Bell Beaker vessels was discovered by Group 13. Due to its small size, accessing this chamber is challenging.

d) **Passage:** Located between Chamber II and the opening that provides access to the left crevice, small-scale excavations revealed some materials in this passage.

e) **Chasm:** Corresponding to the right crevice, where soil from the surroundings and entrance openings has accumulated in its western part. Some superficial remains were found in this area.

The materials donated by Julio Escandell to the Prehistory Museum of Valencia were recovered from Chamber I. It is likely that the materials from the S.I.P. prospecting also originated from the same chamber.

The overall condition of the site is significantly degraded. However, by cleaning and sifting through the loose soil left by previous searchers, there is potential for discovering small archaeological materials, as well as intact layers that have not yet been inspected.

Given that the existing remains from the site have been sourced from different donors, they will first be classified by their origin before being categorized by their nature. As the site has not yet been excavated by specialists, an endeavor that could potentially be undertaken in the future, the approximate location where each item was found will be indicated. This approach may facilitate the completion and restoration of some currently incomplete pieces (from Martínez Pérez, 1986).

Martínez Pérez (1986) categorized the origin of the materials into four groups:

- A) Unpublished materials presented in this monograph
- B) Materials from Group 13
- C) Materials donated by Julio Escandell
- D) Materials obtained from the prospecting conducted by the S.I.P.

Regarding the location, five key points have yielded remains: Chamber I, Chamber II, the chasm, the passageway leading to the inner galleries, and Chamber III.

A) Unpublished Materials

a) Ceramics:

1. **Bell Beaker with a Slightly Pronounced "S" Profile:** Approximately half of this vessel is preserved, composed of 18 fragments that have been fitted together during reconstruction. The decoration consists of alternating incised and smooth bands. The decorated bands are subdivided by three others, with the outer bands featuring a chevron pattern created by oblique incisions, while the central band displays deep, alternating punctuations, possibly made using a blunt-tipped awl, resulting in a pseudo-relief (pseudo-excision). The decoration was applied when the clay was almost at a leather-hard consistency. The clay contains finely crushed calcite as a temper, along with medium-sized sand grains. Given the thin and uniform wall thickness, it is likely that a mold was used during its creation, as this would be difficult to achieve by hand. The firing process was relatively low overall, with the surface appearing toasted by a quick, intense fire that did not fully mature the core. It was probably fired upside down,

as the interior and part of the rim show signs of reduction, while the middle and base are red-orange in color due to contact with air. This vessel was found in Chamber I .

2. **Bell Beaker with 10 Preserved Fragments:** These fragments correspond to about one-third of the piece; however, reconstruction is challenging because not all the fragments fit together. The vessel has an "S" profile with an omphalos base and is decorated with punctate patterns. Based on the available fragments, it likely had 22 bands (11 decorated with impressions alternating with 11 smooth and polished ones). The first and last bands, which are wider, are subdivided into two. The circumferential lines and decorative impressions on the bands were likely created using a toothed spatula, as the raised portions of the tooth concavities are visible. The impressions filling the bands are alternately oblique, except for the two closest to the rim, which coincide. The sub-bands at the rim and base show serrated incisions, with the rim's incision masked by the extension of the adjacent band lines. The firing quality is superior to the previous piece. The clay contains little calcareous and siliceous temper but includes a greater quantity of crushed charcoal or carbonaceous ash, which is evident in the gray-ashy color of the core. Some black reductive patches are present on the external surface, with the rest being brown in tone, both externally and internally. As with the previous piece, it is likely that a mold was used during its creation, given the uniform thickness and thinness of the walls. This vessel was also found in Chamber I.

3. **Bowl Typically Accompanying the Bell Beaker:** Fourteen fragments were collected, which have been fitted together to allow for reconstruction. Due to the absence of the base, it is unclear whether it was decorated. The remainder of the bowl features five decorative bands. The first band is smooth, with a slight spatula finish. The second band is subdivided into 11 stripes: the eight outer stripes are smooth, while the three central stripes, which are slightly wider, are segmented with small alternating vertical incisions. The third band is smooth and also spatula-finished. The fourth band is subdivided into six stripes: the first two and the last stripe are smooth, while the other three, which are consecutive, have the same segmentation as the second band. The fifth band, which is more prominent than the previous ones, is decorated with triangles pointing towards the base of the bowl, filled with parallel and perpendicular incisions relative to the

circumferential lines. The firing process is fairly regular but on the lower side. The clay contains medium-sized calcite and sand grains, along with carbonaceous ash, used as tempering agents. Grayish patches are present on the sides, while the overall color is brown with an ashier core. The craftsmanship of the bowl is refined. It was found in Chamber I.

4. **Smooth Hemispherical Bowl:** Reconstructed from five fragments, representing just over a quarter of the original piece. The firing process was regular. The tempering materials included crushed calcite, sand, and ashes or crushed charcoal, evident from the rounded concretions visible in all fragments. Strong internal reduction is observed, with external surfaces showing alternating reductive patches and oxidized brown tones. This bowl was found in Chamber I .
5. **Smooth Hemispherical Bowl with Incurved Rim:** Sixteen fragments were preserved, amounting to four-fifths of the original bowl. The clay exhibits a light brown color in oxidized areas, with other parts showing an ashy color and strongly reductive blackish patches. The firing was regular. The temper included crushed calcite, sand, and charcoal. The interior of the bowl was well-spatulated, with a lighter finish on the exterior. This bowl was discovered in Chamber I.
6. **Smooth Hemispherical Bowl:** Reconstructed from four fitting fragments, comprising about one-third of the original piece. Both surfaces were scraped, leaving traces of the temper, and later lightly spatulated internally. The tempering material observed was crushed calcite. The clay exhibits orange tones in oxidized areas, transitioning to brown in semi-reductive regions. The firing was regular. This bowl was located in Chamber I.
7. **Small Smooth Hemispherical Bowl:** Composed of a single fragment representing nearly half of the vessel. Crushed calcite was used as temper. The bowl was spatulated both internally and externally. The firing process was oxidizing, creating a beautiful decorative effect with color gradients ranging from orange to blackish-gray, including

sienna, all distributed alternately. The firing quality was quite good. This fragment was found in Chamber I.

8. **Fragment of a Straight-Walled Vessel:** Smooth, with two suspension holes made from the outside in using a punch. The tempering materials include crushed calcite and charcoal. The external surface was spatulated. The color varies from orange to ashy, with sienna tones. The firing was regular. This fragment was found in Chamber I.
9. **Fragment of a Smooth Hemispherical Bowl with Incurved Rim:** The temper includes calcite and charcoal. The internal surface bears the imprint of a cereal grain, though it cannot be specified. The firing quality was quite poor, with colors ranging from orange to blackish. This fragment was discovered in Chamber I.
10. **Although Drawn Separately, Both Fragments Likely Belong to the Same Vessel:** Fragment 10 features a small nipple, while Fragment 11 shows the beginning of two. Both fragments exhibit a blackish interior color. They were not drawn together due to fitting issues and differences in the external surface color. The firing quality was weak. Both fragments contain crushed calcite and charcoal as temper. These fragments were found in Chamber I.
11. **Trunk-Conical Vessel with Slightly Convex Base:** Reconstructed from six fragments, extending from the rim to the middle of the base. The craftsmanship is notably poor, with bulges and asymmetries giving it a rough appearance; the firing quality was very low. The internal surface is ashy and reductive, while the external surface displays sienna-orange tones. This vessel was found in Chamber I.
12. **Globular Pot with Exvasated Rim:** Fifteen joined fragments are preserved, representing two-fifths of the original piece. The surfaces were scraped on both faces, with partial spatulation. Crushed calcite and charcoal were used as tempering materials. The core shows reduction, while the surface is mostly oxidized to a sienna-orange tone. This pot was found in Chamber I.

13. **Fragment of a Bowl with Low Carina and Annular Handle:** The firing was generally reductive but acceptable, resulting in a brownish tone with some blackish patches. Sand and ash were used as tempering materials. Pronounced spatulation was applied over the entire surface. This fragment was found in Chamber I.
14. **Small Bowl with Medium Carina, Undecorated and Roughly Made:** The bowl exhibits bulges and asymmetries. Seven preserved fragments constitute four-fifths of the original piece. Sand, calcite, and ash were used as temper, all in small quantities. The firing quality was quite low, resulting in surface chipping. Light spatulation was applied. This bowl was located in Chamber I.
15. **Unusual Piece:** The exact function of this piece is unclear; it might be a handle from a large vessel, the base of a fruit bowl, or one of the bases of a large pot. The latter option is favored due to the thickness of the wall attached to the base, the wide curvature angle, and its similarity to fruit bowls from Santaella (Córdoba). Three connected fragments are preserved. The piece is well-spatulated except for the base, which has only been lightly spatulated. The firing quality is quite good, with a sienna-orange tone on the surface. This piece was found in Chamber I.

b) Lithic Material:

1. **Arrowhead:** Crafted from grayish flint, bifacially knapped, with a bulging tang and slightly pronounced barbs. This arrowhead was found in Chamber I.
2. **Arrowhead:** Made from whitish flint, bifacially knapped, featuring a triangular tang, slightly pronounced barbs, and serrated edges with perfect retouching. This piece was found in Chamber I.
3. **Arrowhead:** Crafted from melado gray flint, bifacially knapped, with well-formed barbs and tang. This arrowhead was located in Chamber I.

4. **Leaf-Shaped Arrowhead:** Made from toasted white flint, bifacially knapped with precise retouching, with a small break at the tip of the proximal end; considered the best of those found. This arrowhead was discovered in Chamber I.
5. **Triangular Arrowhead:** Crafted from white flint, meticulously knapped on both sides; it is missing part of a barb and the tang, with serrated edges and pronounced teeth. This piece was found in Chamber I.
6. **Polished Stone Axe:** Likely made from quartzite with a blackish tone, mottled with white and brown; triangular in shape with rounded vertices and an oval section; very well-sharpened. This axe was found in Chamber I.
7. **Flake of Whitish Flint:** Retouching is present on one of its edges. This flake was found in Chamber I.
8. **Triangular Arrowhead:** Made from melado flint, very well knapped, with serrated edges. This arrowhead was found in Chamber I.

c) Metal Tools:

1. **Triangular Dagger with Rivets:** Likely made of copper, like all other recovered pieces. It was probably cast in a mold, followed by the sharpening of all edges. Three holes for the handle are present. The condition is good. This dagger was found in Chamber I.
2. **Copper Awl or Punch:** Featuring a quadrangular section that tapers towards the ends; one end has been sharpened, resulting in a circular section. The condition is good. This tool was found in Chamber I.
3. **Unusual Arrowhead:** Made from a small copper punch with a quadrangular section, with the central part crushed to form the widening used as barbs. This arrowhead was found in Chamber I.

4. **Arrowhead or Spearhead of the Palmela Type:** Crafted from copper, featuring a long tang. This item was found in Chamber I.

d) Bone Remains:

1. Human Skull Fragments: Extracted from Chamber I.
2. Long, Thin Bone: Elliptical in section. Found in Chamber I.
3. Carbonized Bone Fragment: Likely from a bird. Found in Chamber I.
4. Polished Bone Fragment: Possibly from the medial part of a bone awl. Found in Chamber I.

B) Materials from Group 13:

1. Bell-Shaped Vessel with Incised Decoration: Found in Chamber III.
2. Bell-Shaped Casserole with Incised Decoration: Retrieved from Chamber III.
3. Bell-Shaped Casserole with Projecting Shoulder, Incised Decoration, and Conical Base: Discovered in Chamber III.
4. Flint Scraper on Retouched Blade: Found in the sinkhole.
5. Tapered Archer's Bracelet or Sharpening Tool, Made of Sandstone: Located in the passage.
6. Bi-pointed Arrowhead, White Flint, Bifacial Retouching, Serrated Edges: Recovered from the passage.

C) Materials from Julio Escandell:

1. Smooth Hemispherical Bowl: Retrieved from Chamber I.
2. Set of Ceramic Fragments: Collected from Chamber I.
3. Complete Human Skull: Found in Chamber I.

D) S.I.P. Prospections:

1. Fragment of the Rim of a Bell-Shaped Vessel with Incised Decoration.
2. Large Globular Vessel with Convex Base, Smooth.
3. Fragment of a Conical Base, Smooth.
4. Various Fragments of Smooth Ceramics.
5. Copper Earring.
6. Triangular Bone Button with “V” Perforation.
7. Flat Bone Spatula.

D) Additional Materials from S.I.P. Prospections:

8. Fragment of a Bone Needle, Circular in Section.
9. Gray Polished Stone Axe.
10. Ten Arrowheads, Flint, with Bifacial Flat Retouching
11. 664 Disc-Shaped Beads in Limestone and Slate: Including one bone disc bead and three disc beads in green stone (possibly *calaitas*).
12. Perforated Cypraea Shell.

Furthermore, Martínez Pérez (1986) noted that, based on a hole observed during a recent visit to the site, it is likely that most of the materials collected by the S.I.P. originated from Chamber I. Among the materials from Cova dels Gats, a particularly notable assemblage was discovered in Chamber III by Group 13. This assemblage, identified as a closed context, included a bone deposit and associated grave goods, which were placed in a small, exposed limestone nook in the most remote and inaccessible part of the cave. While the bones have since been lost, the grave goods, comprising two bowls and a bell-shaped vessel with incised decoration, have been preserved. Additionally, he noted that the burials at Cova dels Gats have been dated to approximately 1900-1800 BCE without radiocarbon dating.

3.1.6. Cova del Pic

This excerpt is sourced from the work of De Pedro (1984):

In the final foothills of the Iberian System, following a clear northwest-southeast direction, a mountainous set is formed by the Serra de les Agulles, the Serra of the Barraca, and the Val d'Aigües Vives. Within this area, the Barranc de l'Estret runs along the mountain range, bordered to the east by the Serra de les Agulles and to the west by the Sierra de la Barranca, constituting the natural path that connects the Ribera del Xuquer with the Valldigna, specifically the Val d'Aigües Vives.

In the surroundings of the ravine, several archaeological sites have been identified, such as l'Avenc de les Aranyes and Cova dels Gats on the right, and Cova del Pic and Cova de la Xarta on the left. Also located near this area are three notable sites: Cau Raboser, Cova de la Caiguda, and Avenc dels Dos Forats or Cova del Monedero, which are found in the mined Muntanyes del Realeng, the final mountains of the Sierra de la Barraca.

With the exception of the Cova del Pic, the other sites have been explored for several years, and the materials from those surveys have been deposited in the Prehistoric Research Service (S.I.P.) and studied by B. Martí (Martí, 1978). The Cova del Pic was excavated in 1981, and this report aims to provide a brief overview of the results, while also relating them to other findings.

The Cova del Pic is located on top of a hill on the right bank of the Barranc de Mir, near its confluence with the Barranc de l'Estret. Its geographical coordinates are 0°23'40" East longitude and 39°06'15" North latitude.

De Pedro Michó (1984) described as: the site is characterized by a diacalse of medium depth with two difficult-to-access openings. The easternmost opening has dimensions of 55 x 30

centimeters and leads into the cave through a narrow, curved tube that ends at a step, where the central room is accessed. The other opening is smaller and leads directly to the central room via an impassable ramp. The cavity has a NE-SW orientation, forming part of a chain of diaclasses that share the same orientation, running parallel to the ravine. Due to significant water activity from the summit, which flows down into the ravine, parts of the cave's roof and walls are covered with stalactite formations. The southeast face of the central room is particularly notable for its smooth wash, and the floor of this room has sunk in certain areas due to water leaks and rock slippage.

In the central room, specifically in the northern section where the roof descends considerably into a smaller space, human remains and archaeological materials were discovered. These finds represent the belongings of those interred within the cave.

De Pedro Michó (1984) documented that the initial discovery of the cavity, including superficial human remains and a copper punch, was made by Joan Gil Sancho, Joaquim Ferón Garcia, and Antoni Galego Iborra. The find was subsequently reported to the Prehistoric Research Service of the Provincial Council of Valencia. Shortly after, Bernart Martí Oliver, a member of the service, confirmed the potential presence of a prehistoric burial site. Due to the significance of the discovery and the risk of damage to the site, the S.I.P. management was informed, and further actions were initiated.

First, the cave was subdivided into two main rooms, labeled A and B. Room A was further divided into four parts: A1, A2, A3, and A4, all of which are shown in the floor plan and corresponding figures.

Both rooms were found to be covered with small and medium-sized stones, which had been introduced through the two mouths of the cave, with room B containing a larger quantity. Beneath these stones, the excavation revealed a greyish layer, averaging 40 to 50 centimeters in thickness, in which most of the human remains and accompanying material artifacts were found.

At the bottom of this layer, whitish soil was observed, likely due to calcium carbonate deposition. Below this, a reddish earth layer was uncovered, containing numerous stones and blocks that had fallen from the vault. Archaeologically, two arbitrary coordinate axes were established for reference.

The disposal of human remains shows clear evidence of displacement, likely due to natural causes. However, we must not entirely rule out the possibility that the reuse of the cave as a necropolis contributed to this displacement, especially given the small space available compared to the abundance of human remains.

Certain associations may provide significant clues, such as a burial found in an E-W direction along sections A3 and A4. The skull was discovered in the westernmost part of A3, along with a large number of discoidal necklace beads around it, in addition to a copper punch recovered during an earlier visit.

In the southern part of A1, extending towards the large block in room B, a skull and other human remains were found in complete disarray, alongside numerous discoidal necklace beads, high-perforation pendants, two flint arrowheads, a copper punch, and fragments of ceramics.

In the southwest area of room B, extending to room A, additional human remains were scattered. In section A4, several fragments of lower jawbones and skulls were found, including a skull accompanied by an arrowhead and ceramic fragments. In A2, only an arrowhead and some scattered bones were discovered.

The total set of human remains appears to belong to around nine individuals, and the accompanying materials are as follows:

- Various fragments of handmade pottery, undecorated, which seem to correspond to two hemispherical vessels and a globular vessel.

- Four flint arrowheads: two with fins and peduncle, one lozenge-shaped, and another with incipient fins.
- Two copper punches with a square section: one bi-pointed and the other with a pyramidal base.
- 303 discoidal necklace beads, made from limestone, slate, bone, and shell.
- 82 perforated *Luria lurida* shells.
- 1 perforated *Conus mediterraneus* shell.
- 1 perforated *Purpura lapillus* shell.
- Fifty small limestone discs, each with an elevated perforated appendix on one side, commonly known as "buttons." Although these were once considered buttons, their purpose seems closer to that of ornaments, such as necklace beads or pendants.

De Pedro Michó (1984) mentioned that the evaluation of the results obtained from the Cova del Pic must be made in relation to its clear evidence and the environment in which it is located, particularly its proximity to sites like the Cova dels Gats or Xarta.

According to this study (De Pedro Michó, 1984), it is evident that this is a small cave used as a collective necropolis. The disordered human remains could indicate some reorganization of the bones after their initial deposition, though there is no definitive evidence to suggest secondary burials or carefully arranged bundles of bones. The presence of abundant necklace beads near two of the skulls suggests that they may have belonged to these individuals.

Based on both its use as a multiple burial site and the artifacts recovered, the site can be dated to the Full Chalcolithic period or its advanced stages. The presence of two metal punches, likely made of copper, supports a dating to the second half of the third millennium BC, a period that also includes the so-called elevated perforation buttons.

These buttons are a particularly noteworthy aspect of the site's material culture. Their discovery is rare in the Valencian region, although similar finds have been made, such as the burial of

Betxí in the Barranc del Nan, the Cova de l'Aigua in Gandía, and the Cova del Partidor and Cova de la Solana in Banyeres (Bernabeu, 1979). Outside the Valencian region, specimens of this type have been found in the necropolis of Los Millares.

The other artifacts found in the cave are typical of Chalcolithic/Eneolithic burial sites, though this one is relatively poor in comparison. The metal finds are limited to two punches, and the pottery is of a coarse, undecorated variety.

The Cova del Pic belongs to the Full Eneolithic and likely predates the appearance of bell-shaped ceramics, placing it in a pre-Bell Beaker horizon during which the first metal tools began to appear.

De Pedro Michó (1984) suggested a possible chronological gradation for burial caves in the area. Sites such as Cau Raboser, Cova de la Xarta, Avenc dels Dos Forats, Cova de la Caiguda, and Cova del Pic may represent earlier phases of the Chalcolithic, characterized by flint knives and arrowheads, bone tools, handmade pottery, and ornamentation such as stone and bone necklace beads, perforated shells, and buttons. These materials all belong to the Full Chalcolithic and specifically to the burial cave tradition.

Additionally, De Pedro Michó (1984) said that the fin beads and globules found in Cau Raboser, for example, may indicate trade connections with the northern Mediterranean, dating between 2500 and 1700 BC (Martí, 1978). These beads are the first of their kind discovered in the Valencian region, though they are more commonly found in Eneolithic tombs in southern France and northern Spain, such as in the dolmens of Vilaseca and Capafons (1967) and the Cueva de los Arboles (1973).

De Pedro Michó (1984) notes that although Cau Raboser lacks bell-shaped pottery, the presence of metal tools indicates an earlier cultural horizon.

Regarding the Cova del Pic, its interpretation must consider both the clear archaeological evidence within the site and its proximity to other key locations like the Cova dels Gats and Xarta. The artifacts suggest a link to the Full Chalcolithic period, or perhaps slightly later. Noteworthy finds include two copper punches, dated to the second half of the third millennium BCE, and ornamental drill buttons, which are rare in the Valencian region but have been found in nearby burial sites such as Betxi, Cova de l'Aigua in Gandia, and the Partidor and Sun Cave in Banyeres. The buttons from Cova del Pic, ranging from 7 to 13 millimeters in diameter, were likely ornamental.

While grave goods from the site are limited—consisting mostly of two metal spikes, basic pottery, and coarse materials—the variety of flint arrowheads, copper punches, and ornaments like bone and stone necklace beads, along with perforated shells, aligns with Eneolithic burial traditions. The specific types of beads and buttons point to potential long-distance connections or influences from other Mediterranean cultures, dating from 2500 to 1700 BCE.

3.1.7. La Muntanya Assolada

Muntanya Assolada is one of the northern spurs of this mountainous range, situated between the Valí de la Murta and the Barranc de l'Aixavegó, overlooking the Xúquer plain. Its coordinates are 30° 08' 40" N latitude and 3° 10' 10" W longitude. The prehistoric site is located on its small plateau-like summit, reaching an elevation of 227 meters above sea level (Martí Oliver, 1983a). The excavated site covers an area of over 700 m², revealing a variety of habitation structures, significant anthropogenic deposits, and traces of diverse activities. These include occupation layers, evidence of abandonment phases, and burnt layers likely resulting from the combustion of materials used for livestock shelter. Additionally, the area shows evidence of slope terracing, indicating a gradual expansion of its usable surface (De Pedro Michó, Martí Oliver, and Pardo Gordo, 2020).

Muntanya Assolada is located on one of the northern spurs of the Serra de Corbera, overlooking the plains of the Xúquer River, near its mouth. This area was densely populated during the Eneolithic and Bronze Age, both in the mountainous parts, with settlements like Muntanya de Carles in Corbera, Muntanyeta dels Galls in Alzira, and Cabeçol de l'Anell in Carcaixent (Llavador and Ferrer, 1987), and in the burial caves such as Cova dels Gats in Alzira, Cova del Barranc de Xarta and Cova del Pic, both in Carcaixent, among others. Additionally, small elevations and lowlands near the river, like les Cases de Montcada in Alzira or Coroneta del Rei in Alberic, were also inhabited (Enguix Alemany and Martí Oliver, 1988; Martí Oliver, De Pedro Michó, and Enguix Alemany, 1995).

Several prehistoric sites are known in the vicinity of Muntanya Assolada, also attributable to the Bronze Age or the final stages of the Eneolithic. These include Muntanya de Caries, the Castell, and Puntal de l'Abuela in Corbera; the Cabecol de l'Anell, Cova del Barranc de Xarta, and Cova del Pic in Carcaixent; and Muntanyeta dels Galls and Cova dels Gats in Alzira. Collectively, these sites attest to a significant human presence in the region during this period (Martí Oliver, 1983).

The upper section of the settlement is organized around a central street, flanked by rectangular structures on both sides. Noteworthy features include a domestic oven, likely used for bread baking or cereal roasting, and a stone staircase providing access to another structure. The settlement is enclosed by natural escarpments and a robust stone wall nearly two meters thick and three meters high (De Pedro Michó, Martí Oliver, and Pardo Gordo, 2020).

Additionally, the hilltop has been modified with significant stone and clay constructions arranged in a slope, forming a complex access system. Multiple terracing lines expand the settlement down the slopes, creating usable terraces. Evidence of different occupation levels, observed through stratigraphy and material remains, points to periodic remodeling. Some structures were deliberately and quickly filled in to enable new construction phases, indicating a pattern of continuous occupation throughout the Bronze Age (De Pedro Michó, Martí Oliver, and Pardo Gordo, 2020).

Cultural and Chronological Context of La Muntanya Assolada has described by Martí Oliver (1983) as follows:

The Muntanya Assolada site is attributed to the Valencian Bronze Age (circa 1700-1000 BC). The ceramic styles, settlement structure, and materials align with other known sites from this period in the Valencia region. However, Muntanya Assolada offers some unique elements not found extensively at other Bronze Age sites, such as a significant amount of decorated ceramics and earlier materials suggesting influences from older traditions, including Bell Beaker culture.

- Ceramics The pottery from the site includes typical Valencian Bronze Age ceramics, such as carinated vessels (vessels with sharp ridges), hemispherical bowls, and twin-handled vessels. Some ceramics feature unique decorative motifs, such as solar symbols and incised lines, which may link to earlier cultural traditions.

- Decoration: Burnished decoration on the exterior of some vessels is particularly noteworthy, as it's uncommon in the region for this time. The presence of such decorations and stylistic

influences suggests a transitional period, blending older traditions with the established Bronze Age style.

- **Parallels with Other Sites:** Muntanya Assolada's material culture shows similarities with other Valencian sites such as Serra Grossa (Alicante), Torrelló de Onda, and Llometa del Tío Figuetes. Some of the ceramics, especially carinated vessels, indicate an evolved phase of the Valencian Bronze Age.

- **Chronology:** The site's artifacts, including ceramics and tools, suggest it dates to the middle or early phase of the Valencian Bronze Age, likely around 1700-1500 BC. The presence of earlier elements, such as flint arrowheads and stone bracelet fragments, points to older traditions potentially carried over from the Bell Beaker period, possibly marking a transitional phase between the two cultures.

- **Significance:** Muntanya Assolada stands out due to the richness of its ceramic decorations, which contrasts with the typically undecorated pottery of other Valencian Bronze Age settlements. Connections to earlier cultural influences are suggested by its materials, providing insight into the cultural transitions of this period.

Muntanya Assolada offers insights into the Valencian Bronze Age, showing both typical elements of the era and unique features, especially regarding pottery and decoration, which may reflect older cultural influences or a transitional phase between the Bell Beaker and Bronze Age periods (Martí Oliver, 1983).

In Martí Oliver, De Pedro Michó, and Enguix Alemany (1995) describe as:

Excavations, directed by B. Martí, R. Enguix, and M.J. de Pedro and conducted by the S.I.P. under the annual program of the Valencian Department of Culture, began in 1978, focusing on areas affected by urbanization work at that time. These excavations revealed significant habitation levels and structural remains, particularly on the upper platform, which

measures approximately 40 x 20 meters. In the northern section of this platform, rectangular rooms were uncovered, flanking what appeared to be a narrow street or central passageway. These rooms were formed by walls with stone foundations. The western and southern boundaries of the upper platform were defined by a solid wall built with rows of uncut stone, bound together with mud. On the eastern side, the steep natural slope of the mountain was deemed to serve as the enclosure.

In line with other known settlements from the early 1980s, Muntanya Assolada conformed to the model of small, scattered farmsteads across the Valencian region, inhabited by a few families primarily engaged in cereal cultivation. This interpretation was reinforced in 1983 when a small burial cave on the southeastern slope, adjacent to the settlement, yielded the remains of at least four individuals, along with animal bones and part of the grave goods. This closely parallels the Muntanyeta de Cabrera settlement, where burial in a nearby cave was also considered typical of the Valencian Bronze Age (Martí Oliver, 1983a; Enguix Alemany and Martí Oliver, 1988; Fumanal, 1990; Martí Oliver and Enguix Alemany, 1991; La Roca, 1991; Martí Oliver and De Pedro Michó, 1994 from Martí Oliver, De Pedro Michó and Enguix Alemany, 1995).

Indeed, in one of the earliest known references to the settlement, Gual (1953) noted that "at the foot of the hill, a small cave was explored, where more ceramic remains and human bones were found, indicating its use as a burial site." Although the first examination revealed that this narrow cavity had been significantly disturbed, the relevance of the information made its verification necessary. As a result, the remaining soil within the cave was sifted, yielding satisfactory findings.

The cavity has an elongated, vertically oriented entrance, measuring 80 x 180 cm, leading into a small horizontal gallery extending 350 cm. Its average width is 150 cm, and its height was 100 cm before excavation. Most of the recovered materials came from the innermost part of the cavity, where sediment accumulation was thicker, reaching 80 cm. The cavity is a sinkhole formed along a SE-NW fissure, influenced by an inclined stratification. The topography of the cavity was surveyed by J. Fernández.

The materials recovered are divided into three categories:

1. Funerary Goods: These include a white flint arrowhead made through bifacial retouching, 126 disk-shaped necklace beads (mostly made of limestone), a tubular necklace bead, a rectangular limestone pendant, a fragment of a bone button with a V-shaped perforation, 15 small perforated shells, and some small undecorated ceramic fragments.

2. Human Remains: A total of 169 bones were found, representing a minimum of four individuals. According to a preliminary study by I. Sarrión, these include:

- Two fragments of cranial vault
- One left temporal bone
- One immature occipital fragment
- 31 teeth
- One scapula fragment
- Five humeri (three left, two right). Measurements: Lengths of 319 mm, 204 mm, and diameters of 56.8 mm, 50.6 mm. The right humerus, distal third, shows intentional breaking and incisions on the inner and outer faces.
- Various bones including clavicles, ribs, vertebrae, and bones from the limbs (metapodials, phalanges, etc.) were also found.

These remains belonged to three adults and one immature individual.

3. Animal Remains: Identified vertebrates include *Oryctolagus cuniculus* (rabbit), *Eliomys quercinus* (garden dormouse), *Apodemus sylvaticus* (wood mouse), and *Vulpes vulpes* (fox). While some are considered part of the natural fauna, the presence of other remains suggests possible human transport, perhaps related to funerary practices. However, other possibilities, such as the use of the cavity as an animal den, cannot be ruled out.

The excavation confirmed that this is a burial cavity associated with the settlement located immediately above, yielding the remains of four individuals, some animal bones, and part of their funerary goods (Martí Oliver, De Pedro Michó, and Enguix Alemany, 1995).

The burial cave of the Muntanya Assolada has many close parallels, such as Coveta dels Gats in Corbera (linked to the Muntanya de Carles settlement), the burials at Sima de la Pedrera in Benicull, Cullera Mountain, Mallada Verda in Corbera, and Cova dels Gats. Notably, Coveta dels Gats yielded five flint arrowheads, a fragment of a bone awl, four disc-shaped necklace beads, and small ceramic fragments, including one possibly from a Bell Beaker vessel with impressed decoration (Martí Oliver, De Pedro Michó, and Enguix Alemany, 1995).

These parallels suggest that the Muntanya Assolada burial cave is more closely aligned with the Transition Bell Beaker Horizon. The findings from La Muntanya Assolada underscore the need to reevaluate other significant discoveries lacking apparent context within the site, such as a jawbone from the first excavation campaign in 1978 and cranial fragments found in subsequent areas. The evidence suggests that these may represent remains from a disturbed burial due to alterations in habitation structures or changes in area function (Martí Oliver, De Pedro Michó, and Enguix Alemany, 1995).

The archaeological investigations at La Muntanya Assolada have revealed significant insights into the burial practices and settlement patterns during the Valencian Bronze Age, particularly through discoveries of both a multiple burial in a cave on the southern slope and an individual burial within the settlement.

The research at La Muntanya Assolada highlights the continuity of some Chalcolithic burial traditions into the Bronze Age, while also indicating changes in grave goods, particularly the inclusion of metal objects, as part of an evolving cultural landscape.

3.1.8. Cau de la Serp

No information has been found about Cau de la Serp (Carcaixent).

3.2. Method

3.2.1. Determination of sex

The determined sex during embryonic development undergoes a heightened manifestation in both phenotype and skeletal morphology due to the release of hormones, including estrogen and testosterone, during the adolescent period. Consequently, sex determination methods in skeletal investigations predominantly target adult individuals. While the identification of sex can be achieved through various bones and teeth within the skeletal structure, with particular emphasis on the pelvis and cranium in adults, researchers face significant challenges when dealing with non-adult individuals in the same context. Due to the onset of sexually dimorphic features during adolescence, determining the sex of non-adult individuals remains a recurring challenge in the field of anthropology. To address this issue, many researchers have conducted sex determination studies on non-adult individuals; however, the reliability of these studies is highly debated (e.g. Schutkowski, 1993; Molleson and Cruse, 1998; Loth and Henneberg, 2001). It is possible to differentiate the sex of non-adult individuals using DNA obtained from their teeth (Cox and Mays, 2013).

When considering the task of determining an individual's sex, two primary methods are employed: Morphological and Morphometric. The morphological approach entails the examination of observable or macroscopic features of the skeletal structure. This method was

predominantly employed in the early stages of research (e.g., Washburn 1948, 1949; Phenice 1969). Through this approach, scholars have identified and elucidated male and female skeletal characteristics within the realm of anthropology. To illustrate the morphological method, let us consider the example of analyzing a coxae bone. By evaluating its overall structure, one can infer whether it pertains to a female or male individual. For instance, if the coxae exhibits robustness, well-defined muscle attachment sites, and a narrow incisura ischiadica major, it is indicative of male attribution. While the morphological method remains significant in contemporary studies, it may not offer conclusive answers in specific scenarios, such as instances of limited sexual dimorphism within the population under investigation or extensively fragmented skeletal remains, where sex-indicative characteristics are not clearly observable or may be subject to observer errors. In such cases, the application of the morphometric method becomes relevant.

The morphometric method involves the interpretation of measurements taken from the skeleton based on statistical data. This approach allows for the acquisition of information regarding inter-population shape variations and intra-population shape variations in the bones. Since early studies, these two methods have provided enlightening insights in population-specific investigations. However, in later periods, some researchers have expressed the inadequacy of morphological and morphometric methods in comprehending the differences in shape and size between genders. In response, they have developed a new technique called geometric morphometrics, utilizing traditional morphometric techniques, to better understand these distinctions (Slice 2007; İşcan and Steyn 2013; Aytek 2016). Geometric morphometrics, in its broadest definition, encompasses analyses that evaluate the shape, size, and form (shape+size) of anatomical landmarks based on their Cartesian coordinates (Slice 2007).

In addition to the mentioned techniques, in the past few decades, sex determination from skeletons has also been performed using DNA analysis. Obtaining DNA from skeletal remains, particularly from individuals belonging to ages where sexual characteristics have not yet developed, enables the possibility of conducting sex determination. This approach has the potential to resolve the controversial issue within anthropological studies, addressing the feasibility of sex determination in such cases.

The reliability of sex determination using anthropological methods varies depending on factors such as the condition of the available skeletal material, the degree of sexual dimorphism in the studied population, and the experience of the researcher. In this context, researchers have calculated the accuracy of their sex determinations by examining each individual component of the skeleton separately, in order to understand the reliability rate. Hrdlička (1939) stated that sex determination can be achieved with an accuracy rate of 80% by examining only the cranial skeleton, and when the mandible bone is included, this rate can increase to around 90% (Stewart 1948). However, Stewart (1948) found this rate to be 77% in the skeletal series he studied, including the mandible bone (Stewart 1948). According to Krogman (1939), if the entire skeleton is recovered, the accuracy rate would be 100%, with only the pelvis resulting in a rate of 95%, only the cranium at 92%, the combination of pelvis and cranial skeleton at 98%, the acquisition of long bones alone at 80%, and the evaluation of long bones and pelvis together at 98% reliability (İşcan and Steyn 2013). In his study focusing on the pelvis, Washburn (1948) conducted sex determination based on the length of the ischium and pubis bones and the ischium-pubis index. He found that the ischium-pubis index provided a higher accuracy rate, around 90% (Washburn 1948).

In various studies, it has been firmly accepted by researchers that the pelvis is the region that most clearly exhibits sex characteristics, followed by the cranium, depending on factors such as the sexual dimorphism observed in the studied population. In cases where these two regions are not available, albeit with lower reliability, long bones and other body bones are used for sex determination. However, when examining skeletal remains, especially when using morphometric and geometric morphometric methods, researchers should ensure that the methods they employ will provide accurate results specific to the population they are studying. If sex determination methods applied to different populations are not suitable for their own population's sexual dimorphism, women can be misclassified as men, and men can be misclassified as women. The study conducted by Kotevara et al. (2016) serves as a good example to understand the outcomes of studies when population-specific applications are disregarded. In their study, they applied the methods used in Portugal, Southern Europe, and North America to the Czech population they examined, and as a result, they identified incorrect classification of female individuals. Based on these findings, they emphasized the significant role of size differences between populations in sex determination.

When considering the identification of sex based on skeletal remains, the pelvis, particularly the hip bone, is the primary focus (Phenice 1969). The remarkable feature of the pelvis is its distinct morphology, which exhibits significant differences between females and males. The primary factor contributing to these differences is the evolutionary adaptation of the female hip bone to accommodate childbirth. This adaptation has resulted in a unique morphology of the hip bone in females, shaped by the proportional relationship that developed over time between the diameter of the baby's head and the angle of the pubis within the pelvis.

Upon examining the overall morphology of the hip bone, it becomes evident that it comprises three distinct components: the ilium, ischium, and pubis. These components remain separate entities until adolescence, but at approximately 24 years of age, they undergo complete fusion, resulting in the formation of a singular bone structure (Bass 2002). When examining the pelvis holistically through morphological methods, encompassing the right and left coxae as well as the sacrum, it is commonly observed that the female pelvis exhibits a comparatively shorter and wider structure in relation to males. Nonetheless, the acquisition of a well-preserved pelvis from archaeological excavations is not always feasible. Consequently, in accordance with the state of preservation, additional features indicative of sexual dimorphism in the pelvis can be taken into account. While these features facilitate a distinct differentiation between dominant males and dominant females, they may prove inadequate in cases where the characteristic attributes of females and males are not strongly pronounced. Hence, numerous researchers contend that evaluating multiple characteristics in conjunction would yield more dependable outcomes.

On the pelvis, several traits are examined: the preauricular sulcus, width of the sciatic notch and pubic angle, shape of foramen obtratorius, and the general size and shape of the pelvis (Workshop of European Anthropologists 1980; Brothwell, 1981; Ubelaker, 1991; Buikstra & Ubelaker 1994; Bass, 1995; White et al., 2011). The sulcus preauricularis, situated between the facies auricularis, where the coxae articulate with the sacrum, and the incisura ischiadica major, manifests as a groove-shaped structure exhibiting variations in degrees among individuals. This characteristic is predominantly observed in the female population. Due to being the strongest region of the pelvis, the area where the incisura ischiadica major is located is frequently recovered intact during excavations. This notch, which is wider in females, is observed to be

narrower in males. The angulus pubis, in females, appears to be significantly wide and sometimes even as an arch, whereas in males, this feature is narrow and even takes the form of a triangle. The arc component is obtained by drawing an arc starting from the superior direction of the facies auricularis and continuing towards the posterior direction of the incisura ischiadica major. If the drawn arc is single, it is attributed to male individuals, whereas if it is double, it is attributed to female individuals. The foramen obturatum exhibits a wider and oval structure in male individuals, whereas in female individuals, it appears smaller and triangular in shape (Table 3.2.1.1.)

<i>Features</i>	<i>Hyperfemine</i>	<i>Feminine</i>	<i>Neutral</i>	<i>Masculine</i>	<i>Hypermasculine</i>
<i>Sulcus preauricularis</i>	deep, well delimited	less deep delimited	medium	only slight-present	absent
<i>Inci. Isch. Major</i>	very wide U shaped	wide U shaped	transitory shape	V shaped	Narrow, very V shaped
<i>Angulus pubis</i>	strongly obtuse angled, rounded	obtuse to right angled, rounded	right angled	acute angled	strongly acute angled, A-form
<i>Arc compose</i>	double curve	double curve	—	single curve	single curve
<i>Os coxae</i>	low, broad, with expanding	less conspicuous	transitory form	slight male traits	high, narrow with stronger

	ala ossis and slight muscle relief	female traits			muscle relief
<i>Foramen obturatum</i>	triangular with sharp rims	triangular	form not classifiable	oval	oval, rounded rim
<i>Corpus ossis ischi</i>	very narrow with less conspicuous tub. isch	narrow	middle	broad	very broad, marked tub. isch.
<i>Crista illiaca</i>	very flat S formed	flat, S formed	middle	definite, S formed	accented S formed
<i>Fossa illiaca</i>	very low broad	low, broad	middle high, middle broad	high, narrow	very high, narrow
<i>Pelvis major</i>	very broad	broad	middle	narrow	very narrow
<i>Pelvis minor</i>	very broad oval	broad oval	middle broad	narrow heart shaped	very narrow heart shaped

Table 3.2.1.1.: Pelvis characters recreated from WEA (1980).

In the process of sex determination, the cranial skeleton serves as the second reliable criterion following the hip bone. The cranial skeleton in females undergoes earlier completion of formation during puberty. In contrast, in males, the formation is still ongoing, resulting in continued development of facial bones and muscles. As a result, sexual dimorphism emerges between females and males. It is crucial to take into account the environmental and genetic factors that may intervene or contribute to the development of these characteristics (Cox and Mays, 2013).

Due to the difficulty of finding the cranial skeleton intact in archaeological excavations, morphological evaluations are often conducted based on the recovered fragments (Brothwell, 1981). The most fundamental observation is that robust features are attributed to males, while more delicate features are attributed to females (Bass, 2002; White et al., 2012). Some of the morphological characteristics used in sex determination of the cranial skeleton are frequently employed depending on their frequency of occurrence in archaeological excavations.

On the cranium, various features are examined, such as the robustness of glabella, shape and size of frontal tuberosities, zygomatic bone, orbital sockets, mastoid processes, nuchal crest and occipital protuberance; inclination of frontal bone; robustness of supraorbital arc and mandible; and structure of mental eminence and ramus angle (Workshop of European Anthropologists 1980; Brothwell, 1981; Ubelaker, 1991; Buikstra & Ubelaker 1994; Bass, 1995; White and Folkens, 2005). In females, the nuchal crest manifests as a more gentle contour, whereas in males, it exhibits a highly pronounced and prominent appearance. The mastoid process appears as significantly smaller and shorter in females, while in males, it presents as longer and more robust. The supraorbital margin exhibits a thin, sharp, and pointed structure in females, whereas it manifests as thick, rounded, and curved in males. The glabella exhibits a prominent structure in males, whereas in females, it appears as mild or flat. The mandible, although often fragmented in archaeological excavations, is a frequently encountered bone utilized for sex determination in cranial skeletal studies. When analyzing its overall morphological characteristics, it becomes apparent that the mandible presents a slender and rounded configuration in females, whereas in males, it demonstrates a more robust and square morphology. Furthermore, the mentum prominence is comparatively flat in females but

more prominent in males, and the gonial angle exhibits a wider structure in males (Table 3.2.1.2.).

Features	<i>Hyperfemine</i>	<i>Feminine</i>	<i>Neutral</i>	<i>Masculine</i>	<i>Hypermasculine</i>
<i>Glabella</i>	smooth	slightly delimited	delimited	marked	massive prominent
<i>Processus mastoideus</i>	very small	small	medium	large	very large
<i>Planum nuchale</i>	smooth	slightly arched traces of nuchal lines	nuchal lines and occipital crest evident	nuchal lines and occipital crest marked	nuchal lines and occipital crest with rough surface
<i>Processus zygomaticus</i>	very thin and low	thin, low	medium	thick, high	very thick, high
<i>Arcus superciliaris</i>	smooth	slightly delimited	delimited, marked	marked	very marked arched
<i>Tubera frontalia</i>	marked	medium	moderate	indistinct	missing
<i>Protuber occipitalis</i>	smooth	hardly	medium	marked	very marked

<i>Os zygomaticum</i>	very low smooth surface	low, smooth	medium, irregular surface	high, irregular surface	very high, irregular surface
<i>Inclination frontale</i>	vertical	almost vertical	little inclined	medium inclined	strongly inclined
<i>Forma orbitale</i>	round very sharp border	round sharp border	transitory form, medium	quadrangular rounded	quadrangular very rounded
<i>Mandible</i>	very gracile	gracile	medium	robust	very robust
<i>Mentum</i>	small, rounded	small	medium	prominent	very prominent
<i>Angulus mandibulae</i>	smooth	slight eminences	moderate eminences	marked eminences	strongly marked eminences
<i>Margo inferior</i>	thin	thin	medium	thick	thick

Table 3.2.1.2.: Cranium characters recreated from WEA (1980).

3.2.2. Estimation of Age

Age estimation on skeletal remains of adults is a fundamental aspect of bioarchaeological research. Various methods and techniques are employed to estimate the age-at-death based on the analysis of skeletal indicators. One commonly used approach is the examination of age-related changes in the symphysis pubis. The pubic symphysis undergoes progressive changes throughout the lifespan, and these changes can be categorized into distinct phases or stages. By comparing the observed phase of the pubic symphysis with established reference standards, an estimation of age can be obtained. Another method involves the analysis of dental features. Dental development, eruption, and tooth wear patterns provide valuable information for age estimation. The eruption and wear patterns of specific teeth, such as the third molars (wisdom teeth), can be used to estimate age within a certain range.

Skeletal indicators associated with the long bones, such as the femur and humerus, are also examined. The fusion and closure of epiphyses (the ends of long bones) occur progressively with age. By assessing the degree of epiphyseal fusion and closure, along with measurements of long bone length, age-at-death can be estimated.

Other skeletal features, such as cranial sutures, the morphology of the auricular surface, and the presence of osteoarthritic changes, are also considered in age estimation. These features exhibit age-related changes that can be compared to reference samples or standards to estimate the individual's age. It is important to note that age estimation methods are not always precise and can be influenced by various factors such as population-specific variation, health conditions, and lifestyle factors. Therefore, age estimates are typically provided as age ranges or with a degree of uncertainty.

To enhance the accuracy of age estimation, it is common practice to use multiple methods and incorporate statistical techniques to evaluate the combined evidence. Additionally, the comparison of skeletal remains with documented historical records or DNA analysis can provide further insights into the individual's age. Overall, age estimation on skeletal remains of adults involves a multidisciplinary approach, combining knowledge from anthropology,

anatomy, and statistical analysis to provide valuable information about past populations and individuals.

Age estimation in adult individuals involved the assessment of various age-related features present on the auricular surface, as described in the anthropological literature and established by Lovejoy et al. (1985). The changes in the symphysis pubis phases over time were also employed as age indicators, drawing upon studies by Todd (1920, 1921), McKern and Stewart (1957), Acsadi and Nemeskeri (1970), Gilbert and McKern (1973), and Brooks and Suchey (1990). The eruption timing of the third molars in the dentition was taken into account, based on investigations by Brothwell (1981) and Ubelaker (1991). Furthermore, the closure timing of epiphyses in other skeletal elements was examined to estimate age, incorporating research conducted by the Workshop of European Anthropologists (1980), Brothwell (1981), Meindl and Lovejoy (1985), Ubelaker (1991), Buikstra and Ubelaker (1994), Bass (1995), and White et al. (2012).

Age estimation in non-adult individuals presents distinct challenges compared to adults due to incomplete skeletal development. The methodologies commonly employed for age estimation in adults may not be fully applicable to non-adults. Moreover, the fragile nature of infant and child skeletons, often found in incomplete states during archaeological excavations, further complicates accurate age estimation. Adult age estimation methods, such as epiphyseal fusion and cranial sutures, may not be fully developed or observable in non-adult individuals. Dental development serves as a reliable indicator in non-adults but has limitations regarding age precision and accuracy.

Estimating age in non-adults necessitates a multidisciplinary approach and consideration of specific skeletal indicators associated with juvenile development. These indicators include evaluating dental eruption patterns, tooth mineralization stages, long bone length, and epiphyseal development, among others. However, the absence of complete skeletal remains and the variability in skeletal development within age groups pose challenges to age estimation in non-adults.

To enhance the accuracy of age estimation in non-adult individuals, researchers often rely on comparative data from modern reference populations or employ specialized age estimation methods developed specifically for juveniles. Additionally, advancements in non-invasive imaging techniques, such as computed tomography (CT) scanning, have opened new avenues for studying and estimating age in non-adult skeletal remains.

It is crucial to acknowledge the limitations and uncertainties associated with age estimation in non-adults and exercise caution when interpreting the results. Considering the range of possible ages and the potential impact of external factors on skeletal development is essential in this context.

In this study, the analysis focused on examining dental and jaw fragments obtained from infant and child individuals. Age estimation was performed by determining the timing of tooth eruption using this method, as described by Ubelaker (1991), White and Folkens (2005), White et al. (2012) and Al Qahtani et. al. (2010). In cases where teeth and jaw remains were absent, age estimation relied on the measurement of long bone length, as outlined by Johnston (1962), Anderson, Messner, and Green (1964), and Stewart (1968). For individuals within the adolescent age group, age estimation was based on the assessment of long bone length and the degree of epiphyseal fusion, as discussed by Anderson (1964), Stewart (1968) and Sheuer and Black (2004).

3.2.3. Paleopathology

Traditionally, biological anthropology concentrated on the study of individual skeletal remains. However, the analysis of pathological conditions within skeletal populations has revealed patterns of disease prevalence, distribution, and impact on ancient societies. This transition to examining population-level patterns has enabled researchers to gain a broader understanding of the health dynamics of past populations.

Paleopathology has also played a crucial role in reconstructing disease profiles of ancient populations. By examining skeletal evidence of specific diseases, researchers have acquired insights into their prevalence, geographical distribution, and impact on ancient societies. This information provides valuable knowledge about the health status, living conditions, and interactions with pathogens in the past.

Furthermore, paleopathology studies have shed light on the influence of lifestyle, diet, socio-economic conditions, and occupational stress on human health in the past. Analysis of skeletal remains has revealed evidence of nutritional deficiencies, occupational injuries, and degenerative joint diseases associated with specific activities or occupations. These findings enhance the understanding of daily life, work patterns, and socio-economic conditions in ancient populations.

In this study, the paleopathological examination focused on identifying several specific macroscopic pathological conditions: bone pathologies and dental pathologies.

Bone pathologies:

1. Osteoarthritis is the second most common pathology observed in the skeleton, following dental diseases (Waldron, 2009). It is characterized by the loss of joint cartilage (Aufderheide and Martin, 1998). The etiology of osteoarthritis includes factors such as age, sex, hormones, mechanical stress, and trauma (White and Folkens, 2005).
2. Osteoporosis is a systemic skeletal disorder characterized by decreased bone mass and microarchitectural deterioration of bone tissue, leading to increased bone fragility and susceptibility to fractures. It is commonly associated with aging, hormonal changes (particularly in postmenopausal women), and deficiencies in calcium and vitamin D (Panel N.C., 2001; White and Folkens, 2005; Waldron, 2009).
3. Enthesopathy refers to disorders occurring at the sites where tendons and ligaments attach to bones, known as entheses. These conditions are typically characterized by inflammation or degenerative changes in these regions. Enthesopathy is part of the musculoskeletal system and generally develops due to repetitive mechanical stress, overuse, or underlying systemic diseases (Greenberg, Day and Alradawi, 2023).

4. Porotic hyperostosis is a pathological condition characterized by porous and spongy lesions on the cranial bones, especially the parietal and occipital bones. These lesions are often linked to anemia, particularly iron-deficiency anemia, which leads to marrow hypertrophy as the body attempts to increase red blood cell production (Ortner, 2003; Walker et. al., 2009).
5. Cribra orbitalia refers to porosity found in the orbital roof of the skull, often associated with anemia and nutritional deficiencies. It is considered a marker of metabolic stress, particularly during childhood (Ortner, 2003).
6. Schmorl's nodes are indentations on the upper or lower surfaces of the vertebral bodies caused by herniation of the intervertebral disc into the vertebral body. They are indicative of spinal stress and can be associated with conditions such as osteoporosis, trauma, or congenital anomalies (Waldron, 2009).

Dental pathologies:

1. Dental caries is deriving from the Latin term for "rottenness," is a multifactorial and multi-bacterial disease affecting the calcified tissues of teeth. It is characterized by the demineralization of the inorganic components and the subsequent destruction of the organic material (Aufderheide and Martin, 1998; Hillson, 2005). Caries were diagnosed by observing cavitations in the enamel or dentin of teeth, which appear as discolored areas on the tooth surface. Different classes of teeth show varying susceptibility to caries. For instance, incisors and canines generally have fewer carious lesions compared to molars due to their less complex morphology (Buikstra and Ubelaker, 1994).
2. Antemortem Tooth Loss; evidence of this pathology is noted by the presence of alveolar resorption in the jawbone, indicating the loss of teeth during the individual's lifetime. Periodontal diseases, trauma, caries might be reasons of antemortem tooth loss (Waldron, 2009)
3. Hypoplasia was identified by the presence of linear enamel hypoplasia, which manifests as horizontal grooves or pits on the tooth enamel, indicating periods of stress or malnutrition during tooth development (Aufderheide and Martin, 1998; Mays, 2002).

Due to enamel hypoplasia occurs during the childhood period, acute diseases or poor diet can be responsible for this pathology (Mays, 2002; Ortner, 2003).

Brothwell (1981), Buikstra and Ubelaker (1994), Aufderheide and Martin (1998), Mays (2002), Ortner (2003), Hillson (2005), White and Folkens (2005), Waldron (2009) have been utilized to identify pathological conditions.

3.2.4. Bone preservation index

In bioanthropological studies, the condition of skeletal preservation can be assessed using various formulas that evaluate the extent to which the skeleton has been preserved. These calculations typically depend on the presence or absence of different skeletal elements.

A commonly used formula involves the Bone Preservation Index (BPI) or the Skeleton Preservation Index (SPI). These indices express the extent of preservation of a particular skeleton as a percentage (Lambacher, et. al., 2016).

$$\text{Preservation index} = \left(\frac{\text{number of present bones}}{\text{expected number of bones}} \right) \times 100$$

3.2.5. Calculate the dental pathologies

Dental caries prevalence was calculated based on the total number of observed teeth, including both deciduous and permanent teeth. The caries assessment included lesions on the occlusal, interface (interproximal) and cervical surfaces of the teeth. This combined approach was chosen to provide a comprehensive view of the oral health status within the population and to allow for comparisons with other studies employing similar methodologies.

Dental hypoplasia prevalence was calculated based on the total number of observed teeth, including both permanent and deciduous teeth.

Anetemortem tooth loss was evaluated based on the number of observable sockets in the maxillae and mandibles. Severely damaged jaws, where socket counts could not be reliably determined, were excluded from the calculation. The prevalence of AMTL was expressed as the percentage of missing teeth relative to the total number of observable sockets.

3.2.6. Terminology

In dental terminology, each tooth—incisor, canine, premolar, and molar—is represented by its initial letter. Lowercase letters denote deciduous teeth, while capitalized letters indicate permanent teeth. The letters 'R' or 'L' are added to specify the side of the jaw (White and Folkens, 2005). The positions of the teeth are indicated by numbers, which replace the lower or upper case of the letter to denote whether the tooth is on the maxilla or mandible. For example; LI¹ represents the maxillary permanent left first incisor. Only premolar teeth are indicated by the numbers 3 and 4, as the first and second premolars have been lost in the course of evolution (White and Folkens, 2005).

Mesial: The surface of the tooth nearest to the midline of the dental arch, oriented toward the front of the mouth.

Distal: The surface of the tooth that is furthest from the midline of the dental arch, oriented towards the back of the mouth.

Buccal: The surface of the tooth that is adjacent to the inside of the cheek, typically referring to the posterior teeth.

Lingual: The surface of the tooth that is adjacent to the tongue, typically referring to the lower teeth.

Occlusal: The functional surface of the tooth used for chewing or biting.

Labial: The surface of the tooth facing the inner side of the lip, typically referring to the anterior teeth.

Chapter IV: Results

In the realm of skeletal analyses, the determination of the minimum number of individuals (MNI) plays a pivotal role, especially in cases where skeletal preservation is suboptimal, and the assembly of nearly complete skeletons is unattainable. The MNI is discerned by focusing on the presence of the most frequently occurring individual bones within the assemblage. For instance, in a scenario where there are 5 left humeri, 2 isolated femurs, and 7 mandibles, the MNI is predicated on the number of mandibles since each person typically possesses only one mandible. Consequently, in this particular case, the MNI would be determined as 7. This meticulous method of MNI determination is crucial to maintaining accuracy in population estimations, especially in situations where skeletal elements are fragmented or incomplete. It ensures a conservative count, preventing an overestimation of the number of individuals represented by the skeletal collection and providing a standardized approach essential for archaeological and anthropological investigations (also see Buikstra and Ubelaker, 1994; White and Folkens, 2005, p. 340).

In this chapter, a comprehensive examination of the cave findings will be presented. Subsequently, the hypotheses derived from these findings will be expounded upon in the discussion chapter.

Lab Nr MAMS	Sample Name	¹⁴ C Age [yr BP]	±	δ13C AMS [‰]	Calibrated Ages		C:N	C [‰]	Collagen [‰]	Material
					Probability 68%	Probability 95%				
55110	1 - Cova de la Xarta (sip: 21928)	4185	26	-17.6	cal BC 2879-2702	cal BC2886-2669	3.2	37.5	5.2	bone
55111	2 - Cova del Pic (sip: 24640)	4084	26	-18.4	cal BC 2836-2574	cal BC2851-2497	3.3	34.5	4.6	bone
55112	3 - Cova del Pic (sip: 24648)	4077	26	-19.2	cal BC 2832-2503	cal BC2848-2495	3.3	37.3	6.9	bone
55113	4 - Avenc dels Dos Forats (sip: 75212)	4312	27	-20.5	cal BC 3001-2892	cal BC3010-2887	3.3	40.7	2.2	bone
55114	5 - Cau Raboser del Dalt (sip: 75247)	4115	27	-20.5	cal BC 2848-2587	cal BC2866-2577	3.2	41.1	4.9	bone
55115	6 - Cau Raboser del Baix (sip: 75321)	4142	27	-17.3	cal BC 2865-2635	cal BC2874-2587	3.3	42.8	0.3	bone
55116	7 - Muntanya Assolada (sip: 43462)	4506	27	-21.5	cal BC 3340-3105	cal BC3351-3099	3.2	38.5	6.1	bone
55117	8 - Cova del Pic (sip: 24639)	4158	27	-22.4	cal BC 2870-2674	cal BC2877-2631	3.2	44.6	7.4	bone

Table 4.1: ¹⁴C results

Table 4.1. shows that the result of the radiocarbon dating of the archeological sites in this study. However, the results of the Cova dels Gats, Cova de la Caiguda, and Cova de la Serp are currently unavailable.

4.1. Cova del Cau Raboser

The skeletons obtained from Cau Raboser Cave appear to date back to the 1975 excavation period, according to the data on discovery labels. The cave was identified with two distinct layers: Cau Raboser de Dalt and Cau Raboser de Baix. It has been understood that both human and archaeological findings were classified based on this distinction. Accordingly, the artifacts obtained from Cau Raboser de Baix originate from the cave's Chamber A Superficial, Chamber A/1^a, Chamber A/2^a, Chamber B/1^a, CI/12, CI/14, Left Crevice sections. On the other hand, the artifacts from Cau Raboser de Dalt are derived from the cave's Chamber B, CI/19, CII/1 sections.

A set of human remains from Cau Raboser de Dalt and Cau Raboser de Baix was selected for ¹⁴C analysis. The analysis results indicate that human remains from Cau Raboser de Dalt date back to 2866-2577 cal BC with a 95% probability and 2848-2587 cal BC with a 68% probability, placing them in the third millennium BC (Table 4.1.).

For Cau Raboser de Baix, the remains are dated to 2874-2587 cal BC with a 95% probability and 2865-2635 cal BC with a 68% probability (Table 4.1.). These findings suggest the utilization of the cave during the Chalcolithic period, aligning consistently with archaeological evidence (refer to the material chapter).

4.1.1. Cau Raboser de Dalt

The state of preservation of the human remains reflects a considerable degree of degradation. Nevertheless, the analysis has identified a minimum of six individuals within this deteriorated context (Table 4.1.1.2.). This group comprises three children, one infant, one adolescent, and one adult, whose ages were determined through various anthropological methods outlined in the methodology chapter:

1. A non-adult individual, estimated to be around 10 years old, based on dental development (Figure 4.1.1.2.). This aligns with a range of 10 years $\pm$ 2 years in Ubelaker (1991) and 10.5 years in AlQahtani (2010). Additionally, the proximal epiphysis of the tibia and distal epiphysis of the femur (Figure 4.1.1.4.) exhibit features indicative of a 10-year-old individual.
2. Another non-adult, approximately 3 years old, determined through dental information (Figure 4.1.1.1.). This corresponds to about 3 years in Ubelaker (1991) and 3.5 years in AlQahtani (2010). The fusion degree of the axis supports this age range, and the identification of another axis further reinforces the presence of **two non-adult** individuals.
3. An infant estimated to be around 1 year old, based on dental development (Figure 4.1.1.3.). This aligns with a range of 18 months $\pm$ 6 months in Ubelaker (1991) and 1.5 years in AlQahtani (2010).
4. An adolescent individual, approximately 17 years old, determined through bone development (Figure 4.1.1.7.).
5. An adult individual (Figure 4.1.1.5. and Figure 4.1.1.6.). The age of the adult, estimated to be around 30 years old based on maxillary tooth-wear, is indicative of the challenges in obtaining comprehensive data due to the conditions of the remains. Unfortunately, determining the sex of the adult individual is not feasible given the preservation challenges.

The collection “75247”:

- Remains of an adult human are identified, but the preservation is notably poor. The collection includes 11 fragments of ribs, the right navicular, one right talus, one piece of ilium, and 10 vertebrae (comprising two lumbar, two cervical, one atlas, three thoracic, and two undefined remains of vertebrae). Additionally, iliac crest is fused.

- Representing a non-adult individual, the skeletal remains include an incompletely fused right clavicle, a left calcaneus, a right talus, six fragments of costae, and a right scapula. The corpus of the scapula is broken, and the glenoid cavity is still developing (Figure 4.1.1.7.).

- Representing an infant, the maxilla is fragmented, with the corpus and left side intact. There are no teeth present on the maxilla due to postmortem tooth-loss. A permanent molar is observed to be growing inside the jaw. Additionally, there are isolated crowns of two permanent molars (one maxillary and one mandibular), one deciduous incisor, one deciduous molar, and three deciduous canines. The overall condition of the maxilla is moderate (Figure 4.1.1.1.).

- Characteristic of an infant, the skeletal assemblage comprises 14 vertebrae, including three vertebral bodies, five spinal areas (likely thoracic), and one small, likely spinal fragment, which remains unidentified due to its condition. Additionally, there are two axis vertebrae, one of which only has the dens part, as well as one cervical, one thoracic, and one lumbar vertebra. Two sacrum pieces are present, both unfused; one includes the alae part with the L5 facet in the promontory region, while the other represents the mid-segment of the sacrum. Two epiphyses of the proximal tibia, belonging to different age groups, are identified, along with one unfused proximal radius, two unidentified skeletal fragments, and two phalanges (one from the hand and one from the foot).

- The proximal epiphyses of the tibia, distal epiphyses of the femur, and left calcaneus have been observed. While the epiphyses of the femur and tibia are unfused, the calcaneus exhibits ongoing ossification. All of these elements belong to a non-adult individual (Figure 4.1.1.4.).

- Sixteen metatarsals, fifteen phalanges for the foot, and thirty-five phalanges for the hand are identified. Additionally, there are six tarsal bones, including five cuneiforms and one right navicular. Furthermore, twenty-two carpal bones are present, comprising one right scaphoid, one hamate, two capitate, one pisiform, three trapezium, six triquetral, two trapezoid, and six lunate bones.

- Nineteen burnt bone fragments. Their conditions are poor (Figure 4.1.1.17.).

- One manubrium sterni and one left tympanic bone have been identified. A fragment of the left orbital area has also been detected, but this piece is broken. Only a small part where the left frontal-supraorbital margin-superciliary arch areas intersect is present, and detailed information could not be obtained due to this condition. Additionally, there is one, likely hyoid bone has been detected. Two unfused pieces of sternum belong to a non-adult individual. The preservation of the other 79 fragments of the skeleton, including long bone remains, crania, and other indeterminate skeletal parts, is extremely poor (Figure 4.1.1.18.).

- In the non-adult sample, the dental composition includes five deciduous incisors, three deciduous canines, five deciduous molars, one undefined deciduous tooth due to high degree of tooth-wear, two permanent molar crowns, three permanent molars, five premolars, two permanent canines, and one permanent incisor.

- In contrast, the adult sample exhibits a dental configuration consisting of eleven molars, three canines, twelve incisors, seventeen premolars, and two undefined roots which their crown part is broken or vanished because of the extreme tooth-wear. The overall condition of the isolated teeth is considered moderate: Six permanent molars exhibit various degrees of damage: one has half of the crown broken, the root of two molars is partially broken, one molar retains only the root area, and two molars have small fragments remaining from the crown. The permanent premolar teeth exhibit varying degrees of tooth wear, with four premolars experiencing the complete disappearance of their crowns due to extreme tooth wear. Half of the crown of the

permanent incisor is broken, and two other permanent incisors exhibit a high degree of tooth wear, causing the near disappearance of their crown parts.

The collection “75251”:

- One phalange with a naturally occurring foramen is observed; its juvenile characteristics are evident, particularly in the base part, suggesting a potential juvenile status.

The collection “75255”:

- Representing a juvenile individual, the skeletal assemblage consists of 10 vertebrae (including one atlas, one axis, one cervical, one undefined corpus, two thoracic, and four lumbar vertebrae), two patellae (on the left and right), an unfused femur head and distal epiphyses, one coxae remain (notably small), five costae fragments, one left talus, one hallux (on the right side), four metacarpals, one cuneiform, one capitate, one lunate, seven phalanges (five hand and two foot), three shafts (likely long bone remains), and 10 unidentified small fragments. General aspects of all of them are moderate.

- Eight isolated permanent teeth have been identified, presenting distinct conditions. Three incisors are noted, one of which is broken; a molar is also broken; two premolars include one with an open root; a likely canine displays a severely deteriorated condition due to significant tooth-wear. Additionally, an unidentified tooth is present but broken, further complicating the assessment of their individual characteristics and conditions.

The collection “75299”:

- An adult individual is represented by a fragmented right maxilla. From the right canine socket to right M3, teeth are present, but the canine is missing due to postmortem tooth-loss. The maxilla exhibits a high degree of tooth-wear (see Table 4.1.1.1.).

A limited number of pathological conditions have been discerned in the skeletal remains, with a more comprehensive analysis of paleopathological aspects impeded by the preservation state of the specimens. Notably, enthesopathy has been identified in the phalanges, as illustrated in Figure 4.1.1.8. Enthesopathy refers to the pathological condition involving inflammation at the sites of attachment (entheses) where tendons, ligaments, or joint capsules connect to bones (Aufderheide and Martin, 1998; Ortner, 2003; Mann and Hunt, 2005). Various types of enthesopathy exist, frequently associated with specific causes or underlying diseases (see more detail Mann and Hunt, 2005). Moreover, repetitive stress or trauma can serve as triggers for this condition. Additionally, arthritis has been observed in two phalanges of the foot, as depicted in Figure 4.1.1.9. Osteoarthritis is evident in a thoracic vertebra (Figure 4.1.1.12.), while a lumbar vertebra displays a lack of fusion in the vertebral rim (Figure 4.1.1.13.).

Examining the dental data has revealed enamel hypoplasia, as illustrated in Figure 4.1.1.11. Dental hypoplasia is defined as a deficiency or disruption in the normal development of tooth enamel (Buikstra and Ubelaker, 1994; Aufderheide and Martin, 1998). It typically results from interruptions in the mineralization process of tooth enamel, leading to the tooth having a surface that is smaller, rougher, or pitted compared to the norm. This condition often arises due to various stress factors or diseases during tooth development (Goodman and Rose, 1991; Aufderheide and Martin, 1998; White and Folkens, 2005). Common causes include nutritional deficiencies, infections, trauma, or genetic factors. Dental hypoplasia, occurring most frequently during childhood, bears the traces of various factors affecting tooth development. In archaeological investigations, traces of dental hypoplasia can provide insights into the nutritional status, childhood diseases of past societies.

Moreover, dental caries was identified in three permanent teeth, with occlusal surface caries in two molars and interfacial surface caries in a premolar (Figure 4.1.1.10.). The permanent teeth also exhibit varying degrees of tooth wear, a phenomenon that could be attributed to factors such as age, occupation, or dietary habits. However, due to the scarcity of remains, establishing a definitive cause for tooth-wear remains challenging. Incorporating general insights into paleopathology, this analysis provides a glimpse into the health conditions and lifestyles of the studied population.

Two cervical vertebrae exhibit bilateral duplication of the foramen transversarium, as illustrated in Figure 4.1.1.14. The foramen transversarium is an anatomical feature specific to the cervical vertebrae within the vertebral column. It represents a passage or opening within each transverse process of these vertebrae. The transverse processes are osseous projections that extend laterally from either side of the vertebra. The primary purpose of the foramen transversarium is to serve as a conduit for the vertebral arteries and veins as they traverse the cervical vertebrae. These vessels play a crucial role in supplying blood to the brain (Ellis, 2006).

The vertebral artery courses through the foramen transversarium in the upper six cervical vertebrae (C1 to C6), while the vertebral vein may also pass through it. Occasionally, a duplication of the foramen transversarium may be observed on each side of the cervical vertebrae. The precise etiology of this congenital variation remains unclear. Some scholars suggest that this variation can be caused by vertebral artery insufficiency which may lead to headache, migraine and fainting attacks (Kaya et. al., 2011).

Moreover, additional findings include animal bones, specifically identified through examination as belonging to the Bovidae and Leporidae families (Figure 4.1.1.15. and Figure 4.1.1.16.). Several of these animal bones exhibit distinctive superficial cut marks.

Several burnt bone remnants have been identified (Figure 4.1.1.17.), raising questions about whether these burnings were conducted for ritualistic purposes or if the exposure to fire resulted from other causes. The degrees of burning in these bone fragments vary. Given the limited quantity of burnt remains and the discrepancies in the degrees of burning, the possibility of cremation or a burial ritual involving fire may seem unlikely. The ambiguity surrounding the intent behind these burnings, whether ritualistic or incidental, adds complexity to the interpretation of these archaeological findings.

Cau Raboser de Dalt (Chalcolithic)	Human Remains
75247	16 metatarsals; 16 tarsal phalanges; 36 carpal phalanges; 5 cuneiform; 2 right navicular; 22 carpal bones (1 right scaphoid, 1 hamate, 2 capitate, 1 pisiform, 3 trapezium, 6 triquetrum, 2 trapezoid, 6 lunate); undetermined bone fragments; manubrium sterni; 1 left tympanic bone; 1 left orbital bone fragment; 4 cranium fragments; hyoid bone?; 2 juvenile sternum fragments; 2 left calcaneus; 24 vertebrae (2 atlas, 3 axis, 3 cervicals, 2 thoracic, 4 lumbar, 2 corpus, 5 spines, 3 undefined); 18 costae fragments; proximal unfused tibia; distal unfused femur; 1 right clavicle; ; 1 right talus; ; 1 right fragmented scapula; 2 long bone remains; 1 ilium remain; 1 maxilla fragment (non-adult); 2 unfused longbone heads; 1 femur distal?
75247 (isolated teeth)	Non-adult: 5 deciduous incisor, 3 deciduous canine, 5 deciduous molar, 1 undefined deciduous, 2 permanent molar crowns, 3 permanent molar, 5 permanent premolar, 2 permanent canine, 1 permanent incisor. Adult: 11 molars, 3 canines, 12 incisors, 17 premolar, 2 undefined roots
75251	One phalange
75255	10 vertebrae (1 atlas, 1 axis, 1 cervical, 2 thoracic, 4 lumbar, 1 undefined corpus); unfused femur head and distal; 1 coxae piece; talus, 2 patella (left-right); 3 shafts; 5 costae; 4 metacarpals; 7 phalanges (5 hand, 2 foot); 1 right hallux; 1 capitate; 1 cuneiform, 1 lunate; 10 undefined remains; 8 permanent teeth (3 incisors, 1 molar, 2 premolars, 1 canine?, 1 undefined)
75299	Right fragmented maxilla

Table 4.1.1.1.: Human remains of Cau Raboser de Dalt

Infant	± 1 year old
Juvenile	± 3 years old ± 3 years old ± 10 years old
Adolescent	± 17 years old
Adult	± 30 years old

Table 4.1.1.2.: Individuals of Cau Raboser de Dalt



Figure 4.1.1.1.: Around 3 years old individual



Figure 4.1.1.2.: Approximately 10-year-old individual



Figure 4.1.1.3.: 18 months $\pm$ 6 months



Figure 4.1.1.4.: Approximately 10-year-old individual



Figure 4.1.1.5.: Adult maxilla, occlusal angle



Figure 4.1.1.6.: Adult maxilla, front angle



Figure 4.1.1.7.: Adolescent individual



Figure 4.1.1.8.: Enthesopathy in phalanges

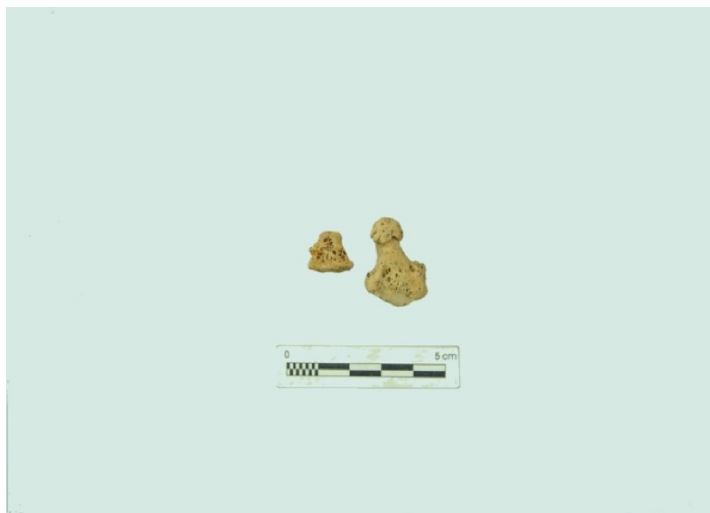


Figure 4.1.1.9.: Arthritis in phalange



Figure 4.1.1.10.: Dental carries



Figure 4.1.1.11.: Dental hypoplasia



Figure 4.1.1.12.: Osteoarthritis in thoracic vertebra

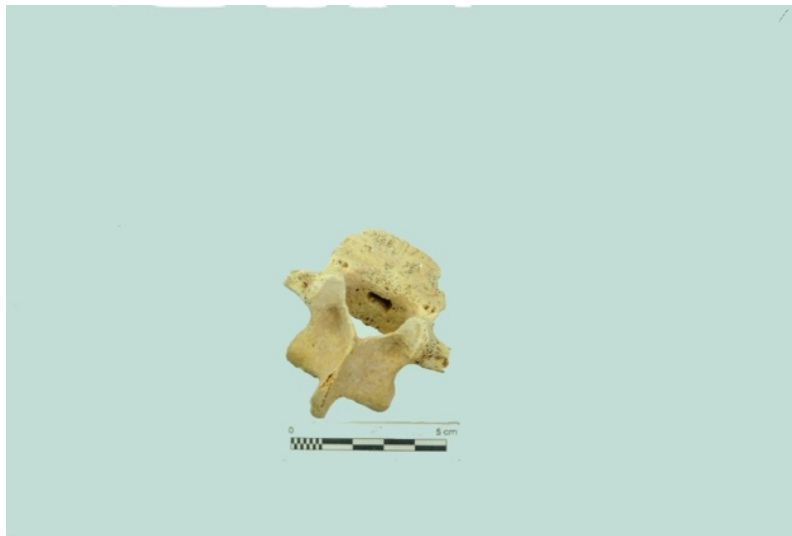


Figure 4.1.1.13.: Lack of fusion in lumbar vertebra

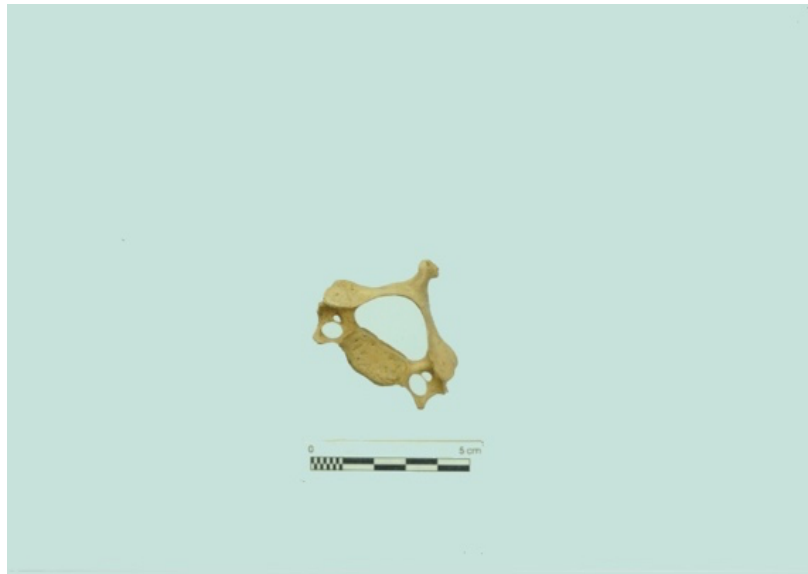


Figure 4.1.1.14.: Variation in cervical vertebra



Figure 4.1.1.15.: Animal bones



Figure 4.1.1.16.: Animal bones



Figure 4.1.1.17.: Unidentified burnt remains



Figure 4.1.1.18.: Remains of “75247”

4.1.2. Cau Raboser de Baix

A minimum of six individuals have been excavated from the site (Table 4.1.2.2.). One non-adult individual, estimated to be around 8 years old (with a range of 8 years $\pm$ 2 years according to Ubelaker and 8.5 years according to AlQahtani), has been identified through dental analysis (Figure 4.1.2.1.).

Additionally, another non-adult individual, approximately 12 years old, has been determined based on bone development (Figure 4.1.2.2.). Furthermore, the examination of bones has revealed the presence of one perinatal or natal individual (Figure 4.1.2.3.).

From the analysis of three left maxillae, a minimum of three adult individuals has been identified, while other remains did not provide specific information about the number of individuals. Characteristics observed in the mandible, such as the structure of the mandibular angulus, the prominent mentum, and overall robust features found in at least one of the identified minimum three adult individuals, suggest the likelihood of this individual being male (Figure 4.1.2.4.). Tooth wear in the mandible estimates the age to be around +35 years. Concurrently, the delicacy of the mastoid process in the temporal bone and features of the sciatic notch indicate that the other individual might be female, with bone developments demonstrating an age of +30 years old. The two of three maxillae of the adult individuals have demonstrated a similar age range (Figure 4.1.2.5. and Figure 4.1.2.6.), approximately 30 years or higher while the third maxilla has shown advance adult features (see Figure 4.1.2.9.).

The collection “75282”:

- A right distal humerus, a right distal radius, and a distal ulna (though defining the latter proves challenging due to damage at the distal end).
- The left part of the maxilla, extending from the second incisor to M³, exhibits a broken second incisor with uncertainty regarding whether the damage occurred postmortem or antemortem (Figure 4.1.2.5.). The remaining teeth show a low degree of tooth wear.
- Additionally, a right patella, a damaged vertebra corpus, and a left zygomatic fragment have been uncovered. Among the finds are six fragments of crania, with five likely belonging to the parietal area and one to the temporal area.
- Additionally, a foot phalanx and two metatarsal fragments are present, though clarity on whether these fragments belong to each other remains elusive. Two cuneiforms, a fragmented of scapula with a present but poorly conditioned glenoid part, and a broken costa lacking

identifiable information further contribute to the assemblage. Lastly, eleven undetermined bone pieces, with some potentially linked to long bones.

The collection “75284”:

- Three isolated teeth have been identified within the assemblage. One of these teeth is a molar crown, and its ongoing growth indicates that it belongs to a non-adult individual. Another molar, present in the collection, is attributed to an adult individual. The adult molar exhibits an exceptionally high degree of tooth wear, evident in its notably plain surface. The third tooth is identified as an incisor, characterized by a low degree of tooth wear.

The collection “75304”:

- The skeletal remains include the frontal bone of an adult individual, and a small piece of the parietal bone has also been preserved. The entire frontal bone is intact. On the surface, soil effects are noticeable, and the superciliary arch is slightly discernible.

The collection “75305”:

- In the examination of adult skeletal remains, the overall preservation is notably poor. Among the findings are two phalanges (foot), one hamate, two fragments of vertebra (one solely comprising the spine area and the other representing a broken corpus), five pieces of costae, and a deteriorated distal part of a femur. Additionally, 26 unidentified skeletal remains, likely pertaining to crania and long bones, unfortunately lack clarity due to poor preservation. The bone remains exhibit robust characteristics.

- The mandible corpus has been recovered, revealing only sockets with no teeth present. Notably, the sockets of the central and second incisors and the right premolars are noticeable, though the overall condition of the mandible is very poor.

- Four isolated teeth have been identified, comprising one maxillary molar, one mandibular molar, one premolar, and one incisor. The mandibular molar exhibits a very high degree of tooth wear, while the maxillary molar shows a low degree of tooth wear. All identified teeth are permanent.

The collection “75307”:

- The skeletal remains of an adult individual include nine thoracic vertebrae, encompassing two spine areas, three corpora, and four whole vertebrae. Additionally, 27 fragments of costae have been identified, albeit with extremely poor preservation.

- The left humerus is incomplete, lacking its proximal part. The left ulna exhibits the presence of the proximal and shaft areas, with the proximal part missing. Both left and right radii are present, with the left radius having only the proximal area, while the right radius includes both proximal and shaft parts. The left fibula is extant, excluding its proximal part. Furthermore, there is a single long bone remain, likely belonging to a radius bone.

- The fragment of the coxae includes the ischium, the obturator foramen, and a portion of the acetabulum.

- The occipital bone has been identified, but its condition is very poor, constituting only a fragmented portion of the entire occipital bone.

- A left calcaneus has been observed.

- The left side of the maxilla reveals evidence of antemortem tooth loss, specifically for PM⁴, M¹, and M². Moreover, the jaw exhibits very high degrees of tooth wear for M³ and P³.

- Three isolated teeth have been discovered, including one incisor, one canine, and one premolar. Notably, these isolated teeth also demonstrate a very high degree of tooth wear.
- A fragment of the coracoid process of the scapula has been noticed, and there is a fragment of the clavicle, although it is broken into small pieces.
- Seventeen pieces of undetermined bone remains have been detected; unfortunately, their poor condition impedes the extraction of any information.

The collection “75308”:

- The skeletal remains of an adult individual consist of fragmented coxae, including remnants of the acetabulum, sciatic notch, and parts of the auricular surface. Notably, the sciatic notch appears wide.
- Additionally, a left femur is present, albeit with its distal part missing. The femur's caput is broad, and the linea aspera is discernible, contributing to its overall prominent appearance.
- A right ulna has also been recovered, although its distal part is broken. There is a single scapula fragment, featuring sections of the acromion and glenoid cavity.
- Furthermore, one metatarsal, a very small piece of a rib fragment, one lumbar vertebra, a broken right talus, and a right navicular bone have been identified. Another fragmented remain, likely belonging to a long bone, has been found, along with one undetermined fragment.

The collection “75309”:

- An adult individual's remains include one left tympanic area featuring a large mastoid process. Additionally, there's a small fragment from the occipital area and three other cranium fragments, albeit challenging to identify due to their condition.
- Two robust tarsal phalanges are present along with 16 undetermined bone fragments. A femur shaft fragment, in extremely poor condition, is also among the findings.
- Furthermore, two isolated teeth—a premolar and an incisor—have been discovered, showing signs of tooth wear.
- Additionally, an infantile rib fragment has been identified, indicating the individual may have been neonatal or perinatal in age.

The collection “75312”:

- Nine fragments of a cranium have been recovered, but due to their small size, they are not identifiable. Additionally, one, likely a fibula shaft, one proximal head of the fibula, one distal head of the fibula, and four other shaft pieces of long bones have been found, all of which remain unidentified.
- A left talus and one hamate bone have also been discovered. Six phalanges have been recovered, including one tarsal, four carpal, and one broken phalanx. Furthermore, one metatarsal has been identified.
- Three vertebrae have been observed: one lumbar, one corpus of the thoracic vertebra, and one arch in the spine area. The proximal part of the sacrum (S1) has also been recovered. Two

pieces of the scapula have been found, including one with a broken glenoid cavity and one acromion.

- Moreover, 24 fragments of ribs have been observed, but their condition is extremely poor. Additionally, 84 undetermined bone pieces have been collected, all of which are in extremely poor condition and too small to gather any information from.

- An adult mandible has been recovered, comprising three broken parts, although all parts are present except for the right mandibular condyle. On the left side, there are canine, premolars, and M₁ and M₂ molars present, while on the right side, P₄, M₁, M₂, and M₃ molars are present. There is no evidence of antemortem tooth loss; only postmortem tooth loss has been observed. Furthermore, a high degree of tooth wear has been noted. The general aspect of the mandible is robust.

- Isolated teeth have been found, including three premolars, three incisors, one M₃ (likely mandibular), one maxillary M¹ with its socket, and one unidentified tooth due to a high degree of tooth wear. Generally, isolated teeth exhibit signs of tooth wear. Additionally, an extremely small part of the maxilla bone has been recognized, but due to its poor condition, no further information has been obtained.

- A non-adult individual is represented by skeletal remains comprising an unfused left distal tibia epiphysis and a left talus. Additionally, three isolated teeth have been recovered: one deciduous molar, one permanent canine still in the process of growth, and one permanent molar crown also still growing. Furthermore, a tarsal phalanx and one undetermined bone remain have been identified.

- Moreover, there is evidence suggesting the presence of a prenatal or neonatal individual, including three ribs, with only one complete, the others in very poor condition, one broken vertebral arch, and one remaining metatarsal or metacarpal.

The collection “75313”:

- The remains consist of a fragmented adult femur, with its condition severely deteriorated and both distal and proximal parts missing. Only a portion of the shaft area has been recovered, making it impossible to determine its side. Additionally, the shaft exhibits a green coloration, likely due to soil effects.

The collection “75315”:

- Two lumbar vertebrae, one probably thoracic vertebra, and one fragmented vertebral corpus (due to unidentified breakage). Eleven fragments of costae, with extremely poor preservation.

- A fragmented part of the ilium of the os coxae exists. One humeral shaft, probably from the right side, with poor preservation due to broken distal and proximal parts. The general aspect of the humerus is gracile. One carpal phalanx exists.

- Two fragments of the basal part of the cranium, one broken and a small part of the left zygomatic bone, along with six unidentified cranial pieces. Twenty-eight unidentified skeletal fragments, with extremely poor condition. All remains represents an adult individual or individuals.

The collection “75316”:

- An adult individual is represented by skeletal remains comprising one lumbar vertebra, which is in moderate condition.

- Additionally, there is a small ilium fragment, lacking significant information. Two metatarsals are present, with the distal portion of one being broken. There is also one broken carpal phalange, one hamate, and one triquetral bone.

- Furthermore, thirty-six fragments have been recovered, eight of which are cranial fragments, four belong to ribs, while the rest are unidentified due to their extremely poor condition.

- A fragmented left maxilla has been identified, with all sockets present on the left side, although no teeth remain in the maxilla due to postmortem tooth loss. The condition of the maxilla is very poor. Additionally, six isolated teeth have been recovered: four incisors and two molars. One of the molars is in the process of erupting, with only the crown area present. Furthermore, one incisor is broken postmortem. Generally, the teeth are in a normal condition, with only one incisor exhibiting a low degree of tooth wear.

- A fragmented femur has been identified, belonging to a non-adult individual. The distal part is broken, while the proximal part is present and unfused.

The collection “75319”:

- One femur shaft, one tibia shaft, and one proximal part of the right ulna, with a broken olecranon process, as well as one proximal part of the right radius, have been identified. Their conditions are noted to be very poor.

- Additionally, one tympanic bone has been recovered, also in poor condition. A single vertebra spine has been found. Three cranial fragments, each consisting of extremely small pieces, have been recovered. Six fragments of costae, all of which are small pieces, have also been collected.

- Furthermore, two phalanges (one carpal, one tarsal) and six undetermined bone pieces have been recovered.

- A bone fragment from a perinatal or neonatal individual has been identified, likely belonging to a metacarpal or metatarsal bone.

- Additionally, one central part of the maxilla has been identified, with only sockets visible due to its extremely poor condition. Finally, two isolated molars showing moderate tooth wear have been discovered. All collection belongs to an adult individual or individuals.

The collection “75320”:

- Two fragments of an adult crania have been recovered, specifically from the parietal area. The structure of these fragments appears to be thick in form. However, despite their relatively large size, no discernible details or additional information have been gathered.

The collection “75321”:

- Cranial fragments have been identified, but their preservation is extremely poor. Only the left tympanic bone has been recognized, while the other seven fragments remain unidentified. Despite the condition, the remains exhibit adult features.

The collection “75322”:

- One tibia has been identified, with the distal part broken and the epiphysis of the proximal part unfused. Additionally, a long bone shaft has been recovered, although fragmented, it likely belongs to a femur.

- Three coxae fragments have also been found: one fragment showing a broken sciatic notch, another being a small fragment of the unfused ilium, and the third fragment representing the auricular surface area, albeit broken yet identifiable.

- Furthermore, there is one unidentified fragment due to its small size.

- Finally, a maxilla remains, but due to its extremely poor condition, its side (left or right) and other identifiable features cannot be determined (Table 4.1.2.1 and Table 4.1.2.3).

Due to the significantly poor preservation state of the skeletons, the scope of identified paleopathological findings is notably restricted. In the vertebrae (see Figure 4.1.2.7. and Figure 4.1.2.8.), indications of osteoarthritis and osteophyte formations have been discerned. Osteophytes, commonly referred to as bone spurs, manifest as bony outgrowths along the edges of existing bones, typically in response to factors like aging, joint instability, or degenerative joint diseases such as osteoarthritis (Aufderheide and Martin, 1998). These formations can arise in various joints, including the spine, knees, hips, fingers, and toes. Comprising bone tissue, osteophytes can exhibit diverse shapes and sizes, ranging from smooth to jagged. It is noteworthy that, although osteophytes are often associated with aging (Aufderheide and Martin, 1998), they can develop in response to various joint-affecting conditions and are not exclusive to older individuals (Ortner, 2003).

A cribra femoralis was identified on one femur neck (see Figure 4.1.2.10.). The term "cribra" is of Latin origin and translates to "sieve" or "mesh." Cribra femoralis, an anatomical feature observed in human skeletal remains, involves the presence of multiple small openings or pores in the cortical bone of the femoral neck. This pathology is thought to be associated with conditions such as anemia, especially those caused by iron deficiency, malnutrition, and certain infectious diseases (Aufderheide and Martin, 1998; White and Folkens, 2005; Waldron, 2009).

An adult fragmented maxilla exhibited evidence of antemortem tooth loss (see Figure. 4.1.2.9.). Accordingly, the individual lost the second premolar, as well as the first and second molars on the left side of the maxilla. Antemortem tooth loss denotes the loss of one or more teeth during

an individual's lifetime. Common factors contributing to tooth loss include dental caries, periodontal diseases, and abscesses. Nutritional deficiencies, other health issues, and a lack of oral hygiene can serve as indicators of dental pathologies. Additionally, a high level of tooth wear was detected in the same maxilla, suggesting that the age of this individual might be advanced, possibly exceeding 45 years. Furthermore, an isolated permanent molar has caries interface, and the same molar has shown very high degree of tooth wear. Conversely, a high level of tooth wear may be indicative of occupational stresses or diet-related deformations.

As a final, some animal bones have been recovered. Those remains have shown Bovidae and Leporidae families features (Figure 4.1.2.11. and Figure 4.1.2.12.).

Cau Raboser de Baix (Chalcolithic)	Human Remains
75313	Fragmented femur
75284	Isolated teeth: 1 permanent molar (is growing), 1 permanent molar, 1 permanent incisor
75305	2 phalanges(foot);1 hamate; 2 fragmented vertebrae; 5 fragmented costae; undefined remains; mandibula corpus; 1 permanent maxillary molar; 1 permanent mandibular molar; 1 permanent incisor; 1 permanent premolar
75321	Fragmented cranium: left tympanic bone, 7 undefined small pieces
75315	1 undefined jaw piece; 2 isolated teeth (1 premolar, 1 permanent canine); 4 vertebrae (2 lumbar, 1 thoracic, 1 corpus); 11 fragmented costae; cranium (2 pieces basal part, 1 broken left zygomatic, 5 fragments); 1 right humerus shaft (gracile); 1 hand phalange; 2 pieces ilium
75319	1 femur shaft; 1 tibia shaft; 1 right proximal ulna; 1 right proximal radius; 1 tympanic bone; 6 costae; 2 phalanges (1 hand, 1 foot); 3 cranium pieces; 6 undetermined remains; 1

	broken vertebra; 1 small jaw piece (maxilla?); 2 isolated molar
75312/1	Mandibula; small maxilla piece; proximal sacrum; left talus; 9 cranium pieces; 1 proximal fibula; 1 distal fibula; 5 long bones shaft (upper and low limb); 1 hamate; 6 phalanges (1 foot, 4 hand, 1 broken); 1 metatarsal; 3 vertebrae (1lumbar, 1 throcal corpus, 1 arc); 2 scapula pieces (acromion, glenoid cavity); 24 costae; undetermined remains; 9 isolated teeth (3 premolar, 3 incisor, 1 M3,1M1, 1 broken crown)
75312/2	Right distal tibia; left talus; 2 costae, 2 vertebrae arc; isolated teeth (1 deciduous molar, 1 permanent molar crown, 1 growing canine); 1 small jaw piece? ; 2 phalanges
75307	Left distal humerus; left and right proximal radius; left proximal ulna; fragmented foramen obturatum; fragmented occipital; left calcaneus; 9 thoracic vertebrae (2 arc, 3 corpuses, 4 whole); 27 costae; left distal fibula; 1 fragmented clavícula; 1 coracoid process of scapula; 2 fragmented long bones(fibula?); undetermined remains; left maxilla; M3 exists
75308	Fragmented left femur; right proximal ulna; fragmented coxae; 1 metatarsal; 1 fragmented right talus; 1 fragmented scapula; 1 costa; 1 fragmented long bone; 1 undetermined remain; 1 lumbar vertebrae; 1 navicular
75316/1	Left maxilla; 1 lumbar vertebra; 1 small ilium piece; 2 metatarsals; 1 hand phalange; 1 hamate; 1 undefined carpal; 4 costae; 8 cranium pieces; undetermined remains; isolated 5 teeth (4 incisor, 1 molar)
75316/2	Right distal femur; 5 undetermined pieces; 1 molar
75320	2 cranium pieces (parietal)

75309/1	1 left tympanic; 1 small occipital; 1 broken talus; 3 cranium pieces; 2 phalanges (foot); 1 broken femur shaft; undetermined remains; 2 isolated teeth (1 premolar, 1 incisor)
75309/2	1 rib
75322	1 undefined long bone piece (femur shaft?); 1 jaw piece (maxilla?); 1 proximal-shaft right tibia; 1 broken ilium
75304	Frontal bone
75282	1 right distal humerus; 1 right distal radius; 1 distal ulna? ;1 left maxilla; 6 cranium pieces; 1 left zygomatic; 1 right patella; 1 vertebrae corpus (thoracic?); 2 costae; 1 foot phalange; 2 metatarsals; 2 tarsals (cuneiform); 1 fragmented scapula; 1 costa; undetermined remains

Table 4.1.2.1.: Human remains of Cau Raboser de Baix

Infant	1 perinatal or natal
Juvenile	±8 years old ±12 years old
Adult	1 female 1 male 1 undetermined

Table 4.1.2.2.: Individuals of Cau Raboser de Baix

Postcranial parts	2 right humeri 2 right radii 2 right proximal ulna
Cranial parts	3 left maxillas 2 mandibles 2 left mastoid processes

Table 4.1.2.3.: Most frequency remains of Cau Raboser de Baix



Figure 4.1.2.1.: Dentals of around 8-year-old



Figure 4.1.2.2.: Talus and tibia epiphysis belong to nearly 12-year-old individual



Figure 4.1.2.3.: Bone remain of perinatal or natal individual



Figure 4.1.2.4.: Mandible of the male individual



Figure 4.1.2.5.: Maxilla



Figure 4.1.2.6.: Maxilla



Figure 4.1.2.7.: Osteoarthritis and osteophytes on vertebrae



Figure 4.1.2.8.: Osteophytes on vertebra



Figure 4.1.2.9.: Ante-mortem tooth loss on maxilla



Figure 4.1.2.10.: Cribra femoralis on femur neck



Figure 4.1.2.11.: Animal remains belong to Leporidae



Figure 4.1.2.12.: Animal remains belong to Bovidae

4.2. Cova del Monedero (Avenc dels dos Forats)

According to the data on discovery labels, the human remains discovered from Cova del Monedero appear to date back to the 1976 excavation period. In accordance with the ¹⁴C results derived from the selected skeletal remains, Avenc dels dos Forats is dated to 3001-2892 cal BC with a probability of 68%, and to 3010-2887 cal BC with a probability of 95%, placing it in the third millennium BC (Table 4.1.).

A minimum one individual has been identified. The features of the remains indicate that this individual could be a young adult. The mandibula (Figure 4.2.1.) displays male characteristics, and the prominent mentum is a significant indicator for sex determination. According to dental aging, this individual is estimated to be 18-20 years old (Lovejoy, 1985), with no signs of tooth wear. Furthermore, the trace of epiphysis closure of the ulna (Figure 4.2.2.) suggests an age range of 18-23 years.

The collection “75207”:

- Seven small fragments of crania have been detected. Due to the conditions of cranium remains are very poor, these fragments have not been investigated.
- Two hand phalanges have been noticed. No specific pathologies or anomalies have been detected.
- A broken humerus head have been recovered. The small piece of this humerus head not suitable for to get any information. Also, another small remain have been noticed, and this remain probably belong to talus bone.
- Three isolated teeth have been examined. Two of them are premolar teeth, the last one is molar tooth. The enamel of one premolar tooth is broken. The other premolar's condition is

good, it has not shown any sign about tooth-wear. Due to the soil impact, the molar tooth exhibits a darkened appearance and is covered with sediment. Moreover, the molar tooth has low degree tooth-wear.

The collection “75212”:

- Seven cranium pieces. One of them is the fragment of the temporal bone, and this remnant probably belongs to a non-adult individual. However, the dimensions of the temporal bone have not permitted a conclusive description in this situation. Since there is a lack of any remains of a non-adult individual to determine a more definitive conclusion within this discovery group, establishing a definitive determination remains challenging. The other six pieces of crania remains are too small to examine.

- Five isolated teeth have been recovered. One permanent canine, three permanent incisors, one crown of molar (probably third molar). Also, the root of molar tooth has been separated, and in two pieces. The canal of root still has opened. One incisor has broken, the root almost has vanished. The other incisors have demonstrated soil effect. The canine has shown low degree tooth-wear.

The collection “75216”:

- Four pieces of crania; one tympanic bone, and three undefined fragments of cranium exists. One thoracic vertebra, three undetermined long bone pieces, two fragments of ilium have been examined. One clavicle shaft, probably left side, has been noticed. Due to the both side of the clavicle is broken, any information has not been yielded. Lastly, another five undefined fragments have been noticed.

The collection “75218”:

- The ulna is in two pieces. This ulna exhibits traces of epiphyseal closure, indicating a high probability of belonging to a young individual (Figure 4.2.2.).
- The left side and central part of the mandible are present; although the left ramus is broken, preliminary indications suggest the presence of the third molar. Post-mortem tooth loss is evident, with only the P₄ and the M₁ and M₂ remaining in the jaw. The shape of these teeth is notably symmetrical and well-preserved (Figure 4.2.1.) (Table 4.2.1.).

Due to the lack of remains, paleopathological signs couldn't be observed. Only one thoracic vertebra has shown some pathological conditions (Figure 4.2.3.). The spinae and transversarium processes revealed a porotic structure. Additionally, a lack of fusion on the vertebral rim has been observed. Moreover, the erosion of the vertebral corpus could be a sign of aortic aneurysm problems; however, due to the absence of another part of the vertebral column, making concrete statements about this disease is not possible.

Cova del Monedero (Chalcolithic)	Human Remains
75212	7 cranium pieces (1 temporal); 5 isolated teeth (1 permanent canine, 3 permanent incisor, 1 molar (M3?))
75207	7 cranium pieces; 2 hand phalanges; 1 fragment talus?; 1 broken humerus head; 1 vertebrae arc; isolated 3 teeth (2 premolar, 1 molar)
75218	Distal and proximal ulna (2 pieces); broken mandibula (left and central exists)
75216	4 cranium pieces (1 tympanic); 2 illium pieces; 1 thoracic vertebra; 1 fragmented clavícula (left?); 1 left proximal ulna; 3 undetermined long bone pieces; 5 undetermined remains

Table 4.2.1.: Human remains of Cova del Monedero



Figure 4.2.1.: Mandibula



Figure 4.2.2.: The distal and proximal parts of left ulna



Figure 4.2.3.: Erosion in thoracic vertebra

4.3. Cova de la Caiguda

The cave, Cova de la Caiguda, dates back to the Chalcolithic (Eneolithic) period. A minimum of three individuals have been discovered (Table 4.3.2), comprising two adults and one non-adult. The dental aging of the non-adult individual (Figure 4.3.1.) suggests an age of 11 years $\pm$ 2.5 years according to Ubelaker (1991) and 11.5 years according to AlQahtani (2010).

The analysis of a complete cranium and another occipital part revealed the presence of two adult individuals. The complete cranium (24527) exhibits distinct male characteristics, including a large mastoid process, pronounced glabella, and robust zygomaticum (Figure 4.3.2.). Considering factors such as cranial suture closure and tooth wear, the estimated age of this cranium is approximately +35 years. The second occipital part (Figure 4.3.3. and Figure 4.3.4.) displays a robust nuchal crest, indicative of male sex determination.

The collection “24526”:

- The left and right scapulae. The inferior angle of left scapula is broken. Beside of that, they are well preserved. General aspect is robust.
- The left and right clavicle has been observed. Since their conditions are perfect, the measurement of length of clavicles have been calculated. According to this, the length of right and left clavicle are 17,27 cm.
- One left femur, one tibia, two fibulas have existed. All proximal and distal ends of these long bones are broken. Their general conditions are poor.
- Right talus and unidentified small bone piece exist. The condition of talus is well preserved.

- Left humerus has been observed. The proximal part of humerus is broken. General aspect of humerus is gracile.

- Two cervical vertebrae, one thoracic vertebra, one lumbar vertebra. One cervical vertebra has not corpus, only spine part exists. The conditions of other vertebrae have shown well preserved.

- In this collection 29 costae fragments have been recovered. Only nine of them have shown moderate preservation. The other remaining costae consist of challenging-to-examine 20 small fragments.

The collection “24527”:

- A complete cranium. Frontal, temporal, parietal and occipital parts have existed and have fused each other. Their conditions are perfect, except the right side of parietal bone exhibits a substantial cavity. Moreover, the face skeleton of this individual well preserved. Orbitals, nasal, zygomatics, and maxilla bones are complete. The right side of zygomatic bone and zygomatic process became deformed. The observed fractures in the parietal and zygomatic bones, devoid of evidence linking them to antemortem lesions, trauma, or disease, suggest postmortem alterations, likely influenced by taphonomic processes occurring after death. Additionally, basal part of crania is complete.

- The mandible of “24527” is mostly preserved. The ramus, coronoid process, and condylar neck have not existed of both sides. The corpus of mandible is well preserved, except the part of includes M₂ and M₃ have been vanished.

The collection “24528”:

- One occipital remain. The preservation of this remain is poor because of the soil effect. Nuchal crest is robust.

The collection “24529”:

- Non-adult mandible (Figure 4.3.1.). The condition of mandible is very poor. Only two fragments have been recovered. Beside of these two fragments, three isolated teeth have been noticed. One of them is permanent premolar, the other permanent molar. The last one is deciduous tooth, and probably canine. On the mandible left permanent second incisor, left canine which is still erupting, right P₄ also eruption is continuing, and right M₁ is still growing, however the crown of molar is broken.

The collection “24530”:

- Left radius has been examined. Except the broken proximal part, general aspect of the radius is moderate. Furthermore, it has shown gracile features (Table 4.3.1.).

The complete cranium (24527) exhibits some pathological conditions. Porotic hyperostosis and cribra orbitalia were detected (Figure 4.3.5.), pathologies commonly associated with iron deficiency anemia and malnutrition. Additionally, an osteoma was found on the parietal area (Figure 4.3.6.). Osteoma is a benign tumor, a term used in medical terminology. The word benign generally denotes harmlessness, non-cancerous nature, and a lack of propensity to become cancerous. These tumors may cause certain symptoms due to their size or pressure exerted in their location (Aufderheide and Martin, 1998).

Furthermore, antemortem tooth loss was detected in both the maxilla and mandible (Figure 4.3.7. and Figure 4.3.8.), and an abscess was observed in the maxilla. On the maxilla only right

third molar and right first incisor-left first incisor have preserved; the other teeth have been lost antemortem, and their sockets have been closed. On the mandibula all incisors, left P₃, left M₃, right M₁ have lost antemortem. Due to right part is broken, it has not been observed the situation of molar teeth. On the left side, P₄, M₁ and M₂ have preserved whereas on the right side two premolar teeth have existed. All preserved teeth have shown high degree tooth-wear. This condition might be a related aging process.

Lastly, an osseous on the lambdoid suture was noted (Figure 4.3.12.). The small bones found on the lambdoid suture are generally considered anatomical non-metric variations (Berry and Berry, 1967). These types of variations are morphological differences that naturally occur among individuals. The additional bones in the lambdoid suture region are typically referred to as Wormian bones, emerging at the juncture of the sutures in the skull. These variations are often linked to genetic factors. In other words, an individual's genetic heritage can influence the formation of such additional bones during bone development. However, these types of bone variations generally do not pose a significant health issue for individuals.

Despite this, joint degeneration was observed on the costae, and osteophytes were detected on the vertebrae (Figure 4.3.9.- Figure 4.3.10., and Figure 4.3.11.). Aging, repetitive stress, trauma, genetic factors, or other health conditions may affect these kinds of degenerations.

Among the findings obtained from the cave, skeletal remains belonging to the Leporidae and Bovidae families have also been discovered (Figure 4.3.13.).

Cova de la Caiguda (Chalcolithic)	Human Remains
24526	Scapula (left-right); 4 vertebrae (2 cervical, 1 thoracic, 1 lumbar); clavícula (left-right); 29 costae pieces; right talus; left fragmented femur; fragmented tibia; 2 fibula fragments; left distal-shaft humerus
24527	Complete cranium; fragmented mandibula
24528	Fragmented occipitale
24529	Fragmented mandibula; 3 isolated teeth (1 permanent premolar, 1 broken molar, 1 deciduous canine?)
24530	Left proximal radius

Table 4.3.1.: Human remains of Cova de la Caiguda

Juvenile	~ 11 years
Adult	Male, +35 years Male

Table 4.3.2.: Individuals of Cova de la Caiguda



Figure 4.3.1.: Non-adult individual



Figure 4.3.2.: Male Adult, complete cranium



Figure 4.3.3.: The occipital bone, ectocranial

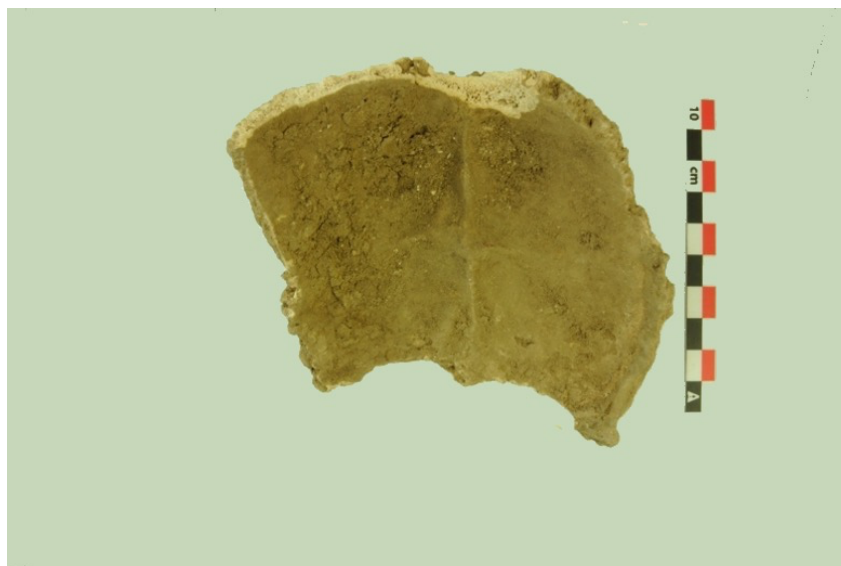


Figure 4.3.4.: The occipital bone, endocranial



Figure 4.3.5.: Porotic hyperostosis and cribra orbitalia



Figure 4.3.6.: Osteoma on crania

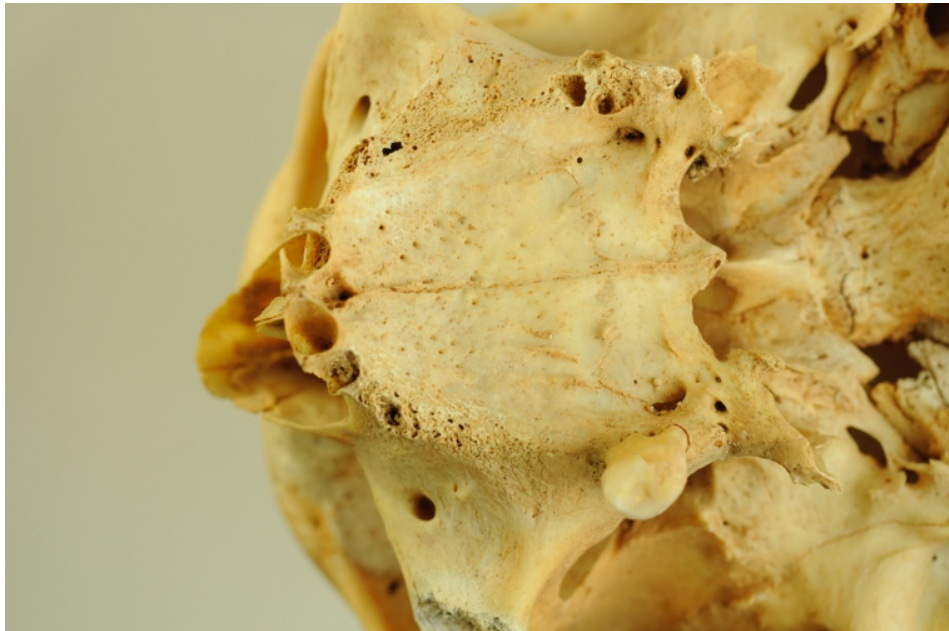


Figure 4.3.7.: Antemortem tooth-loss on maxilla



Figure 4.3.8.: Antemortem tooth-loss on mandibula



Figure 4.3.9.: Osteophyte on vertebrae



Figure 4.3.10.: Osteophyte on vertebrae



Figure 4.3.11.: Joint degeneration on costae



Figure 4.3.12.: An osseo on lambdoid suture



Figure 4.3.13.: Animal bones, Bovidae and Leporidae

4.4. Cova de la Xarta

Based on the ^{14}C results derived from samples extracted from Cova de la Xarta cave, the cave has been dated to the third millennium BC. The probability of this dating is 68%, ranging from 2879 to 2702 cal BC, and with a 95% probability, it extends from 2886 to 2669 cal BC (Table 4.1.).

Upon scrutinizing the human remains retrieved from the cave, a minimum of four individuals have been identified (Table 4.4.2.), comprising one adult and three non-adult individuals. Through dental aging, the non-adult individual is estimated to be 8 years $\pm$ 2 years (Figure 4.4.1.) in accordance with Ubelaker (1991) and 7.5 years according to AlQahtani (2010). The other non-adult, according to long bone remain, might be a perinatal (Figure 4.4.3.). The age of third non-adult individual is estimated to be 2 years $\pm$ 8 months (Figure 4.4.2.) in Ubelaker (1991) and 2.5 years in AlQahtani (2010).

The cranium of the adult individual is almost complete, excluding the basal part and the face (Figure 4.4.4.). Additionally, both the maxilla and mandibula are present (Figure 4.4.5.). The presence of small mastoid processes, a smooth arcus superciliaris, a nuchal crest, and a gracile mandibula indicates female characteristics.

Tooth-wear aging suggests a potential age of +35 years (Lovejoy, 1985) for this individual, while an estimation based on ectocranial suture closure places the age at approximately 32 years (Meindl and Lovejoy, 1985) with a standard deviation of 8.3.

The collection “75325”:

- An adult individual is represented by seven teeth, consisting of three premolars, three incisors, and one unidentified tooth due to a high degree of tooth-wear. One premolar exhibits a very high degree of tooth-wear, while the other two premolars show a low degree of tooth-wear. Among the three incisors, likely mandibular, two have cavities, with one probably being the central incisor and the other the left second incisor. The left second incisor displays a high degree of tooth-wear, nearly obliterating the occlusal surface. The last incisor, presumably the right second incisor, exhibits a similar condition with its occlusal surface almost vanished, mirroring the left second incisor.

- A non-adult individual is represented by five teeth, comprising 2 deciduous incisors, 1 deciduous molar, and 2 permanent incisors. The molar tooth is broken, while the two permanent incisors are in good condition with slightly open roots. Additionally, the deciduous incisors exhibit a good condition.

The collection “21927”:

- The cranium exhibits incompleteness in the basal part and face. The frontal, parietal, occipital, mandible, maxilla, foramen magnum, zygomatic bones, and temporals are present. The sutures are prominently visible. However, it should be noted that the cranial skeleton is not intact; rather, it is fragmented. Except the mandible and the maxilla, 15 pieces of crania has been detected.

- In the mandible, the right first and second molars (M_1 and M_2) are present, while only the left first molar (M_1) is observed. Post-mortem tooth loss has been identified, excluding the right P_4 . In the maxilla, the left first and second molars (M^1 and M^2) are present, along with the right first molar (M^1). Post-mortem tooth loss has also been observed on the maxilla. General aspects of the mandible and maxilla has been seemed moderate. Although the ramus portions on both sides of the mandible are broken, the overall body is intact and in good condition. While the maxilla is fractured into two pieces along the midline and appears to have incurred slightly

more damage compared to the mandible, all dental sockets are present and can be examined with ease.

The collection “21928”:

- Seventeen fragments of the cranium, with their structure and thickness examined, suggest the likelihood of belonging to a juvenile individual; the cranium appears to be notably thin. The conditions of the fragments are very poor.

The collection “21929”:

- Isolated teeth of non-adult: Four deciduous teeth include two incisors, one canine, and one molar. Among the four permanent teeth; one premolar is currently erupting, while three incisors exhibit various root conditions: two with nearly closed roots and one with an open root.

- Isolated teeth of adult: Fourteen permanent teeth are present, including one M_3 , four incisors, three premolars, three canines, and three undefined teeth. Due to the high degree of tooth-wear, these three teeth cannot be precisely identified. All teeth exhibit tooth-wear, ranging between a medium and high degree. Because of the caries M_3 has cavity.

The collection “21930”:

- Categorizing as juvenile, the skeletal remains consist of four metacarpals, six phalanges, and nine vertebrae, encompassing one lumbar, one thoracic corpus, one probably cervical corpus, one cervical spine, along with five fragmented spinal areas originating from unidentified vertebrae. The age range is indicative of similarities with an 8-year-old individual.

- The skeletal assemblage comprises four metatarsals, three phalanges (foot), one left talus, one right navicular, four metacarpals (two of which are first metacarpals), three hand phalanges, one hamate, one triquetral, and one capitate. All of them belong to an adult person.
- Thirteen fragments of ribs are present; however, the preservation of the costae is notably poor. There is one fibula shaft, but both proximal and distal parts are missing, indicating its overall poor condition.
- One perinatal long bone, likely to be, and an undefined skeletal remnant have been identified.
- Currently, there are 51 skeletal remains available, encompassing remnants from various skeletal regions, primarily including skull and long bone remains. However, due to the considerably poor condition of these fragments, conducting any meaningful assessment is nearly impossible (Table 4.4.1.).

Upon examining the pathological conditions of the adult individual, antemortem tooth loss has been identified, right P₄, on the mandibula (Figure 4.4.5.). Furthermore, it has been observed that the mandibula lacks the eruption of the third molar, while the maxilla has third molars.

Dental pathologies indicate caries in three teeth on the mesial side (isolated M₃, an unidentified tooth, and one incisor) (Figure 4.4.6.) and one tooth on the lingual side (Figure 4.4.7.). Both adult and non-adult individuals exhibit dental hypoplasia (Figure 4.4.8.), a condition resulting from abnormalities during tooth enamel formation. Enamel, the hard outer layer covering the tooth surface, can develop abnormalities due to various factors, including poor nutrition, serious childhood illnesses (such as febrile diseases), and trauma. Furthermore, one costa demonstrates osteophytes on its articular facet (Figure 4.4.9.).

Several animal bones have been unearthed from Cova de la Xarta, belonging to Bovidae, Muridae, Leporidae, Aves, and Serpentes (Figure 4.4.10.). Additionally, remains of malacofauna, including shells with foramens, suggesting potential human modification for jewelry-making, have been identified.

Final result, a few copper artifacts have been discovered (Figure 4.4.11.).

Cova de la Xarta (Chalcolithic)	Human Remains
75325/1	Isolated 7 teeth (3 premolars, 3 incisors, 1 undefined)
75325/2	Isolated 5 teeth (2 deciduous incisors, 1 deciduous molar, 2 permanent incisors)
21927	Cranium, except basal and face. Frontal, parietal, occipital, maxila, foramen magnum, zygomatic bones, temporal, mandibula
21930 (non-adult)	4 metacarpals; 6 phalanges; 9 vertebrae (1 lumbar, 1 thoracic corpus, 1 cervical corpus, 1 cervical arc, 5 arc fragments)
21930 (adult)	4 metatarsals; 3 feet phalanges; 1 left talus; 1 right navicular; 4 metacarpals; 3 hand phalanges; 1 hamate; 1 triquetral; 1 capitate; 13 costae, 1 fibula shaft
21930	1 probably long bone (perinatal?) and 1 undefined remain
21928	17 cranium fragments
21929 (1)	8 isolated teeth (2 deciduous incisors, 1 deciduous canine, 1 deciduous molar, 1 permanent premolar, 3 permanent incisors)
21929 (2)	14 permanent teeth (1 M3, 4 incisors, 3 premolars, 3 canines, 3 undefined teeth)

Table 4.4.1.: Human remains of Cova de la Xarta

Infantile	Perinatal
Juvenile	~ 8 years ~2 years
Adult	Female, +30 years

Table 4.4.2.: Individuals of Cova de la Xarta



Figure 4.4.1.: 2-year-old non-adult



Figure 4.4.2.: 8-year-old non-adult individual



Figure 4.4.3.: Perinatal individual



Figure 4.4.4.: Adult individual



Figure 4.4.5.: Maxillae and mandibula of adult individual



Figure 4.4.6.: Dental caries on interfaces



Figure 4.4.7.: Dental caries on lingual side



Figure 4.4.8.: Dental hypoplasia



Figure 4.4.9.: Osteophytes on costae



Figure 4.4.10.: Animal bones



Figure 4.4.11.: Copper remains

4.5. Cova dels Gats

A minimum of 10 individuals have been detected (Table 4.5.2.), including two non-adults and eight adults. Based on dental records, one non-adult is estimated to be approximately 3 years old with a margin of error of ± 1 year (Figure 4.5.1.) according to Ubelaker (1991), and approximately 3.5 years old according to AlQahtani (2010). The other non-adult individual is estimated to be approximately 9 years old with a margin of error of ± 2 years in Ubelaker (1991), and 9.5 years in AlQahtani (2010).

According to the most frequently observed bones, with the mandible being the most common, a minimum of eight adult individuals have been noticed. Based on the characteristics of these

mandibles, like mentum and total aspect of mandible, two are identified as female, two as male, and four as unidentified in terms of sex.

The collection “21944”:

- An adult cranium has been discovered, lacking the facial region with no mandible and maxilla found. The preservation of the cranium is moderate, with ectocranial sutures barely noticeable and endocranial sutures completely disappeared. The entire basal part is present and fused. Additionally, there is a hole in the left frontal area; however, it appears to be postmortem, possibly resulting from the excavation process. Lastly, the features of crania show masculine characters.

The collection “21945”:

- Two fragmented parietal bones have been recovered, with one fragment belonging to the right side and the other fragment to the left side. The sutures of the parietal bone fragments are compatible with each other, and these parietal bones are situated on the occipital bone side. Additionally, three occipital bone fragments have been recovered. Although these pieces are too small, they are also compatible with each other, and one of them directly articulates with both parietal bones on the lambdoid suture area. Two tympanic bones (left and right) have been detected. Furthermore, one orbital bone fragment has been noted, but it is too small to provide any identifiable information. The general aspect is poor.

- One left orbital fragment has been recovered, albeit small, with the zygomatic area broken. Additionally, there is a fragment from the left side of the frontal bone, featuring the supraorbital margin and a part of the superciliary arch. The left orbital fragment and the frontal remain articulate with each other. Furthermore, one right parietal fragment and one left parietal fragment have been recovered. The right parietal bone is of mid-size, while the left one is too small. Also, an occipital fragment has been observed, belonging to the lambdoid suture area. This occipital remain is too small to gather any data from. All remains appear to belong to an adult individual or individuals. The conditions of the remains are very poor.

- Additionally, thirty-one fragments of crania have been collected. However, due to their preservation are extremely poor, these remains are unidentified.

The collection “21946”:

- An adult mandible has been identified, comprising three fragments. The right-side features three molars on the jaw, but the right ramus is broken. In the central part, there are three broken segments, although dental sockets are present and easily noticeable, indicating postmortem tooth loss. On the left side, M₁ and M₂ are present, while the left side of the mandible above the M₃ tooth is broken. However, the socket for M₃ is detectable despite being broken. The molars on the right side exhibit a low degree of tooth wear, whereas those on the left side show a medium degree of tooth wear. Additionally, there is caries on the medial side of the left M₁. The angle of the mandible is smooth, the mentum is small, and the inferior border shows a thin to medium feature. Overall, the mandible appears to be of medium size. Based on these features, the individual is likely female.

The collection “21947”:

- A fragment of a non-adult mandible has been recovered, with the central and right parts present. Only deciduous m₁ and m₂ are present on the jaw. The permanent right M₁ is erupting but still located inside the mandible. The preservation of the mandible is poor.

The collection “21948”:

- An adult mandible fragment has been identified, with the central and left sides being noticeable. The ramus is broken, and there is no evidence of the presence of M₃. Due to the very poor condition of the mandible and the unclear visibility of dental sockets, it is difficult to determine whether there is antemortem tooth loss. The mentum is small, and the overall aspect of the mandible appears gracile. Based on these characteristics, the individual is likely female.

The collection “21949”:

- An adult fragmented mandible has been recovered. The jaw does not contain any teeth due to postmortem tooth loss. The central and left parts of the mandible are present, although their conditions are very poor. The ramus is broken. It appears that this individual lost the left M₂ and M₃ before death, as evidenced by antemortem tooth loss; the dental sockets of these teeth are almost closed. Despite the poor preservation, the general aspect of the mandible exhibits robust features. Therefore, it is likely that the individual is male.

The collection “21950”:

- An adult fragmented left mandible has been recovered, with the central and left parts present. The ramus is broken. Only the left M₃ remains on the jaw, exhibiting caries on the mesial and occlusal sides. The left M₁ and M₂ are missing, indicating antemortem tooth loss. Additionally, signs of antemortem tooth loss are observed in the second left premolar, as its socket appears to be closing. Due to antemortem tooth loss, the mandible has lost some bone density. Despite this, the overall aspect of the mandible appears to exhibit prominent to robust features, with a medium-sized mentum. Therefore, it is likely that this individual is male. Additionally, the preservation of the mandible is very poor.

The collection “21951”:

- An adult fragmented mandible has been recovered. Only the left side of the mandible is present, with only the left second molar remaining on the jaw; the other teeth exhibit postmortem tooth loss. This remaining molar shows a medium degree of tooth wear. The ramus is broken, and the central part of the mandible is missing. Due to the poor preservation, it is not possible to estimate the sex of the individual.

The collection “21952”:

- An adult maxilla has been recovered in three fragments (right-center-left). The fragment on the right side of the maxilla is incomplete, making it impossible to assess the situation of the M² and M³ molars. However, evidence of antemortem tooth loss can be observed on the left PM⁴ and M¹. The left side maxilla is present, including the zygomatic bone. Additionally, the right M¹ is missing due to antemortem tooth loss. No teeth remain on the maxilla, indicating postmortem tooth loss.

The collection “21953”:

- A fragmented right maxilla has been recovered, with only parts of the canine, two premolars, M¹, and M² remaining. Other parts of the maxilla are not available. The canine is retained with the jaw which is called impaction (Hillson, 2009). Due to the small portion of the maxilla recovered, it is undetectable whether M³ exists or not. However, the maxilla appears to belong to an adult individual, likely a young adult due to the lack of tooth wear.

The collection “21954”:

- An adult fragmented mandible has been recovered, with both the left and right sides broken, including the sockets for molar teeth on both sides. Only the left PM₄ remains on the jaw; the

others exhibit postmortem tooth loss. The mentum displays prominent features; however, due to the extremely poor condition of the mandible, it is not possible to predict the sex.

The collection “21955”:

- Isolated teeth have been recovered, including five permanent molars. Two molars are broken postmortem, with the roots intact but the crown parts broken. One molar, likely first molar, is in good condition, while another molar, third molar, exhibits caries at the interface and shows medium to high degree of tooth wear. The last molar shows soil effects on the occlusal surface.
- Furthermore, two premolars have been recovered. One premolar has a broken crown but is still observable, while the other premolar exhibits a low degree of tooth wear.
- Additionally, three incisors have been detected. One incisor shows a high degree of tooth wear, one incisor shows a low degree of tooth wear, and the last incisor shows no signs of tooth wear and is in normal condition.
- Moreover, three canines have been collected. One of them belongs to a non-adult individual, with its root still growing. One canine exhibits a medium degree of tooth wear, while the other exhibits a low degree of tooth wear.
- Lastly, fifteen teeth fragments have been observed, all of which are broken into small pieces, making identification not possible.

The collection “21956”:

- Two ulnae have been recovered, one from the left and one from the right. The distal part of both ulnae is broken, and the olecranon part of the right ulna is also broken.

- Additionally, half of a clavicle has been found, with only the acromial end remaining. One right calcaneus has been recovered; however, its condition is extremely poor.

- Furthermore, a small piece of a long bone remain unidentified, along with another bone fragment, which likely belongs to a coxa. All of these remains belong to an adult individual or individuals.

The collection “21957”:

- An adult fragmented cranium has been recovered. The fragmented left and right parietal bones are fused, although they are not whole and show strong soil effects. Additionally, four small cranium fragments have been recovered, likely belonging to the parietal area. These four fragments do not exhibit soil effects.

The collection “21958”:

- Fragmented right-central an adult mandible fragments have been collected. The molars are absent due to ante-mortem tooth loss, and postmortem tooth loss has also been observed. The mentum is between medium and prominent; however, due to the extremely poor preservation of the mandible, determining the sex is not possible.

The collection “21959”:

- Fragmented left-central mandible fragments have been collected. The molars are absent due to ante-mortem tooth loss, and postmortem tooth loss has also been observed. The mentum is between medium and prominent; however, because of the extremely poor preservation of the mandible, determining the sex is not possible. The mandible belongs to an adult individual.

The collection “21960”:

- Ten isolated permanent teeth have been studied. Among these are three molars: one maxillary molar and two mandibular molars. One of the mandibular molars, likely M₂, exhibits caries on the occlusal surface. The maxillary molar shows a high degree of tooth wear, while the other mandibular molar, likely M₁, has a low degree of tooth wear.
- Two canines have been examined; one of them is short and small, while the other is long and large. The long canine exhibits a low degree of tooth wear.
- Two premolars have been observed. One of them is likely maxillary and exhibits a low degree of tooth wear, while the other premolar shows a high degree of tooth wear.
- Three undefined teeth have been examined. Two of them are broken, and the third tooth exhibits a very high degree of tooth wear.

The collection “21961”:

- Fragmented lower limb bones have been recovered. A left femur is present, but the distal part is missing, and the proximal part is incomplete. Additionally, two tibiae have been recovered: one is the right proximal part of the tibia, and the other is the left tibia missing the distal part. There are also four small pieces of fibula, presumably, and three unidentified bone pieces. The conditions of the remains are extremely poor due to the strong soil effect, except for the fibula fragments. Furthermore, due to the strong soil effect, it is not clear whether these remains belong to an adult or not.

The collection “21964”:

- Fragmented lower limb remains have been recovered. Only the shaft area of the left femur (two pieces) has been recovered. Additionally, the shafts of both the right and left tibiae are present, along with one fibula fragment. Furthermore, there are 15 fragments of long bones, which are too small to be identified precisely. Generally, the remains exhibit gracile features and likely belong to an adult individual or individuals.

The collection “21965”:

- Fragments of an adult cranium have been recovered. A total of 12 fragments are present, including fragments from the left and right parietals, occipital, and frontal parts. However, these fragments are not whole; they are small and appear to belong to one individual.

The collection “21966”:

- Postcranial remains have been observed, including the shaft of a gracile tibia. Additionally, there is an extremely small piece of the femur condyle, along with fragments of the right proximal and distal ulna. It is unclear whether these ulna fragments belong to each other due to the missing shaft part. One scapula fragment has been recovered, which belongs to the glenoid cavity, although the preservation of the fragment is extremely poor. Furthermore, there is one metatarsal present.

- Additionally, there is a non-adult tibia fragment, with the distal part missing and most of the shaft broken. Due to the soil effect, the morphology of this fragment is unclear.

The collection “21967”:

- An adult facial skeleton, without the mandible, has been recovered. The general aspect of the facial skeleton is robust. Although the maxilla is present, its condition is extremely poor due to soil effects. Antemortem tooth loss has been observed on the right M¹ and left M¹. On the right side, the canine, premolars, and M² are present, while on the left side, the canine and premolars remain on the jaw, with the others exhibiting postmortem tooth loss. M³ sockets are present, and these teeth show a high degree of tooth wear. Based on general facial characteristics, such as thick, high zygomatic bones, thick, rounded supraorbital margin, and a quadrangular-rounded shape of the orbital sockets, the individual is likely male.

The collection “21968”:

- Fragmented adult cranial remains have been recovered, including the right and left parietal bones, which are fused, and one fragment of the occipital bone. A part of the nuchal crest exists on the occipital bone and appears noticeable; however, due to the fragment being broken, it is not possible to collect any information. The sutures are detectable. The preservation of these two cranial fragments is poor.

The collection “21969”:

- A frontal bone remain of an adult individual has been recovered, with mostly the left side intact. The glabella appears prominent, and the left supraorbital margin is thin. However, due to the right side being broken, further information cannot be determined.

The collection “21970”:

- Seventeen fragmented pieces of crania and one unidentified remain, likely belonging to the coxa, have been recovered. One of these cranial fragments is the right tympanic bone. The conditions of these fragments are poor. It appears that all of them belong to adult individuals.

The collection “24552”:

- A fragmented right side of the cranium has been recovered, with the left side basal part and the back of the cranium vanished and fused with the soil. Only the part of the right side is detectable, with extremely strong soil effects. The right orbital socket, zygomatic bone, and half of the frontal bone are present. However, due to the soil effect, the maxilla is barely observable, along with the right M¹, M², and M³. The features of the zygomatic bone, orbital socket, supraorbital margin, and frontal tubercle suggest robust and prominent characteristics, indicating the possibility of a male individual. However, due to the strong soil effect, estimating the sex is challenging.

- Additionally, 17 fragmented bone remains have been observed. Among them, three belong to long bones, while the others cannot be identified due to their sizes. The general aspect indicates extremely poor preservation (Table 4.5.1. and Table 4.5.3.).

The pathological results of Cova dels Gats are scarce, which could be attributed to the preservation of the remains and the lack of traces of pathology on the skeletons. However, some dental pathologies have been detected. Antemortem tooth loss has been observed on three mandibles and two maxillae (Figure 4.5.2. and Figure 4.5.3.). Molar teeth and second premolars are affected by antemortem tooth loss. Moderate dental hypoplasia has been observed on multiple teeth (such as Figure 4.5.4.), including permanent incisors and canines. However, whether deciduous teeth have hypoplasia or not is not clear due to the lack of non-adult tooth remains. Additionally, some dental caries has been identified, including caries on the interface of one third molar and caries on the occlusal surface of one second molar (Figure 4.5.5. and Figure 4.5.6.). Indeed, an anomaly has been observed on one maxilla: a retained

canine tooth in the jaw (Figure 4.5.7.), commonly referred to as impaction (Hillson, 2005). Impacted canines occur when the tooth fails to fully erupt into its normal position in the dental arch, remaining embedded or trapped within the bone or soft tissue, and unable to properly emerge into the mouth. This condition can arise due to various factors, including overcrowding in the dental arch, abnormal tooth development, or obstruction by other teeth or structures. Impaction predominantly affects canines and third molars, as supported by literature (Pindborg, 1970; Hillson, 2005).

Furthermore, two animal teeth have been noticed, with one potentially being a tusk tooth. These teeth are likely to belong to the Suidae family (Figure 4.5.8.).

Finally, pot remains consisting of nine fragmented pieces with a black-red color paste have been observed. These pieces do not have any decorations (Figure 4.5.9.).

Cova dels Gats (Bell Beaker)	Human Remains
21944	Cranium, without face-maxilla and mandibula
24552	Fragmented cranium; face (right side); 2 broken long bone remains; undetermined remains
21961	Left broken femur; fragmented fibula; 1 right proximal tibia; 1 left proximal tibia
21958	Fragmented right mandibula
21960	Isolated 10 permanent teeth (3 molars, 2 canines, 2 premolars, 3 undefined)
21959	Left mandibula
21957	Fragmented cranium (left and right parietal, other 4 piece)

21953	Fragmented right maxilla
21954	Fragmented mandibula corpus
21956	Left and right ulna; 1 fragmented coxa; 1 fragmented right calcaneus; 1 right fragmented clavícula; 1 fragmented undetermined remain (burnt)
21949	Fragmented left-central mandibula
21950	Fragmented left mandibula
21947	Fragmented left-central mandibula
21948	Fragmented left mandibula
21946	3 mandibula pieces
21951	Fragmented left mandibula
21955	Isolated 13 permanent teeth (5 molars, 2 premolars, 3 incisors, 3 canines)
21952	2 maxilla pieces; left zygomatic
21945	2 fragmented left-right parietals; 3 fragmented occipitals; 2 left-right tympanic; 1 left zygomatic; 1 left frontal; 1 right parietal; 1 fragmented occipital
21964	Fragmented lower limb (right femur shaft, left-right tibia shafts, non-adult? Tibia? Shaft and other small long bone pieces)
21966 (1)	Tibia shaft; right proximal ulna; right distal ulna; femur condyle; 1 metatarsal; scapula piece
21966 (2)	Tibia
21967	Facial skeleton, without mandibula

21968	Fragmented left and parietal; fragmented occipital
21969	Left frontal bone
21965	Fragmented 12 cranium pieces (left-right parietals, occipital, frontal)
21970	Fragmented 17 cranium pieces (1 right tympanic); fragmented coxae?

Table 4.5.1.: Human remains of Cova dels Gats

Juvenile	~3 years ~9 years
Adult	8 individuals: 2 female individuals 2 male individuals 4 indifferent individuals

Table 4.5.2.: Individuals of Cova dels Gats

Postcranial parts	3 left tibias 2 left femurs 2 right tibias 2 right ulnae 1 left ulna
-------------------	--

Cranial parts	8 adult mandibles 5 frontal-orbital parts 4 maxillae 2 crania
---------------	--

Table 4.5.3.: Most frequency remains in Cova dels Gats



Figure 4.5.1.: 3-year-old individual of Cova dels Gats



Figure 4.5.2.: Antemortem tooth-loss on mandible



Figure 4.5.3.: Antemortem tooth-loss on maxilla



Figure 4.5.4.: Dental hypoplasia



Figure 4.5.5.: Dental caries on occlusal



Figure 4.5.6.: Dental caries on interface



Figure 4.5.7.: Impaction of canine



Figure 4.5.8.: The remains of Suidae



Figure 4.5.9.: The pot remain

4.6. Cova del Pic

Three sets of human remain from Cova del Pic were selected for radiocarbon dating (^{14}C). The results indicate that Cova del Pic dates:

- According to collection “24639”, the dates are 2877-2631 cal BC with a 95% probability, and 2870-2674 cal BC with a 68% probability (Table 4.1.).

- According to collection “24640”, the site is dated to 2851-2497 cal BC with a 95% probability, and 2836-2574 cal BC with a 68% probability (Table 4.1.).

- According to collection “24648”, the site is dated to 2848-2495 cal BC with a 95% probability, and 2832-2503 cal BC with a 68% probability (Table 4.1.).

All of these results indicate that Cova del Pic dates to the third millennium BC.

A minimum of 14 individuals have been identified (Table 4.6.2.), consisting of four non-adult individuals, one adolescent, and nine adults. Dental aging estimates for one non-adult individual suggest an age of approximately 6 months $\pm$ 3 months (Figure 4.6.1.) according to Ubelaker (1991), and 7.5 months according to AlQahtani (2010). Another non-adult individual is estimated to be around 3 years $\pm$ 1 year (Figure 4.6.2.) according to Ubelaker (1991), and 3.5 years according to AlQahtani (2010). Additionally, one non-adult individual is estimated to be around 8 years $\pm$ 2 years (Figure 4.6.3.) according to Ubelaker (1991), and 8.5 years according to AlQahtani (2010). The age of the last non-adult individual, based on skeletal aging, is approximately 6 years old (Figure 4.6.4.) (Sheuer and Black, 2004).

Furthermore, one adolescent individual has been identified, and based on ilium fragments, this individual could be approximately 15 years old (Sheuer and Black, 2004).

According to the most frequently recovered remains, particularly mandibles, a minimum of nine adult individuals have been identified. Among them, three males and two females (for example: Figure 4.6.5. and Figure 4.6.6.) have been distinguished based on pelvic characteristics such as the sciatic notch and preauricular sulcus, as well as mandibular features including the overall aspect of the mandible and mentum.

The collection “75244”:

- Adult long bone remains have been recovered, including two tibia shafts with small broken parts, each likely belonging to a separate tibia. Additionally, there is one tibia shaft with both proximal and distal ends broken, as well as one proximal tibia with its proximal end also broken. Among the remains are one right radius with both distal and proximal ends broken, along with one radius shaft. Furthermore, there are seven fragments of fibula, all of which are small fragments. Additionally, three humerus shaft fragments are present, with limited information available due to their small size. Finally, there are four other unidentified fragments of long bones.

- Out of the 60 fragments of the skeleton recovered, the conditions of the fragments are exceedingly poor. Among them, one fragment is identified as belonging to a vertebra, while at least six fragments are presumed to belong to long bones. However, the remaining fragments are unrecognizable due to their extremely degraded state.

- The remains include both right and left coxae, with the left coxa is broken, consisting of two pieces separated from the acetabulum. Both coxae have intact ilium and ischium parts, although the pubis is missing for both. Based on pelvic features such as the sciatic notch, preauricular sulcus and composite arch, the sex could be identified as male.

- A single sciatic notch has been recovered, with the other parts of the coxa missing. Despite not being complete, its width suggests a likely female sex.

- One carpal phalange, one metatarsal, two scapula fragments from the acromion and glenoid cavity area, and four vertebrae spines, all of which remain unidentified, have been recovered.

- Four cranial remains, likely all belonging to the parietal area, have been recovered. However, they are small and poorly preserved.

- A fragmented central-left mandible fragment has been collected, showing evidence of antemortem tooth loss affecting the M₁ molar. Additionally, postmortem tooth loss has been observed, leaving only the M₂ and M₃ on the jaw. The M₂ exhibits a minimal amount of tooth wear, while the M₃ shows no signs of tooth wear. Despite the missing ramus part and the overall poor preservation, the mandible appears robust, with a prominent mentum. Based on these features, the sex is likely male. Finally, all remains in this collection belong to adult individuals.

The collection “75246”:

- An adult left femur has been recovered, with the distal end missing. The structure of the femur exhibits erosion likely due to soil effects, leading to a darkened coloration. Despite the presence of a distinct linea aspera, the overall appearance of the femur is gracile.

- Eleven pieces of cranium have been recovered, including one left tympanic bone, three parietal fragments, and seven additional small fragments. The tympanic bone exhibits a large mastoid process. However, the overall preservation of these remains is highly poor.

- Three broken metatarsals, one carpal phalange, one tarsal phalange, and one broken axis fragment have been recovered, all exhibiting extremely poor conditions. Additionally, seven unidentified extremely small fragments were found. Although a scapula fragment was also

recovered, its poor condition makes it difficult to provide any further information about this piece.

- An adult right maxilla fragment has been recovered, containing the premolars along with M¹ and M². Additionally, an isolated M³ tooth is present, with its socket also broken. The maxilla and teeth exhibit strong soil effects, resulting in highly poor preservation.

The collection “24630”:

- An adult fragmented cranium has been observed, containing fragments of parietals, occipital, temporals, and sphenoid bones. The occipital bone appears semi-separated from the parietals, likely due to soil effects. Notably, the lambdoid suture is noticeable, while the sagittal suture is almost fused, with no discernible suture in the endocranium. The preservation of the cranium is poor, comprising a total of 12 fragments, with no facial skeleton, maxilla, or mandible present. Based on the characteristics of the mastoid process, the sex of the individual could be female.

The collection “24631”:

- An adult fragmented cranium has been identified, with both right and left parietal bones present, although the left side is incomplete. An extremely small piece of the occipital bone is fused with the parietals. All sutures, including the lambdoid suture, are noticeable. A variation known as os lambda has been observed along the lambdoid suture.

The collection “24632”:

- Fragment of a non-adult cranium have been recovered, specifically from the frontal area.

The collection “24633”:

- An adult mandible has been recovered, although fragmented, with all fragments intact. The mandible is broken into two pieces at the center, and the ramus parts on both sides are also broken. Antemortem tooth loss has been detected on both sides of the mandible, with PM₄, M₁, and M₃ missing on the right side, and M₂ and M₃ missing on the left side due to antemortem tooth loss. Additionally, postmortem tooth loss is evident, with only the right canine remaining on the jaw, exhibiting a high degree of tooth wear. The general aspect of the mandible is moderate, with a medium-sized mentum. The sex of the individual cannot be determined from these observations.

- Furthermore, three isolated teeth—a canine, a premolar, and a molar—have been recovered. The crown of the molar teeth is almost completely vanished, and the premolar’s crown is broken.

The collection “24634”:

- An adult fragmented mandible has been recovered, with the left side missing. It appears that the third molar has not erupted and is absent. Only M₁ and M₂ are present on the jaw, with evidence of postmortem tooth loss. The both teeth show high degree of tooth-wear. M₁ exhibits caries on the distal side, along with the presence of a fistula. Third molar agenesis has been observed. The general aspect of the mandible is robust, with a prominent mentum. Based on these characteristics, the sex of the individual is likely male.

The collection “24635”:

- An adult fragmented mandible has been recovered, with the right-center side intact. However, the preservation of the mandible is poor. M₁ is missing due to antemortem tooth loss. In the center part, due to broken dental sockets, it is difficult to gather any information. Only the M₂ tooth remains on the jaw, but its crown area is completely broken, likely due to postmortem

effects. The socket for M₃ is present. Overall, the mandible appears prominent in its general aspect.

The collection “24636”:

- An adult mandible fragment has been recovered, with extremely poor preservation. Only the right PM₄, M₁, M₂, and M₃, along with their socket areas, remain. The other bone structures of the mandible are completely destroyed. M₃ exhibits impaction, positioned in a lower position relative to M₂, with its occlusal area touching the distal side of M₂. These teeth show a low degree of tooth wear, except for M₁, which displays a medium to high degree of tooth wear. No further information can be gathered from this mandible fragment due to its condition.

The collection “24637”:

- An adult fragmented right maxilla has been recovered, including the canine fossa and part of the zygomatic process. Canine, PM³, and M¹ sockets are present, while the other parts are broken. M¹ and PM³ are still attached to the jaw. M¹ displays a low degree of tooth wear and also exhibits caries on the lateral (buccal) side. The preservation of the maxilla is extremely poor.

The collection “24638”:

- The recovered coxae fragment corresponds to the right side of an adult individual. While the ilium and ischium components are present, the pubis is missing. Notably, features such as a wide sciatic notch and a deep sulcus preauricularis suggest that the sex of the individual is likely female.

- The recovered skeletal remains include a left humerus shaft, a tibia shaft, and another tibia fragment missing its distal part, with the proximal part incomplete. Additionally, there is a femur proximal area fragment, albeit in poor condition.

- The recovered lower limb remains include three patellas, two on the right side and one on the left, along with a left talus fragment which is broken, and a calcaneus in poor condition. Additionally, there is one navicular bone, one undefined tarsal bone, and one triquetral bone.

- Among the phalanges, there are six metatarsals and five tarsal phalanges, as well as seven carpal phalanges. Furthermore, there are nine undefined tarsal and carpal remains.

- The recovered skeletal fragments include 24 fragments of costae, all in poor condition. Additionally, there are 24 fragments of vertebrae, belonging to both adult and non-adult individuals, but their conditions are extremely poor. Only two of these fragments have recognizable spine areas, with one being thoracic vertebra and the other lumbar vertebra.

- Approximately 80 skeletal fragments have been recovered, all of which are in an extremely poor condition and cannot be identified.

- Out of the 11 fragments recovered, one appears to be from the pelvis, possibly representing the auricular surface, while the remaining fragments remain unidentified.

- The recovered remains include two fragments of the ilium from a non-adult individual, the epiphysis of a distal tibia, and four additional fragments that could not be identified.

The collection “24639”:

- An adult cranial fragment has been recovered, comprising the frontal, parietal, and occipital bones, all of which are fused together. The sagittal and lambdoid sutures are completely fused,

while the coronal suture is slightly discernible. The superciliary arch is prominent, and there are slight traces of a raised nuchal crest.

The collection “24640”:

- Three fragments of an adult cranium have been recovered, specifically from the right and left sides of the parietal bones. The sagittal, coronal, and lambdoid sutures are highly noticeable on these fragments.

The collection “24641”:

- A fragmented cranium comprising 59 pieces has been recovered. The remains are notably small, and the preservation is severely poor. Among the fragments, there are three left temporal bones, two occipital bones (with one potentially belonging to a non-adult individual), and one burnt fragment, likely a sphenoid fragment. Additionally, there are two left and one right orbital areas, two tympanic parts, and three temporal bones, with one of them belonging to a non-adult individual. These remains are challenging to recognize. Furthermore, there are 44 additional fragments that cannot be identified due to their poor condition.

The collection “24642”:

- An adult mandible fragment has been recovered, with only the M₁ and its socket part remaining. Based on the features of the mental foramen and M₁, it appears to be from the right side.

The collection “24643”:

- An adult mandible fragment, located in the left-center, has been discovered. The left M₁ remains in place on the jaw, while the other teeth have experienced postmortem tooth loss. Despite being broken, the socket of M₃ is recognizable. The crown part of M₁ is also broken, likely indicating extreme tooth wear. The preservation of the mandible fragment is severely poor.

The collection “24644”:

- Isolated 41 teeth have been identified, belonging to non-adult and adult individuals. Among them are six deciduous molars, one deciduous canine, five permanent molars with crowns still in the process of eruption, two permanent M₁ molars with almost fully closed roots, three developing premolars, three developing canines, and one permanent incisor with an almost closed root. In total, there are 21 isolated teeth from non-adult individuals.

- For adult individuals, a total of 20 teeth have been recovered. Among these are eight molars, four premolars, two canines, and six incisors. One molar and one canine are broken, while three molars exhibit a high degree of tooth-wear. Additionally, one M₃ molar shows signs of caries. Among the premolars, one exhibits a low degree of tooth-wear. Furthermore, four incisors display a low degree of tooth-wear, while one incisor exhibits a low degree of hypoplasia.

The collection “24647”:

- An adult cranium fragment, comprising the parietal and occipital bones, has been discovered. The remains are covered by soil and gastropod remains. While the ectocranial sutures are completely fused, the endocranial sutures are still noticeable. Notably, an ossicle at the lambda (Berry and Berry, 1967) has been observed at the junction between the sagittal and lambdoid sutures. Additionally, other ossicles have been noticed along the lambdoid suture.

The collection “24648”:

- Non-adult crania remains have been discovered, comprising the entire frontal area despite being fragmented into four pieces. Additionally, four other remains have been found, including a tympanic bone, while the remaining three fragments are unrecognizable.

The collection “24649”:

- An adult fragmented mandible has been discovered, with the right, center, and left portions present, though the ramus parts are missing. The mandible exhibits significant soil effect, hampering detailed analysis. Despite this, several observations have been made. On the right side, antemortem tooth-loss is evident, with PM₃, M₁, M₂, and M₃ missing. Additionally, PM₄ tooth almost vanished. On the left side, premolars, M₂, and M₃ are still present on the jaw, all exhibiting extremely high degrees of tooth-wear. Additionally, signs of antemortem tooth-loss are visible in the incisor sockets, though interpretation is limited due to the soil effect. The general appearance of mandible suggests robustness, with a prominent mentum, indicative of a possible male sex attribution.

The collection “24650”:

- 29 pieces of crania have been identified, with only the right zygomatic part being clearly noticeable. Four of these pieces likely belong to the parietal area. However, due to extremely poor preservation, it is challenging to determine whether these remains belong to an adult or a non-adult individual.

The collection “24651”:

- Isolated teeth and one extremely small piece of maxilla with a molar tooth have been recovered. The maxilla fragment contains only the socket of the molar tooth, which

unfortunately cannot be recognized due to its extremely poor condition. Among the identified isolated teeth are one permanent canine, one crown of a canine, the latter appearing to be in the erupting stage, one permanent molar, one deciduous molar, and one premolar. The strong soil effect has greatly affected the conditions of these remains, rendering them in extremely poor condition.

The collection “24652”:

- A non-adult individual is represented by skeletal remains including one left femur, comprising only two pieces. The proximal part is intact, whereas the distal part is missing. Additionally, a humerus shaft, likely from the left side, has been identified; however, both the proximal and distal parts of the humerus are broken. Furthermore, there is a left radius shaft present. Additionally, one small fragment of a long bone has been observed, possibly belonging to a radius bone. Notably, all epiphyses of the long bones are missing.

- The adult skeletal remains consist of several fragments: one distal part of the left humerus, with the distal end broken; a humerus shaft, although its side cannot be determined due to its condition; the proximal part of the right ulna, appearing robust; a small fragment of the proximal part of the right radius, with the radius head broken; and a vertebra spine area, which cannot be identified further. Additionally, there are ten extremely small, unseparated bone remains. Overall, the general condition of these remains is very poor.

The collection “24653”:

- The adult cranial remains consist of 23 fragmented pieces, all of which are small. Among these fragments are parts of the parietal bone and tympanic bone. Additionally, a fragment representing the right orbital area has been identified. However, no further information could be gathered about the other remains due to their fragmented nature.

- The non-adult cranium remains consist of four fragments, including remnants of the parietal bone and one left mastoid process. However, due to the poor preservation of the remains, no additional information could be obtained.

The collection “24654”:

- The recovered long bone fragments consist of 20 fragments from the lower limbs of adults, characterized by small and poorly preserved pieces. Additionally, there is one fragment from the proximal ulna of the right side, one right radius missing its distal end, and one right distal humerus. Two shafts from the left radius, one left humerus corpus, and two unidentified long bone fragments were also found. Among the non-adult remains are one proximal femur fragment, one femur shaft, two humerus fragments, two fibula fragments, one proximal ulna, and one shaft of the radius.

- More than 100 splinter fragments, likely originating from the postcranial skeleton, have been recovered. However, due to their extremely poor preservation, it is impossible to determine specific details about these remains.

- The remains recovered include two metacarpals, seven carpal phalanges, 17 metatarsals, six tarsal phalanges, one broken calcaneus (right and left), one broken left talus, two right taluses, and one broken tarsal bone.

- Of the 27 vertebra fragments recovered, belonging to both adult and non-adult individuals, their preservation is extremely poor. Among the 14 adult vertebra fragments, only one cervical and two thoracic vertebrae are recognizable. Of the 13 non-adult vertebra fragments, one piece of the sacrum (S1) has been identified, while the rest remain unidentified.

- Four coxae remain have been collected, comprising two sciatic notches, one fragment of the ilium, and one broken acetabulum.

- Five scapula remains have been recovered. One of them belongs to the acromion area, while another belongs to the inferior angle. However, the identification of the remaining three scapula fragments is unclear.

- Seven different clavicle fragments and one sternum fragment have been recovered. Among the clavicles, there is one broken right clavicle, three shafts of clavicles, and another three clavicle shafts, albeit smaller in size. Overall, the general condition of these remains is poor.

The collection “24655”:

- The fragmented left mandible exhibits a broken ramus, with the central part missing. The M₁ and M₂ teeth appear broken, indicating antemortem damage. There is no evidence of eruption for the M₃ tooth. Both M₁ and M₂ display medium to high degrees of tooth wear. Overall, the mandible’s preservation is extremely poor.

The collection “24656”:

- The fragmented mandible belongs to a non-adult individual, featuring a deciduous molar on the jaw. Beneath this molar, the premolar teeth are in the process of eruption. Postmortem tooth-loss is evident, with the sockets of deciduous incisors and deciduous canines present. However, the overall condition of the mandible is very poor.

The collection “24657”:

- A small fragment of the center of the mandible has been found. Although the sockets of incisors are noticeable, no teeth are present on the jaw. It appears that this mandible fragment belongs to a non-adult individual. However, due to the poor condition and small size of the remain, further details cannot be determined.

The collection “24658”:

- Two fragments of the maxilla, one from the right side and the other from the left, have been discovered. These fragments are intact, but determining the orientation of the maxilla is challenging. There is a likelihood of antemortem tooth-loss observed in the premolars and molar teeth on the left side. However, due to missing parts in these fragments, it is difficult to ascertain this definitively.

The collection “24659”:

- A total of 27 isolated teeth have been identified, consisting of nine teeth from non-adult individuals. Among these are four deciduous teeth and five permanent teeth. Specifically, among the deciduous teeth, there are three canines and one incisor. As for the permanent teeth, there are three crowns of molars, all of which are still in the process of eruption, and one premolar, with its root still growing.

- Among the 18 adult teeth identified, there are nine molars, four incisors, two canines, two premolars, and one unidentified tooth due to severe tooth-wear. Of the molars, two are broken, one exhibits caries on the interface, and two show a very high degree of tooth-wear. Additionally, one molar has caries on the medial side. Another molar displays a medium degree of tooth-wear, while the last two molars show no signs of tooth-wear. Among the other teeth, one canine exhibits a low degree of tooth-wear, while three incisors and two premolars show a high degree of tooth-wear.

The collection “24843”:

- Upper limb remains consisting of eight humeri have been recovered. One of these humeri appears to belong to a non-adult individual, likely from the right side. The remaining humeri belong to adult individuals, with a total of three right and three left humeri, along with one humerus shaft. None of these humeri are complete, as they are missing either their distal,

proximal, or both parts. Additionally, one humerus head epiphysis and two pieces of the trochlear have been recovered.

The collection “24844”:

- Lower limb remains consisting of 13 fragmented femurs have been recovered. Among these, four are from the right side, two from the left side, four are shaft fragments, and one is from the femur head area. The condition of these femurs is poor, with their proximal and distal ends broken, and five of them only retaining small parts. Additionally, one femur belongs to a non-adult individual.

The collection “24845”:

- Five tibiae have been recovered, consisting only of their shafts, with both proximal and distal ends missing. One of these tibiae belongs to a non-adult individual. The overall condition of the tibiae is poor.

The collection “24846”:

- Lower limb remains consisting of four fibulas have been noticed. However, their conditions are extremely poor, making it impossible to gather any information from them.

The collection “24847”:

- A left radius has been recovered, with the proximal part missing and the distal part partly broken. Based on its appearance, it seems to belong to an adult individual.

The collection “24848”:

- Four ulnae have been recovered, consisting of two right and two left fragments. All of them are broken, with two having only the proximal parts and the others having proximal and shaft parts. None of them include the distal area, and only one has a complete olecranon part. The overall condition of these remains is poor.

The collection “24849”:

- Vertebral remains have been detected, including one broken atlas, two lumbar vertebrae, and one non-adult thoracic vertebra with its spine area broken. Additionally, two vertebral corpuses have been found, likely belonging to a pre-adult or young adult individual(s). Lastly, four spine area remains have been recovered, all of which are extremely small.

The collection “24850”:

- Postcranial remains have been collected, including two right talus bones, ten metatarsals, seven of which are broken, two tarsal phalanges, a fragmented clavicle with both ends broken, a distal left humerus with a foramen on the trochlear, a distal ulna, a distal fibula, and 32 fragments of long bones. The conditions of these remains are extremely poor. All of the recovered remains are likely from adult individuals.

The collection “24851”:

- Four metacarpals and five carpal phalanges have been identified, with one metacarpal and one phalange exhibiting damage. These remains are attributed to adult individual or individuals.

The collection “24852”:

- Nine costae fragments have been observed, all in extremely poor condition, making it impossible to gather any information from them.

The collection “24853”:

- A fragmented ilium, likely belonging to an adult individual, has been identified. Only a portion of the iliac crest is present, with other parts of the bone missing.

The collection “24854”:

- A fragment of the glenoid cavity has been recovered, indicating it likely belongs to an adult individual.

The collection “24855”:

- A fragment of the right frontal bone has been recovered. While the temporal side is intact, most of the frontal area is broken. It is unclear whether the remains belong to a non-adult or adult individual.

The collection “24856”:

- Six fragmented cranial pieces have been recovered, each appearing to belong to the parietal area. Despite their small size, the sutures are noticeable. These remains suggest they could be from an adult individual.

The collection “24857”:

- A fragment of right side of an adult mandible have been recovered, with the broken ramus area. It is unclear whether the M₃ has erupted due to the poor condition of the mandible. The sockets between the second incisor and M₂ are present, although no teeth were found in the jaw.

The collection “24858”:

- Isolated 15 teeth have been recovered, comprising a mix of non-adult and adult dentition. Among the non-adult teeth, there are seven deciduous teeth, including four incisors, two canines, and one molar. While one molar and one canine are fully erupted, the incisors and the remaining canine are in the process of eruption, with only the crown parts exposed. This variation in tooth development suggests the presence of more than one non-adult individual.

- For the adult teeth, there are four incisors, one canine, two molars, one premolar, and one molar root. Among these teeth, two molars exhibit caries: the M1 tooth displays caries on both the buccal and lingual sides, while the other molar, likely M2, has caries on the mesial side. Additionally, both molars show signs of tooth wear, with M1 exhibiting a high degree and M2 a low degree of wear. Moreover, premolar tooth also has caries on distal side.

The collection “24859”:

- The collection comprises a total of 111 fragments, encompassing both cranial and postcranial remains. Among these, a minimum of eight fragments pertain to long bones. However, the majority of the remains are in an extremely poor condition, rendering further determination challenging (Table 4.6.1. and Table 4.6.3.).

Various pathologies have been observed on the vertebrae. Some vertebrae exhibit osteoporosis, osteoarthritis, while one thoracic vertebra shows a Schmorl's nodule (Figure 4.6.7.). Schmorl's nodule is described in Aufderheide and Martin (1998) as a "vertical disk hernia", and Mann and Hunt (2005) describe it as a "result of herniation of the nucleus pulposus, the partially liquid central portion of the intervertebral disc". The age category of the individuals with osteoarthritis and Schmorl's nodule is not specified. However, Schmorl's nodules are generally observed in older individuals, usually aged 45 years or older (Aufderheide and Martin, 1998). Cribra femoralis has been identified on femur neck (Figure 4.6.8.).

In Cova del Pic, several dental pathologies have been examined. Antemortem tooth loss has been observed on multiple jaw remains. Moreover, one mandible exhibits a fistula on the M1 socket (Figure 4.6.5.) on the right side. Among the isolated molar teeth, two show caries on the occlusal surface, while another two display caries on the mesial side. Additionally, one M1 molar exhibits caries on both sides (buccal and lingual), whereas one M2 molar has caries on the mesial side, one premolar tooth shows caries on the distal side (for example; Figure 4.6.9., Figure 4.6.10., Figure 4.6.11.). Lastly, one incisor tooth has hypoplasia. The impact of soil on the teeth, including its potential link to hypoplasia, has not been examined in this site.

Furthermore, a few non-metric variations have been detected. Ossicles have been observed on the lambdoid suture area of two crania, a condition referred to as os lambda (Berry and Berry, 1967) (Figure 4.6.12.). Additionally, a non-metric variation known as the vastus notch has been observed in one patella (Figure 4.6.13.). This variation is characterized by a small notch often found in the superolateral angle of the patella, indicating some concavity in the area for the insertion of the vastus lateralis tendon (Finnegan, 1978). One cervical vertebra displays a double foramen (Figure 4.6.14.). Moreover, one metatarsal exhibits a squatting facet on its distal area. Lastly, it has been observed that the M3 tooth did not erupt in two adult mandibles (third molar agenesis).

Additionally, various animal remains have been recovered from Cova del Pic. These include specimens from the Suidae, Bovidae, and Leporidae families, as well as Malacofauna (Figure 4.6.15. and Figure 4.6.16.).

Cova del Pic (Chalcolithic)	Human Remains
75244	Fragmented right-left pelvis; right-left calcaneus; left talus; 1 broken distal tibia; 2 broken tibia shafts; 1 right radius shaft; 5 broken fibula remains; 1 broken humerus shaft; 1 metatarsal, 1 vertebrae arc; 1 coxae fragment; 1 tibia shaft; 2 broken humerus shaft; 1 long bone; 1 proximal tibia; 4 long bone pieces, 1 radius(?) shaft; 2 fibula remains; 1 hand phalange; 2 cranium pieces; 1 scapula piece; 3 vertebrae arcs; undefined remains
75246	6 cranium pieces (1 left tympanic, 3 parietals, 4 small fragments); 3 metatarsals; 2 phalanges (1 hand, 1 foot); 1 proximal ulna; undetermined small fragments; fragmented left mandibula and 2 pieces ramus; fragmented right maxilla; isolated 2 molars; 1 left fragmented femur
24844	Fragmented 13 femurs (4 right, 2 left, 4 shaft, 1 femur head, 1 non-adult left femur and 1 non-adult distal femur)
24843	11 fragmented humerus (1 non-adult, 3 right, 3 left, 1 shaft, 1 capitulum humeri and 2 trochlear pieces)
24845	6 tibias (1 non-adult)
24856	6 cranial pieces
24852	9 costae fragments
24851	4 metacarpals; 5 phalanges
24850	2 right taluses; 10 metatarsals; 2 feet phalanges; left distal humerus; distal ulna; distal fibula; fragmented clavícula; long bone remains

24853	Fragmented ilium
24854	Fragmented scapula (glenoid cavity)
24859	Fragmented long bones, undetermined
24847	Fragmented left distal radius
24848	4 proximal ulnae (2 right, 2 left)
24858	Isolated 7 deciduous teeth (4 incisors, 2 canines, 1 molar); isolated 9 permanent teeth (4 incisors, 1 canine, 2 molars, 1 premolar 1 root)
24855	Fragmented right frontal bone
24846	3 fibula fragments
24849	10 vertebrae (broken atlas, 2 lumbar vertebrae, 1 thoracic, 2 corpuses, 4 arc)
24857	Fragmented right mandibula
24654	13 femur-tibia fragments; 7 fibula fragments; 1 right proximal ulna; 1 right proximal radius; 1 right distal humerus; 2 left radius shafts; 1 left humerus shaft; 2 undefined long bone remains; 1 non-adult proximal femur; 1 non-adult femur shaft; 2 non-adult humerus; 2 non-adult broken fibula; 1 non-adult proximal ulna; 1 non-adult radius shaft; 2 metacarpals; 7 hand phalanges; 17 metatarsals; 6 foot phalanges; 27 vertebrae pieces (13 belong to non-adult); 4 scapula fragments; 4 coxae pieces; 2 calcaneus (right-left); 3 talus(1 left, 2 right); 1 tarsal bone; 7 clavícula pieces; 17 costae fragments
24659	Isolated 27 teeth: 9 non-adults (3 deciduous canines, 1 deciduous incisor, 3 permanent molars, 1 permanent canine); 18 adults (9 molars, 4 incisors, 2 canines, 2 premolars, 1 undefined)

24658	2 maxilla pieces
24657	Fragmented mandibula corpus
24655	Fragmented left mandibula
24656	Fragmented mandibula
24653	23 adult cranium pieces (Parietal bones, 2 tympanic pieces, 1 right orbital and other small remains) 34 non-adult cranium pieces (1 left mastoid process, parietal remains and other small pieces)
24641	59 cranium pieces (3 left temporal, 1 burnt sphenoid? Remain, 2 occipital, 2 tympanic, 2 left and 1 right orbitales, parietal bones)
24643	Fragmented left-central mandibula
24637	Fragmented right maxilla
24644	Isolated 41 teeth: 21 non-adults (6 deciduous molars, 1 deciduous canine, 7 permanent molars, 3 permanent premolars, 3 permanent canines, 1 permanent incisor); 22 adults (8 molars, 2 canines, 4 premolars, 6 incisors)
24631	Right and left parietal
24632	Fragmented frontal
24639	Fragmented frontal, parietal and occipital
24633	Mandibula; 3 isolated teeth (canine, premolar, molar)
24636	Fragmented right mandibula
24642	Right mandibula pieces

24640	Fragmented left-right parietal bones (3 fragments)
245635	Fragmented right mandibula
24634	Fragmented right-central mandibula
24630	Parietal; occipital; temporals and sphenoid
24638	Right broken coxae; 2 ilium pieces; distal tibia epiphyses; other epiphyses fragments(undefined)
24650	29 cranium pieces
24651	Isolated 4 teeth (2 molars, 1 premolar, 1 canine); 1 maxilla fragment
24648	4 frontal pieces; 1 tympanic bone
24647	Parietal and occipital
24652	Non-adult: 1 left distal femur; 1 left Proximal femur; 1 left? Humerus shaft; 1 left radius shaft; 1 long bone piece (radius) Adult: 1 distal left humerus; 1 humerus shaft; 1 right proximal ulna; 1 right proximal radius; 1 vertebrae arc; 1 radius? Shaft; 4 small long bone fragments; 1 small cranial piece; 5 undetermined remains
24649	Fragmented mandibula

Table 4.6.1.: Human remains of Cova del Pic

Infant	~ 6 months
Juvenile	~ 3 years ~ 6 years ~ 8 years
Adolescent	~ 15 years
Adult	9 individuals: 2 females 3 males

Table 4.6.2.: Individuals of Cova del Pic

Postcranial parts	8 left tibias 5 left femurs 5 left humeri 4 right ulnae 4 right femurs 4 right radii 2 left radii 2 left ulnae
Cranial parts	9 mandibles 6 left mastoids 4 occipitals 3 left temporals

Table 4.6.3.: Most frequency remains in Cova del Pic



Figure 4.6.1.: Approximately 3-year-old individual



Figure 4.6.2.: Approximately 6-month-old



Figure 4.6.3.: Approximately 8-year-old individual



Figure 4.6.4.: Approximately 6-year-old individual



Figure 4.6.5.: Male individual



Figure 4.6.6.: Female individual



Figure 4.6.7.: Schmorl's Nodule on thoracic vertebra



Figure 4.6.8.: Cribra femoralis on femur neck



Figure 4.6.9.: Caries in occlusal surface



Figure 4.6.10.: Caries on mesial side



Figure 4.6.11.: Caries on distal side



Figure 4.6.12.: Os lambda on lambdoid suture



Figure 4.6.13.: Vastus notch on patella



Figure 4.6.14.: Double foramen on cervical vertebra



Figure 4.6.15.: Animal bones in Cova del Pic



Figure 4.6.16.: Animal bones in Cova del Pic

4.7. La Muntanya Assolada

While the remains with catalog number 24253 were excavated during the 1983 archaeological excavations, the remains with catalog number 43562, as well as the human remains cataloged as 24254, were obtained in the years 1985 and 1988 respectively.

In 2009, De Miguel Ibañez and colleagues conducted an analysis of the remains designated as “24254”. They established that the site corresponds to the Early Bronze Age, precisely dating back to 2210-2130 BCE. However, in this study, the ^{14}C method was applied on “43462”. According to the outcomes, La Muntanya Assolada is dated to 3340-3105 BCE with a 68% probability and 3351-3099 BCE with a 95% probability (Table 4.1.). Consequently, the archaeological site is attributed to the 4th millennium BCE.

A minimum five individuals have been recognized (Table 4.7.2.); three adults, one non-adult, one infant. Based on dental ageing, four deciduous teeth; three canines, and one crown of molar tooth, which the root of molar was still growing (Figure 4.7.1.), of infant individual 3 years $\pm$ 1 year in Ubelaker (1991), 2.5 years in AlQahtani (2010). Moreover, skeletal ageing from vertebrae and ilium have supported the age range for this individual.

For juvenile individual, unfused sacrum pieces have shown approximately 12-14 years old. Furthermore, femur condyle, unfused humerus epiphyses, and unfused clavicle have shown similar ageing (Figure 4.7.2.).

According to two left humeri, minimum two adult individuals have been detected. Additionally, nearly complete skeleton of another adult individual (catalog number 24254) has been recovered.

The collection “24254” individual:

-The right humerus, right ulna, right radius, six phalanges have been recovered. The proximal and distal parts of ulna and radius have broken. The capitulum humeri has not existed. The humerus has two pieces, distal part has broken. The carpal bones have not shown any degeneration.

-The left humerus, left ulna, left radius, one metacarpal, 12 phalanges have been recognized. The conditions of ulna and radius were normal. However, the proximal and distal parts of humerus have broken. The conditions of metacarpal and carpal bones were good.

-The left femur, left tibia, left fibula existed. The fibula has completed. The proximal and distal parts of femur and tibia have broken.

-The right femur, right tibia, right fibula existed. The distal part of fibula has broken. the proximal and distal parts of tibia have not existed. The femur has had three parts; femur head, femur neck and femur shaft. The distal part of femur has broken.

-Right patella, one fragmented femur condyle, left talus, one foot phalange, 16 pieces bones all of them probably belong to the long bones, because of their conditions to establish concretely were not possible. Also, another three small fragmented bones have not been determined. Totally 23 bone pieces have been recognized.

-Left cuboid bone, right navicular, medial cuneiform, left patella, right talus, three metatarsals, five phalanges (foot). The conditions were normal, except one metatarsal's proximal part.

-Left and right scapula existed. However, their conditions were very poor, total 19 pieces have been detected.

-13 bone remains. The conditions of remains were very poor. The remains couldn't define exactly. One of them probably has belonged to the proximal part of tibia.

-One phalange (foot), two metatarsals one of them was broken (proximal part was broken). Three undefined tarsal remains, the remains are very small. One left navicular bone.

-Right coxae. The conditions were very poor. The ischium and pubis parts were not defined, except great sciatic notch (*insisura ischiadica major*), because of the lack of conservation. The most parts of ilium have been detected, but also those parts were fragmented. According to sciatic notch, this individual has shown female character. Due to multiple fragments of coxae, other sex characters were not been observed (Figure 4.7.3.). Total nine fragments of coxae have been noticed.

-One metatarsal 1, two phalanges (foot), one intermediate cuneiform, and one probably cuboid.

-Two metacarpals, their conditions were good.

-One coccyx has been found. The conditions of other six remains were very poor. Only two small fragments of vertebrae have been detected. However, it couldn't find another information about these vertebrae. The other four remains have not designed properly, two of them probably belonged to the crania.

-The 42 fragments of costa have been recovered. All of them were broken, due to has not been separated as left and right.

-The 11 fragments of vertebra's conditions were very poor. The five of them belonged to spinal area, whereas four of them were corpus of vertebra (the fragments of corpus were very small). The other two vertebral remains were small than the others. Lastly one undefined remain have been discovered.

-The left and right clavícula existed. The medial end (sternal extremity) of right clavícula was broken. Furthermore, the right clavícula was two pieces. The lateral end (acromial extremity) of left clavícula was broken. The sternal end of right clavícula has shown osteoarthritis.

-The mandibula has been founded (Figure 4.7.4.). The total aspect of mandibula was medium, not gracile or robust. The mentum was small, whereas the angle of mandibula was thick. Third molars erupted. It has been detected antemortem tooth loss on the second incisor of the right side.

-The atlas existed (Figure 4.7.5.). Joint degeneration was observed on the atlas, which was articulated with the axis.

- The axis and the third cervical vertebra were found fused to each other (Figure 4.7.6. and Figure 4.7.7.).

- The numbers 62800, 62812, 62821 were determined as the same individual “24254” by De Miguel Ibañez and her colleagues (2009) when bioarcheological examines were occurred. According to this, 12 fragments of human remain came from these numbers: one caput humeri, one cervical vertebra, three phalanges, two small fragments of costa, one permanent molar; the condition of molar was normal, has not shown high degree of tooth-wear. One permanent premolar; has shown moderate tooth-wear. Two small pieces of human remains, one of them could be a mandibula fragment, the other undefined. One cranial fragment.

The individual's left coxae, upper sacral part, and four lumbar vertebrae were excavated along with the soil layer in which the skeleton was dispersed. Therefore, it could not be thoroughly examined, and photographs could not be taken due to the remains conditions.

When was examined the health conditions of “24254”, Klippel-Feil syndrome (Figure 4.7.6., Figure 4.7.7., Figure 4.7.8. and Figure 4.7.9.) has been defined (refer to De Miguel Ibañez et.

al., 2009). This congenital syndrome has been described as fused cervical vertebrae, and it shows itself short neck, low posterior hairline, rotation difficulties of neck (Klippel and Feil, 1975; Tracy et. al., 2004). This adult female individual's axis-C3 and C6-C7 cervical vertebrae has shown Klippel-Feil syndrome. The atlas has shown osteophyte on dens area. This joint degeneration might be linked to other fused cervical vertebrae because of the limited range of motion.

Dental conditions of the individual have shown moderate features. Between the left M1 and M2 has found dental caries. Also, the occlusal surface of left M2 and right M3 have been detected insignificant caries. Right second incisor socket was almost closed, this condition has shown ante-mortem tooth-loss. Left two premolars, left canine and left M2 have demonstrated dental hypoplasia, which has a relation such as; malnutrition, infectious diseases (e.g. Hillson, 2005; Waldron, 2008).

Additionally, has been detected porous structures vary skeleton remains. These porous structures might be a sign osteoporotic disease (Aufderheide and Martin, 1998).

The collection "43462":

- Two fragments of parietal bone of an adult person (Figure 4.7.14.). Structure of parietal fragments are thick. Because of the poor conditions of remains couldn't find any information. Additionally, 43462 has been used carbon-14 analysis.

The collection "24253":

- The remains of infant, approximately 3 years old, has been detected. Four vertebrae; one corpus of cervical vertebra, one vertebra arc, one corpus of thoracic vertebra, another thoracic vertebra except spine part. One right coxae remain; mostly ilium part has existed, has been defined auricular surface, sulcus preauricularis, and sciatic notch. The fragment of scapula, possibly has belonged to right side, only superior border has been recovered.

- The remains of another non-adult, approximately 12 years old. The left humerus with capitulum humeri has been founded in perfect condition. Also, the condition of right clavícula is perfect. One right distal end, epiphyses, has been noticed. One corpus of lumbar vertebra. The bottom part of sacrum (S3-S4-S5) has fused, S1 and S2 has not fused not only each other, but also the bottom. The general condition of S1 has been seen normal, however S2 has broken. The manubrium sterni existed. Lastly, two undefined remains have been noticed.

- The left humerus belongs to an adult person. The general aspect of humerus is good, except the one fragment of proximal end has broken. Two corpuses of cervical vertebrae.

- Another left humerus of an adult individual. Proximal end has broken, but the remain of humerus head existed. The general aspect of humerus has been seemed robust. One small fragment of fibula shaft. One lumbar vertebra, one axis, and three vertebral arcs has been detected.

- The 20 fragments of costae belong to adult and non-adult individuals. Their conditions are very poor.

- Vertebral remains have been founded. One lumbar vertebra, one corpus of thoracic vertebra, three spines of cervical vertebra, three corpuses of another cervical vertebrae, probably one of them belongs to a non-adult person; two thoracic vertebrae, one of them is corpus of thoracic, which belong to a non-adult individual.

- The six tarsal bones; left talus, left calcaneus, three cuboid bones, one navicular. Their conditions are moderate.

- Seven metatarsals, 12 phalanges of tarsal. The remains are well-preserved.

- The six carpal bones; left scaphoid, one trapezium, four lunatum. Their conditions are well.
- Seven metacarpals, 34 phalanges of carpal. The remains have shown good conditions.
- A tympanic bone, and three cranium pieces. The pieces of crania are very small. For this reason, they have not been categorized properly.
- The isolated teeth of “24253”: Total 31 isolated teeth have been recovered. Four of them are deciduous teeth: three canines; one molar crown, which is the root is still growing. The permanent teeth: 12 incisor teeth; the root of one of them is broken. Three canines; seven premolars have been identified. Two molars, the root of one them is opened. The other molar has shown very high degree tooth-wear. Three undefined teeth because of the tooth-wear degrees (Table 4.7.1. and Table 4.7.3.).

In collection “24253” has been founded a few pathological conditions. On the dental remains, has been discovered hypoplasia (Figure 4.7.10.). Dental hypoplasia is a developmental condition that affects teeth, leading to incomplete or underdevelopment of the enamel (Hillson, 2005). Enamel is the outer layer of the tooth that plays a crucial role in protecting it from decay and damage. Hypoplasia can result in thin enamel, pits, or grooves on the tooth surface. Additionally, dental caries has been identified on interface of incisor tooth (Figure 4.7.11.).

Two hand phalanges have shown osteophytes (Figure 4.7.13.). Osteophyte is commonly employed to denote bony prominences along joint peripheries, primarily concomitant with degenerative joint afflictions, such as osteoarthritis (OA). Specifically, within the osteoarthritic milieu, there occurs a progressive attrition of the constituent bones comprising the joints. Osteoarthritis manifests as a gradual deterioration and depletion of cartilaginous tissue within the joints. This pathological condition accentuates friction across joint interfaces, consequently augmenting stress between the osseous elements. In response to this heightened stress and wear, the organism instigates a reparative mechanism, leading to the formation of new osseous projections, termed osteophytes (Aufderheide and Martin, 1998; White and Folkens, 2005).

On humerus has been observed foramen on coronoid fossa (Figure 4.7.12). To this variation is named septal aperture in literature given by Hrdlička (1932) (Mathew et. al, 2016; Mutlu, 2022). The precise origin of the septal porosity in the humerus remains uncertain; however, there exists a set of theories regarding its etiology; such as one of them these theories suggests that a possible phylogenetic basis (further reading Hrdlička, 1932; Mutlu, 2022).

Finally, Leporidae remains (Figure 4.7.15.) have been noticed.

La Muntanya Assolada (Bronze)	Human Remains
24253 (1)	1 coxae; 1 scapula piece; 4 vertebrae (1 cervical, 2 thoracic, 1 arc); undefined remain
24253 (2)	Sacrum pieces; 1 lumbar vertebra; 1 vertebrae arc; right clavícula; left humerus; right distal femur; manubrium sterni; 2 undetermined bone pieces
24253 (3)	Left humerus; 2 cervical vertebrae
24253 (4)	Left humerus; 1 fibula shaft; 1 lumbar vertebra; axis; 3 vertebrae arcs
24253 (5)	20 costae; 10 vertebrae (1 lumbar, 3 spines, 3 thoracic, 3 cervical); 6 tarsals; 7 metatarsals; 12 phalanges (foot); 6 carpals; 7 metacarpals; 34 phalanges (hand); tympanic bone; 3 cranium pieces
24253 (isolated teeth)	Total 31 teeth; 4 deciduous teeth (3 canine, 1 molar crown); permanent: 12 incisors, 3 canine, 7 premolars, 2 molars, 3 undefined teeth
43462	2 cranium pieces
24254 (62800)	1 phalange

24254 (62821)	1 cranium piece
24254 (62812)	1 cervical vertebra; 1 capitulum humeri; 2 isolated teeth (1 premolar 1 molar); 2 phalanges; undetermined remains
24254	The skeleton mostly exists. Left right femur, tibia, fibula; left-right upper limb; mandibula; fragmented pelvis; right clavícula; atlas; 1 symphyseal surface...

Table 4.7.1.: Human remains of La Muntanya Assolada

Juvenile	~3 years ~12 years
Adult	1 female, +30 years 2 adults

Table 4.7.2.: Individuals of La Muntanya Assolada

Postcrania	4 left humeri
------------	---------------

Table 4.7.3.: Most frequency remains of La Muntanya Assolada



Figure 4.7.1.: Teeth of infant individual



Figure 4.7.2.: The remains of juvenile individual



Figure 4.7.3.: Right coxae of “24254”



Figure 4.7.4.: The mandibula of “24254”



Figure 4.7.5.: Atlas of “24254”

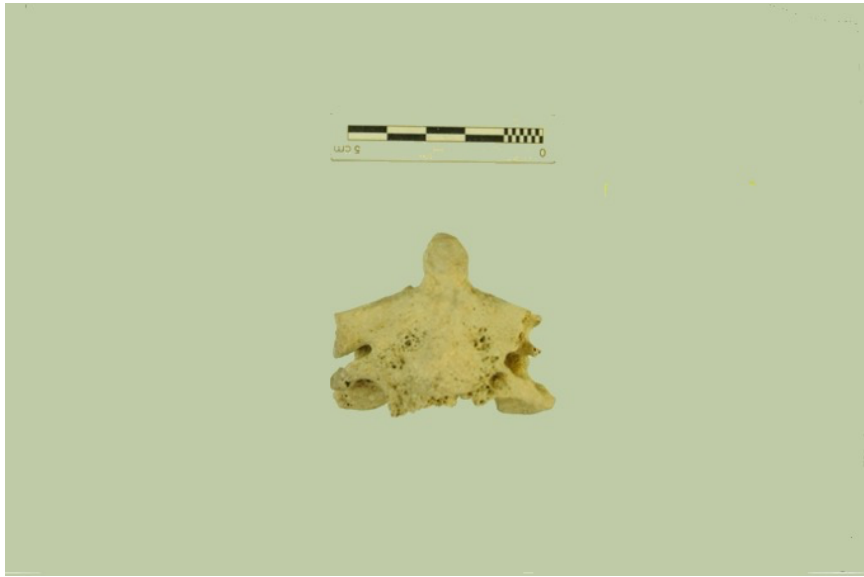


Figure 4.7.6.: Fusion of axis and C3



Figure 4.7.7.: Fusion of axis and C3



Figure 4.7.8.: Fusion of cervical vertebrae



Figure 4.7.9.: Fusion of cervical vertebrae



Figure 4.7.10.: Dental hypoplasia



Figure 4.7.11.: Dental caries on interface



Figure 4.7.12.: Variation, foramen on coronoid fossa

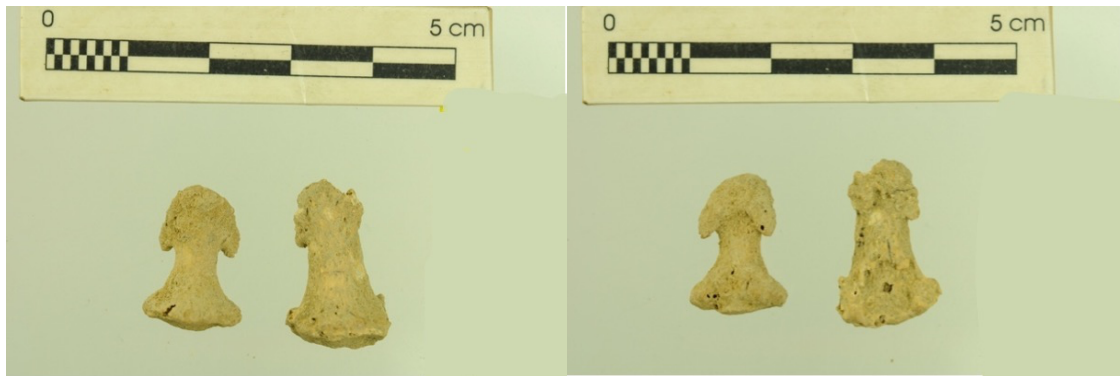


Figure 4.7.13.: Osteophytes on phalanges



Figure 4.7.14.: Two crania pieces of 43462



Figure 4.7.15.: Leporidae remains

4.8. Cau de la Serp

It couldn't find any information about Cau de la Serp. Moreover, lack of the remains has not been defined any bioarcheological data from one cranium fragment, and four isolated teeth (Table 4.8.1.) (Figure 4.8.1. and Figure 4.8.2.).

Cau de la Serp	Remains
76351	1 cranium piece; isolated 4 teeth (2 molars, 2 incisors)

Table 4.8.1.: Human remains of Cau de la Serp



Figure 4.8.1.: The remains of Cau de la Serp



Figure 4.8.2.: The dental remains of Cau de la Serp

Site	Number of remains
Cau Raboser de Dalt	412
Cau Raboser de Baix	511
Cova del Monedero	51
Cova de la Caiguda	53
Cova de la Xarta	182
Cova dels Gats	195
Cova del Pic	965
La Muntanya Assolada	364
Cau de la Serp	5
TOTAL	2738

Table 4.2.: Total number of remains

From all archaeological sites, a minimum of 50 individuals have been recovered. Among them, 29 individuals have been identified as adults, while 21 individuals have been determined to be non-adults. Furthermore, among the adults, six female and eight male individuals have been recovered, while the sex of the others could not be estimated due to the condition of the remains.

In the paleopathological results, no serious health issues or causes of death have been identified. This could be attributed to the poor condition of the remains. Additionally, potential pathological conditions may not have affected the bones. However, several pathological results have been identified. Generally, dental records from all sites indicate dental diseases such as caries, antemortem tooth loss, and hypoplasia. Based on observations, it is primarily the molar teeth that exhibit antemortem tooth loss (see table 4.3.).

Site	Antemortem tooth-loss
Cau Raboser de Baix	75307: LPM ⁴ , LM ¹ , LM ² 75282: LI ²
Cova de la Caiguda	24527: LPM ₃ , LM ₃ , RM ₁ , and all incisors 24527: all teeth of maxilla show ante-mortem tooth-loss; except RM ³ , RI ¹ , LI ¹
Cova de la Xarta	21927: RPM ₄
Cova dels Gats	21950: LPM ₄ , LM ₁ , LM ₂ 21952: LM ¹ , RPM ⁴ , RM ¹ 21958: RM ₁ , RM ₂ , RM ₃ 21959: RM ₁ , RM ₂ , RM ₃
Cova del Pic	75244: LM ₁ 24633: RPM ₄ , RM ₁ , RM ₃ , LM ₂ , LM ₃
La Muntanya Assolada	24254: RI ₂

Table 4.3.: Antemortem tooth-loss

The total number of teeth found was 376, comprising 46 deciduous teeth and 330 permanent teeth. Additionally, a total of 265 possible dental sockets were identified. Two mandibles and one maxilla from Cova del Pic, three mandibles from Cova dels Gats, and one maxilla from Cau Raboser de Baix were excluded from the antemortem tooth loss analysis due to their extremely poor condition. Among the jaws with antemortem tooth loss, there was one female, three males, and seven unidentified. No significant differences were observed between female and male individuals.

Based on the available data, antemortem tooth loss was observed in 16.6% of the sockets (44/265), dental enamel hypoplasia was present in 7.98% of the teeth (30/376), and dental caries affected 6.91% of the teeth (26/376).

Analyzing the dental caries prevalence for each archeological site, Cau Raboser Dalt has 5.55% (5/90), Cau Raboser Baix 2% (1/50), Cova del Monedero 0% (0/11), Cova de la Caiguda 0% (0/12), Cova de la Xarta 13.15% (5/38), Cova dels Gats 13.51% (5/37), Cova del Pic 6.73% (7/104), La Muntanya Assolada 7.31% (3/41), and Cau de la Serp 0% (0/4). Mostly, molar teeth are affected by dental caries, followed by incisor teeth, which also show this pathology.

When examining the hypoplasia rates for each archaeological site individually, Cau Raboser Dalt has 11.11% (10/90), Cau Raboser Baix 2% (1/50), Cova del Monedero 0% (0/11), Cova de la Caiguda 0% (0/12), Cova de la Xarta 13.15% (5/38), Cova dels Gats 13.51% (5/37), Cova del Pic 0.96% (1/104), La Muntanya Assolada 19.51% (8/41), and Cau de la Serp 0% (0/4). It has been observed that the caves with a 0% rate contain fewer dental remains compared to the others. The most affected teeth, in order, are the incisors, premolars, and canines.

Considering the antemortem tooth loss prevalence for each archaeological site individually, Cau Raboser Dalt has 0% (0/5), Cau Raboser Baix 9.09% (4/44), Cova del Monedero 0% (0/10), Cova de la Caiguda 71.42% (20/28), Cova de la Xarta 3.33% (1/30), Cova dels Gats 20% (12/60), Cova del Pic 8.95% (6/67), La Muntanya Assolada 6.25% (1/16) (Table 4.3.). Due to the absence of mandibles and maxillae, antemortem observations could not be conducted at Cau de la Serp. The highest prevalence has been observed at Cova de la Caiguda. Notably, all antemortem tooth losses belong to the same individual, which may be related to the aging process.

While individual rates for each site have been presented, the discussion focuses on the overall rates derived from the total sample. This approach was adopted to provide more meaningful conclusions, considering the poor preservation conditions and varying sample sizes across the sites.

The preservation of the skeletal remains (BPI) was assessed, yielding a total preservation (Table 4.2.) rate of 26.58%. It is important to note that the total bone count includes fragments of bones from the same region, which could potentially lead to a lower preservation rate if these

fragmented pieces were excluded from the analysis. To ensure a more accurate assessment of preservation, the preservation rates of the long bones were also evaluated separately.

Due to poor preservation and fragmentation, only long bones with a confirmed side (left or right) and distinct anatomical features were included in the preservation index calculation for both adult and non-adult individuals. Small or undifferentiated shaft fragments, where it was unclear whether they represented a single bone or parts of multiple bones, were excluded from the analysis.

The analysis identified 14 tibiae (12 left, 2 right), 13 femora (8 left, 5 right), 10 humeri (6 left, 4 right), 12 ulnae (4 left, 8 right), and 9 radii (3 left, 6 right) across all archaeological sites. According to the bone preservation index, the prevalence rates are as follows: tibiae at 14%, femora at 13%, humeri at 10%, ulnae at 12%, and radii at 9%.

The findings indicate that the skeletal remains are in very poor condition, as shown by the preservation index. This level of preservation creates difficulties in reconstructing the biological and cultural aspects of the population need to interpret the data with caution.

Chapter V: Discussion

This study presents an examination of human remains from the Chalcolithic-Bell Beaker periods, shedding light on the health, diet, and lifestyle of these ancient populations. By analyzing skeletal and dental remains, patterns of disease, nutrition, and overall well-being within these communities have been discussed.

Paleopathological assessments have identified various conditions affecting the skeletal and dental health of individuals from these periods. The prevalence of dental diseases such as caries, antemortem tooth loss, and enamel hypoplasia offers valuable insights into the dietary habits and health challenges faced by these populations. Additionally, findings on bone pathologies highlight the physical stresses and environmental factors impacting these ancient societies.

This discussion will explore the implications of these findings, placing them within the broader context of anthropological and archaeological research: bioarcheological perspective. Changes in diet, lifestyle, and environmental conditions and their influence on the health of these populations will be examined.

5.1. Results with paleopathological conditions and their possible meanings

Due to condition of the remains the paleopathological observation has been limited. However, in this chapter will discuss what can be say about pathological findings for each archaeological

site. It should be noted that any death related pathological condition has been founded, due to conditions of remains may cause it; furthermore, pathological conditions do not always affect the bones.

Before presenting a detailed paleopathological analysis with bioarchaeological literature, a brief evaluation of the findings from each archaeological site is provided to establish a contextual foundation for the discussion:

5.1.1. Cau Raboser Dalt

The identification of enthesopathy in the phalanges indicates repetitive stress or chronic mechanical strain, which could point to specific physical activities or habitual practices of this population. Enthesopathy, often linked to stress or repetitive motions, can reflect the intensity of physical labor or specific tasks that place pressure on particular joints.

The presence of arthritis in the phalanges and osteoarthritis in the thoracic vertebra suggests a community dealing with degenerative joint conditions, likely increase by age or repetitive, physically demanding activities. Meanwhile, the observed lack of fusion in the lumbar vertebra could reflect congenital spinal development variations or be linked to developmental stress or physical strain.

Dental enamel hypoplasia observed in both deciduous and permanent teeth provides insight into developmental stress experienced by this population, especially during childhood. Since enamel hypoplasia is linked to periods of nutritional deficiency, illness, or environmental stress, these findings suggest that this group may have experienced episodes of malnutrition, illness, or environmental stress during critical growth periods. Such evidence of physiological stress during childhood implies that access to nutrition or exposure to disease was likely inconsistent, gives ideas about the broader health challenges faced by this community.

The prevalence of dental caries on the occlusal and interfacial surfaces of permanent teeth, along with visible tooth wear, underscores the dietary composition and lifestyle of this population. Caries typically reflect diets rich in carbohydrates, which promote decay, whereas tooth wear can indicate coarse or fibrous diets, age-related wear, or even occupational habits. Without a broader sample, it's challenging to pinpoint a single cause, but these findings align with the known transition toward more agrarian, plant-based diets, which often accompany increased dental wear and caries rates in archaeological records.

The bilateral duplication of the foramen transversarium observed in the cervical vertebrae is a notable congenital variant. This duplication, while a benign anatomical variation, could suggest regional genetic patterns, given its specificity. Observing such a trait could indicate the presence of particular familial lineages or genetic groups within this community, hinting at the regional genetic diversity and possibly the relative isolation of the population over generations.

5.1.2. Cau Raboser Baix

The restricted paleopathological scope due to poor preservation limits a more extensive understanding of health patterns but still reveals key insights into the skeletal stressors and possible lifestyle factors of the population. Osteoarthritic changes and osteophyte formations in the vertebrae indicate age-related degeneration or possibly lifestyle-driven physical stress. Osteophytes, generally develop as a response to joint instability or repetitive mechanical stress, often in association with degenerative joint conditions. These findings suggest that individuals from this group likely experienced chronic physical activity, leading to gradual degeneration in load-bearing joints. This osteoarthritic evidence is hypothesizing about the population's physical activities, which may have included repetitive tasks or sustained physical labor that caused joint wear.

The presence of cribra femoralis in the femur suggests the nutritional or health challenges faced by this community. Cribra femoralis is often linked to iron-deficiency anemia, malnutrition, or exposure to disease, conditions that can cause porosity in the cortical bone. This finding implies that some members of the population may have experienced periods of nutritional deprivation or were vulnerable to diseases that disrupt red blood cell production, which could be linked to dietary limitations or environmental stresses. Anemia or malnutrition evidence like this is particularly important in understanding the living conditions and possible scarcity of resources faced by this society.

The antemortem tooth loss observed in the fragmented maxilla, including the loss of molars and premolars, aligns with a pattern of dental wear and decay, possibly due to age, diet, or inadequate oral hygiene. High tooth wear combined with caries further suggests that this individual may have been older, possibly over 45 years, based on the degree of attrition seen. Severe wear may also be indicative of a coarse diet, perhaps involving fibrous or abrasive foods, or it might suggest repetitive dental use in tasks beyond eating, such as tool processing. Additionally, the observed caries on the isolated molar, alongside pronounced wear, could reflect carbohydrate-rich dietary habits or limited access to oral hygiene, common in past societies.

These paleopathological findings paint a picture of a community likely dealing with considerable physical demands, potential dietary restrictions, and episodes of nutritional or health-related stress. The evidence of osteoarthritis, anemia-related conditions, and dental pathologies offers a window into the health dynamics and lifestyle of this population. Such findings allow for a nuanced interpretation of how diet, physical exertion, and environmental factors impacted health, revealing resilience amid the limitations of prehistoric life.

5.1.3. Cova del Monedero

The minimal preservation of remains significantly limits the paleopathological analysis, restricting insight into the general health or disease patterns of the population. However, the

isolated thoracic vertebra with pathological signs provides some clues. The porotic structure observed in the spinae and transverse processes may indicate issues related to bone density or underlying metabolic stress, which could be due to nutritional deficiencies, chronic illness, or age-related degeneration. Porosity in vertebrae often correlates with conditions such as osteoporosis or other metabolic bone diseases that weaken bone structures over time.

The lack of fusion observed along the vertebral rim suggests a developmental or degenerative anomaly. Unfused vertebral rims can be associated with aging or specific stress-related conditions, possibly linked to physical strain or wear on the spine. This feature could imply that the individual experienced prolonged physical exertion, leading to degenerative stress on the vertebral column, a common occurrence in prehistoric populations engaged in physically demanding tasks.

5.1.4. Cova de la Caiguda

The observed pathologies in cranium 24527 provide subtle insights into potential health challenges or variations of this individual. The presence of porotic hyperostosis and cribra orbitalia—conditions often correlated with iron deficiency anemia or dietary insufficiencies—suggests that the individual may have experienced periods of nutritional stress. However, while these markers are commonly associated with anemia, it is essential to acknowledge that other factors, such as infectious diseases or genetic predispositions, may also contribute to these conditions.

Additionally, the identification of an osteoma on the parietal bone represents a benign bone growth, which, while generally harmless, reflects a common type of non-cancerous tumor occasionally found in skeletal remains (Aufderheide and Martin, 1998). Osteomas rarely cause significant health issues unless they grow large enough to apply pressure to surrounding structures. In this case, the osteoma's benign nature implies it was likely incidental, without substantial impact on the individual's daily life.

Antemortem tooth loss in both the maxilla and mandible—alongside an abscess in the maxilla—points to longstanding dental health challenges. The closed sockets from lost teeth confirm that the individual experienced tooth loss well before death, possibly due to conditions such as dental decay or periodontal disease. The pronounced tooth wear observed across remaining teeth could indicate an age-related process or possibly be linked to dietary habits, such as the consumption of coarse foods that contributed to more rapid dental wear.

Finally, the presence of a small osseo on the lambdoid suture, known as a Wormian bone, is noted as an anatomical variation. Such bones are generally considered benign and likely a result of genetic variation, reflecting the developmental biology of the individual which can be used as an . The appearance of these bones in the cranial sutures is common in various populations and typically does not signify any adverse health effects.

5.1.5. Cova de la Xarta

The absence of third molar eruption in the mandible but not the maxilla, suggests both individual-level variability and potentially underlying genetic or developmental factors. The lack of a third molar in the mandible, known as third molar agenesis, is a relatively common variation and can reflect both genetic predisposition and environmental influences during developmental stages.

The observed antemortem tooth loss of the RPM₄ presence of dental caries on multiple teeth—particularly on the mesial and lingual surfaces—demonstrates the impact of diet or oral hygiene practices. Such localized caries may imply a diet high in carbohydrates, which often contributes to acidic by-products that erode enamel. The detection of enamel hypoplasia in both adult and non-adult individuals provides additional context, as this condition generally results from disruptions during the mineralization of tooth enamel. Hypoplasia often indicates physiological stress experienced during early childhood, likely due to malnutrition, febrile illnesses, or other systemic stresses that affected the population's overall resilience.

Lastly, the presence of osteophytes on the articular facet of one costa suggests an adaptive skeletal response, possibly to mechanical stress or age-related degeneration. While osteophyte formation often arises in response to chronic joint instability or aging, in this context, it may reflect habitual or occupational stresses, particularly those requiring repetitive movements.

5.1.6. Cova dels Gats

The limited paleopathological findings in Cova dels Gats reflect both preservation challenges and a notable absence of detectable skeletal pathologies, which restricts insights into broader health conditions within this population. Nevertheless, the documented dental pathologies provide valuable clues into individual health and lifestyle factors.

Antemortem tooth loss observed in multiple mandibles and maxillae, particularly affecting molars and second premolars (refers to PM4s), suggests a pattern that may be associated with factors like periodontal disease, recurring infections, or dietary habits that contributed to tooth wear and decay. Tooth loss, especially in molars which bear substantial chewing forces, could reflect either age progression or repeated mechanical stress associated with dietary practices involving coarse or abrasive materials.

The presence of moderate dental hypoplasia on permanent incisors and canines further emphasizes the potential for nutritional or health stressors during childhood. Hypoplasia often results from interruptions in enamel formation, frequently due to deficiencies in essential nutrients, febrile illnesses, or systemic stresses that disrupt enamel mineralization. This condition's frequency among the permanent teeth suggests a recurring health issue within the early life stages of the population but cannot be corroborated for non-adults due to the lack of deciduous teeth remains.

Dental caries identified on specific molars highlight localized decay, likely due to diet-related factors. Caries on the occlusal and interproximal surfaces of molars indicate frequent exposure to cariogenic foods or possible deficiencies in dental hygiene. Such decay also provides indirect

evidence of carbohydrate consumption, as fermentable sugars are common contributors to caries development.

The retained canine observed in one maxilla is a notable anomaly. Impacted canines, typically associated with overcrowding or developmental factors, may suggest a genetic predisposition or irregularities in jaw development. The impaction of the canine rather than a third molar is relatively unusual, indicating that specific structural or spatial constraints in the dental arch may have influenced this condition.

5.1.7. Cova del Pic

The squatting facet on the metatarsal offer clues into habitual activities and physical demands placed on individuals. The squatting facet, for example, is typically associated with repetitive squatting movements, suggesting that daily tasks or social practices in this community involved significant lower limb activity (Finnegan, 1978; Buikstra and Ubelaker, 1994; Smith and Woollen, 2020). Such repetitive behaviors, observable through skeletal markers, highlight the physical intensity and possibly communal labor involved in sustaining the population's needs.

The dental pathologies found in Cova del Pic, such as antemortem tooth loss and multiple carious lesions, indicate significant oral health challenges in this population. The occurrence of fistulae, as observed in the M₁ socket, suggests infections possibly due to untreated or advanced dental decay, which may have caused pain, swelling, and difficulties with mastication. Caries on multiple surfaces across different molars (buccal, mesial, and lingual) and premolars imply that the diet likely included cariogenic foods, which promoted tooth decay. Such diets may have been rich in carbohydrates, potentially linked to the agrarian dietary shifts of the time, where carbohydrates from cultivated plants would have increased in prominence. Furthermore, the presence of hypoplasia on an incisor tooth points to nutritional or physiological stress during early childhood, suggesting periods of malnutrition or disease that interrupted dental development.

The absence of M3 eruption (third molar agenesis) in adult mandibles is an evolutionary trait that reflects broader shifts in human morphology and diet. The agenesis of third molars could suggest that this population was beginning to adapt to softer diets, which are commonly associated with reduced masticatory stress and the evolutionary trend of jaw size reduction. This observation fits within the broader context of dietary and environmental adaptations during the transition from Neolithic to later periods.

5.1.8. Cau de la Serp

Due to the scarcity of remains, a detailed pathological analysis was not possible. However, the isolated teeth show significant wear, suggesting advanced age or specific dietary habits.

The following discussion builds on these findings by drawing on relevant bioarchaeological literature and comparative studies.

The remains from all archaeological sites in this study exhibit similar pathological conditions, particularly dental and vertebral pathologies. These findings provide significant insights into social transitions throughout prehistoric periods. Especially dental pathology findings mostly suggested that dietary habits of the population. The transition to an agrarian lifestyle brought significant dietary changes, such as increased carbohydrate consumption. Carbohydrate based diet is related to dental caries, antemortem tooth-loss, and another inflectional dental disease (Mays, 2002; Dioguardi et. al., 2024). In a recent study is published by Bertilsson et. al. (2022) collected the data which shows the dental caries prevalence in European populations increase from 9000 BCE to 1850 AD. This result suggests that the importance of the dietary changes, especially demonstrates carbohydrate effects on the dental health.

Dental caries is among the most prevalent dental diseases and represents a primary cause of tooth loss (Waldron, 2008). It is characterized by the demineralization of enamel tissue, a process initiated by organic acids produced by cariogenic bacteria (Larsen, 1997; Ortner, 2003). The development of dental caries occurs in three stages. First, specific bacteria in the oral environment, notably *Streptococcus mutans*, metabolize carbohydrates, particularly sugars from foods and beverages, producing acids as a metabolic byproduct that gradually erode the enamel. This process results in the formation of a biofilm, known as dental plaque, which accumulates on the tooth surface. Over time, the enamel layer is compromised, allowing decay to advance into the dentin and potentially reach the pulp, leading to pain and possible infection (Larsen, 1997; Mays, 2002; Ortner, 2003; Hillson, 20005; Waldron, 2008).

However, the latest researches demonstrate that not only carbohydrate-based food consumption is the main reason of dental caries, but also, age, genetic, environmental factors—including socio-economic conditions—play important role for this pathology (e.g. Marklein et al., 2019). All indicators should be considered when studying the dental caries of a population.

Genes play a critical role in determining enamel structure, including those encoding for ameloblastin, amelogenin, enamelin, tuftelin, and tuftelin-interacting protein 11 (Patir et al., 2008; Vieira et al., 2015; commentary by Lukacs in Marklein et al., 2019). For instance, amelogenesis is regulated by genetic factors, with variations influencing enamel characteristics such as size, shape, color, and susceptibility to dental caries (Patir et al., 2008). Vieira and colleagues (2015) found that lower levels of amelogenin result in "weaker" enamel, meaning individuals with this enamel structure are more susceptible to acid damage produced by bacteria. It may thus be essential to explain why individuals within the population exhibit varying prevalence of dental caries.

Many researchers have suggested that female individuals display a higher prevalence of dental caries than males. This theory posits that the shift to an agricultural lifestyle—and the resulting population growth—may have disproportionately affected women due to increased pregnancies, which could impact oral health through nutritional demands and physiological changes associated with pregnancy (Lukacs, 2017). Furthermore, these researchers propose that behavioral and cultural factors may also contribute to sex-based differences in caries frequency. They

suggest that, since women tended to stay at home, they had easier access to food throughout the day, whereas men, who spent much of their time working outside, had limited access to food resources during this period. Consequently, food particles remained in the mouths of females for longer periods, fostering an environment where cariogenic bacteria could thrive, leading to a higher prevalence of dental caries among females (Larsen et al., 1991; Hillson, 1996; Larsen, 1997; Cucina and Tiesler, 2003).

The other important indicator of the dental caries is oral microbiome (Gao et. al., 2018; Spatafora et. al., 2024). The oral microbiomes of hunter-gatherer tend to be more diverse than agricultural societies, which is significant for dental health (Gupta et. al., 2017; Quagliariello and Modi, 2023). Gupta et. al. (2017) demonstrate that oral microbiome variation has changed through three major transitions: from hunter-gatherer lifestyle to agricultural lifestyle to industrialized urban lifestyle. This trend shows decrease in the diversity of the microbiome (Gupta et. al., 2017) which can be related the prevalence of the dental pathologies; such as, caries, antemortem tooth-loss, abscesses (commentary by Lukacs in Marklein et al., 2019; Spatafora et. al., 2024).

Marklein and colleagues (2019) investigated the hypothesis that agricultural populations exhibit a higher prevalence of dental lesions than hunter-gatherer groups. To substantiate their analysis, they reviewed research from a wide range of global studies. Upon examining dental caries prevalence across approximately 185 archaeological sites categorized under hunter-gatherer and agricultural societies, they found that dental caries was significantly more common among populations with agricultural lifestyles.

In summary, when the prevalence of dental caries is assessed alongside the other conditions discussed above, it provides a broader perspective on the overall health and lifestyle of a population. This combined analysis can reveal insights into dietary habits, health challenges, environmental influences, and social factors affecting individuals within that population, contributing to a more comprehensive understanding of their living conditions and physiological stressors.

In bioarchaeology literature antemortem tooth-loss mostly links periodontal diseases (Al-Shammari et. al., 2005; Waldron, 2009). According to the literature periodontitis is responsible for more antemortem tooth-loss than dental caries (Shafer et. al., 1983; Aufderheide and Martín, 1998).

Periodontitis is a chronic inflammatory condition that affects the supporting structures of teeth, collectively known as the periodontium. Its progression begins with the accumulation of bacterial plaque on tooth surfaces, which, if not properly managed, triggers an immune-inflammatory response in the gingival tissues (Larsen, 1997; Hillson, 2005). Over time, this response leads to the destruction of the periodontal ligament, alveolar bone, and connective tissue. Without intervention, the structural integrity of the periodontium is compromised, resulting in tooth mobility and eventual tooth loss. The pathogenesis of periodontitis involves a complex interplay between pathogenic bacteria, host immune responses, and various systemic or environmental risk factors (Ortner, 2003; Hillson, 2005). The transition from the hunter-gatherer life to agriculture life style caused by an increase in periodontal disease and tooth-loss (Larsen, 1997).

High rates of tooth-loss could indicate a diet rich in abrasive foods or the consumption of coarse, unprocessed materials, leading to significant dental wear, which it leads to pulp exposure, dental abscess and ultimately causes tooth loss (Lukacs, 2007; Kaidonis, 2007; Dioguardi et. al., 2024). The dental remains analyzed show varying degrees of tooth wear, ranging from mild to severe, alongside evidence of dental caries. This duality can be attributed to the dietary practices of these agricultural communities. A significant contributor to tooth wear was the use of stone tools to grind grains. This process often introduced microscopic stone particles into the flour, which, when consumed, acted as abrasive agents, gradually eroding the enamel (Scott, 1991).

This coexistence of abrasive and cariogenic foods reflects a nuanced dietary pattern, where individuals consumed both processed grains, potentially mixed with residues from grinding tools, and softer carbohydrate-based foods derived from agricultural practices.

Moreover, studies suggest that in more recent periods, AMTL has been associated with socio-economic factors, such as poverty, malnutrition, or inadequate access to dental care (e.g. Walkup, Winburn and Stock, 2023).

Although there is no direct evidence, it is worth considering that antemortem tooth loss might have resulted from possible dental interventions. Evidence of toothpick use has been observed in Neanderthal specimens from Cova Foradà in Valencia (Lozano et al., 2013); however, detailed knowledge regarding dental treatments in the Valencia region during prehistoric periods remains limited. Also, some traumas or occupational conditions could let to antemortem tooth-loss (Larsen, 1997; Ortner, 2003).

In such cases, tooth loss may predominantly affect the front teeth, as these are often subjected to extensive use in occupational or cultural activities (Scott, 1991). This includes tasks like gripping, cutting, or holding materials with the teeth, which can result in accelerated wear, fractures, or periodontal strain over time (Lozano et. al, 2021; Díaz Navarro et. al., 2023; Romero et. al., 2024). The repetitive mechanical stress caused by such practices could compromise the structural integrity of these teeth, ultimately leading to their antemortem loss. These patterns are commonly observed in populations with specific occupational or cultural practices involving tool-like use of the teeth.

Enamel hypoplasia is a developmental defect of dental enamel characterized by the presence of horizontal grooves or pits on tooth surfaces. These defects occur during the formation of enamel and serve as markers of physiological stress during childhood (Lukacs, Nelson, and Walimbe, 2001; Ortner, 2003).

Enamel development, or amelogenesis, is a complex process orchestrated by ameloblasts, specialized epithelial cells derived from the inner enamel epithelium of the dental organ (Goodman and Rose, 1991). During amelogenesis, any disruption caused by malnutrition, illness, or other environmental factors can impair the activity of ameloblasts, resulting in permanent enamel defects (Brothwell, 1963; Nikiforuk and Fraser, 1981; Goodman and Rose, 1991; Lukacs, Nelson and Walimbe, 2001). Enamel hypoplasia arises from disruptions during

the enamel-forming phase (amelogenesis) due to systemic physiological stressors. These disruptions stem from deficiencies in essential nutrients like calcium, phosphorus, and vitamins D and A, as well as metabolic imbalances affecting enamel mineralization (Brothwell, 1963; Nikiforuk and Fraser, 1981). Chronic illnesses, malnutrition, and prolonged infections can exacerbate these effects, leading to visible enamel defects. The interaction between systemic deficiencies and persistent health challenges highlights hypoplasia as a cumulative marker of childhood stress rather than a result of isolated acute illnesses (Brothwell, 1963; Nikiforuk and Fraser, 1981).

Enamel hypoplasia predominantly affects the anterior teeth, such as incisors and canines (Goodman and Armelagos, 1985a; Goodman and Armelagos, 1985b; Goodman and Rose, 1991; Larsen, 1997), due to the timing of enamel formation during childhood. These teeth begin to develop earlier in the deciduous and permanent dentitions, making them more vulnerable to systemic stressors during critical growth periods (Aufderheide and Martín, 1998). The appearance of hypoplasia, such as horizontal grooves or pits, on these teeth provides valuable insights into episodes of physiological disruption experienced during early development. These defects act as chronological records of stress events, providing insight into the health and living conditions of past populations.

The third molar agenesis in these archaeological sites, have been told above, could be related evolutionary trait. It is correlated with reduced prognathism, maxillary length, archial growth of mandible (Ricketts, 1972; Carter and Worthington, 2015). The mandibular growth was studied by Ricketts (1972). Ricketts observed that the mandibular arch follows specific, predictable growth patterns from childhood through adolescence. He developed a method for mapping mandibular growth by measuring incremental changes in mandibular length and dental arch perimeter. According to his findings the reduction in mandibular size causes M3 eruption problems, such as impaction even further agenesis. These findings indirectly provided a foundational framework for evolutionary dental adaptations.

According to evolutionary theory, the transition from consuming raw meat to cooked foods, followed by the adoption of agriculture and the increasing reliance on softer, more easily consumable diets, profoundly influenced human dietary habits. This shift led to a gradual

weakening of the robust jaw muscles characteristic of earlier human populations and a progressive retraction of the protruding jaw structure toward the facial plane (e.g. Bergman, 1998; Lieberman, 2008; von Cramon-Taubadel, 2011; Pamukcu et. al., 2020). The reduction in jaw size that accompanied these changes resulted in challenges with dental alignment. One significant outcome is the prevalence of issues related to the eruption of third molars, including cases of complete non-eruption, agenesis (Kahn et. al., 2020; Gkantidis et. al., 2021).

A recent study by Vukelic et al. (2017) explored the relationship between M3 agenesis and genetic factors. According to their findings, not only dietary shifts but also genetic factors may contribute to explaining M3 genesis; however, further research is needed to clarify the genetic mechanisms underlying this process.

In modern populations, the absence of third molars varies considerably across different regions and demographic groups. The least common third molar agenesis is founded in sub-Saharan African with 0.5% percent, and Australian aboriginal with 1.8% (Irish, 1997 from Carter and Worthington, 2015).

Porotic hyperostosis and cribra orbitalia are cranial lesions that provide valuable insights into the health challenges faced by ancient populations. They manifest as porous bone surfaces on the skull and the orbital roofs, respectively (Rivera and Lahr, 2017). Porotic hyperostosis typically manifests on the cranial vault, while cribra orbitalia is localized to the roof areas of the eye sockets, reflecting different expressions of similar underlying metabolic conditions (Stuart Macadam, 1989; Walker, 1985; both from Larsen, 1997; Ortner, 2003; Brickley, 2018). If this structure appears on the femur, it is referred to as cribra femoralis. Their presence often have suggessted by researchers a systemic stress markers, typically tied to anemia caused by nutritional deficiencies or chronic infections (e.g. Angel, 1968, 1978; Aufderheide and Martín, 1998).

Angel was a pioneer in systematically analyzing skeletal remains from regions such as Turkey, Cyprus, and Greece, focusing on population-level studies (Larsen, 1997). He hypothesized that porotic hyperostosis was linked to thalassemia or sickle cell anemia (Angel, 1966), suggesting

that these hereditary anemias provided a selective advantage against malaria in the Mediterranean region. However, other regional studies have shown that porotic hyperostosis in past populations can result from a variety of non-genetic factors that lead to iron deficiency anemia. These studies suggest that this type of anemia explains the etiology of both porotic hyperostosis and cribra orbitalia (Larsen, 1997; Salvadei, Ricci, and Manzi, 2001).

The underlying causes of porotic hyperostosis are rooted in disruptions to red blood cell production, which can arise from both genetic and acquired factors. Genetic conditions such as thalassemia and sickle cell anemia lead to chronic anemia due to impaired hemoglobin production. Acquired anemia, on the other hand, frequently results from deficiencies in essential nutrients as well as chronic blood loss or infections. These deficiencies impair red blood cell maturation, creating hypoxic conditions that stimulate erythropoiesis.

When this compensatory mechanism is insufficient, the cranial marrow undergoes significant expansion to boost red blood cell production. This expansion disrupts the bone structure, resorbing the outer table of the cranial vault and forming the characteristic porous lesions of porotic hyperostosis. The lesion severity reflects the chronicity and intensity of the anemia, underscoring its complex interplay with nutritional and environmental factors (Martini and Ober, 2001 from Walker et. al., 2009).

Walker et al. (2009) argue that iron deficiency anemia cannot account for porotic hyperostosis and cribra orbitalia, as it reduces mature red blood cells, which do not disrupt bone structure. In contrast, megaloblastic anemia, caused by deficiencies in vitamin B12 and folic acid (Babior and Bunn, 2001; Green and Mitra, 2017), promotes marrow expansion, potentially leading to these bone surface pathologies.

Regardless of the specific underlying cause, porotic hyperostosis, cribra orbitalia, cribra femoralis serve as a marker of nutritional deficiencies in past populations. While genetic conditions such as thalassemia and sickle cell anemia can contribute to its development, non-genetic factors like megaloblastic anemia caused by vitamin B12 or folic acid deficiencies, as well as broader dietary insufficiencies, are also significant contributors. This pathology

underscores the critical role of nutrition in shaping skeletal health and provides valuable insight into the stressors faced by ancient communities.

Vertebral pathologies reveal evidence of degeneration, suggesting physiological stress within these societies. As noted in the results section, these pathologies include degeneration and osteophytes, likely caused by daily labor activities such as agricultural work, carrying heavy loads, or repetitive movements. Squatting or kneeling, for instance, can lead to the formation of squatting facets on the tibia, talus, or metatarsals (Oygucu et al., 1997; Smith and Woollen, 2020). Such findings align with other bioarchaeological studies, which frequently associate vertebral lesions with subsistence strategies that imposed significant physical demands on individuals.

The term of non-metric variation refers insignificant and cannot be measured, only can be observed anomalies of skeleton (Mays, 2002). These findings in this study, including the duplication of the foramen transversarium in the cervical vertebra and the presence of the ossicles on the cranium such as Wormian bones, demonstrate variations that are common in human skeletal anatomy.

The foramen transversarium, located in the transverse processes of cervical vertebrae, serves as a passage for the vertebral arteries and veins (Ellis, 2006). In this study, bilateral duplication was noted, which is considered a congenital variation. Some studies have suggested that this variation could impact vertebrobasilar circulation, potentially leading to symptoms such as migraines or fainting (Kaya et al., 2011; Chaudhari, Maheria and Bachuwar, 2013). However, in an archaeological context, this finding is interpreted as a reflection of genetic or developmental diversity.

The foramen in the coronoid fossa of the humerus is a variation commonly referred to in the literature as a septal aperture (Hrdlička, 1932; from Mathew et. al., 2016 and Mutlu, 2022). The exact origin of septal porosity in the humerus remains uncertain. One such theory suggests a possible phylogenetic basis (see Hrdlička, 1932; Mutlu, 2022 for further details). This variation does not cause any serious health problem.

The Wormian bones observed in the lambdoid suture, also referred to as os lambda, are small bones that form at cranial sutures. These bones are often linked to genetic factors and are considered non-metric traits that can vary between populations (Berry and Berry, 1967). While these bones generally have no significant health implications, their presence can indicate inherited skeletal patterns or developmental differences.

Another variation, the vastus notch in the patella, was identified in one individual. This feature, characterized by a small notch at the superolateral angle of the patella, is associated with the insertion of the vastus lateralis tendon (Finnegan, 1978). Its presence may suggest either a genetic predisposition or mechanical factors related to activity patterns.

These findings highlight the genetic and anatomical variation present in the population. Although they do not directly impact interpretations of health or lifestyle, they provide additional context for understanding the biological characteristics of the group. Unfortunately, no sufficient record available for non-metric variations in the literature.

To understand the relationship between pathology, diet, and society, the next section explores how past environmental and climatic conditions in Valencia shaped these interactions.

5.2. Results within archaeological perspectives in Valencia region

The adoption of agriculture in the Iberian Peninsula marked a transformative period, significantly affecting both human societies and the environment. By the 6th millennium BCE, the first farmers settled along the Mediterranean coast, gradually expanding inland with domesticated crops; such as, hulled and free-threshing cereals, legumes, and flax (Martí Oliver, 1983b; Bernabeu, 2009; Barberà et. al., 2022; Peña Chocarro and Pérez Jordà, 2022). Alongside cultivated species, early communities also utilized wild plants, including acorns,

hazelnuts, and wild fruits such as wild olives, wild grapes, and pine nuts, to supplement their nutritional needs (Peña Chocarro and Pérez Jordà, 2022). These combined resources reflect the dynamic interactions between early agricultural practices and the surrounding environment.

The interaction between vegetation dynamics and anthropogenic activities from the onset of the Neolithic in the Valencia region have been studied by many researchers. Carrión Marco (in García Puchol et. al., 2010), for instance, investigated paleoenvironmental data of Cova del Monedero. The result illustrates how early agricultural communities shaped their landscapes. According to the carbon analysis the researcher founded several species, including strawberry tree, cistus, heather, ash tree, juniper, thyme, legumes, mastic tree, rosemary, wild olives etc. Also, the researcher noted that wild olives and heather dominate the area, especially wild olives is an indicator that the thermo-mediterranean climate, which represents warm and semi-arid characters (Figure 5.2.1.). Overall, these findings demonstrated that a period of widespread deforestation observed in the thermo-mediterranean belt after the first 500-1000 years of agricultural establishment in the region (Carrion Marco, as referred in García Puchol et. al., 2010; Álvarez, Blanco, and Rivero, 2020). Moreover, paleodiet study in Cova del Monedero was investigated by Culleton and McClure (in García Puchol et. al., 2010). In this study the scholars founded animal-vegetal based diet (terrestrial diet) in the individuals of Cova del Monedero. Also, animal remains findings in these sites seem consistent with this result.



Figure 5.2.1.: Representation of the Valencian Chalcolithic Period

Furthermore, the other archaeological sites analyzed in this study exhibit similar radiocarbon dates, indicating a strong likelihood that they experienced comparable conditions to those of Cova del Monedero. These sites are also situated in the same geographic region, reinforcing the probability of similar patterns of vegetation and human impact across the area.

Paleoenvironmental and paleoclimate analyses from the Valencia region, combined with findings from prehistoric human skeletons examined in this study, reveal significant environmental and dietary changes during this period. The reduction in forest cover and the environmental shifts associated with the spread of agriculture may have caused physical stress for these communities. These changes likely limited access to previously available natural food sources, leading to a diet increasingly reliant on agricultural products.

For example, the development of the Los Millares culture in southeast Iberia after 4800 cal. BP (2850 BCE) coincided with climatic shifts, including winter cooling and relatively moist annual conditions (Schirrmacher et. al., 2020). These environmental changes may have introduced physical stress, particularly for agrarian societies reliant on stable climatic patterns for crop production. Such stress could have influenced agricultural output and, in turn, the resilience and adaptation strategies of these communities. This scenario raises the possibility that similar climatic and environmental pressures may have influenced Chalcolithic societies in the Valencia region. Moreover, environmental changes can affect access to nutrients, including vitamins and minerals that cannot be produced by these societies. For this reason, the Valencian Chalcolithic-Bronze Age climatic situation should be examined.

In addition to environmental and dietary changes, demographic studies conducted in the Iberian Peninsula suggest resilience (e.g. Drake, Blanco González, and Lillios, 2017; Blanco González et. al., 2018; Fyfe et. al., 2019). One such study, Fyfe et al. (2019), observed that in northeast Iberia, population levels increased rapidly after this period and remained high. In contrast, in southeast Iberia (which includes Valencia region, classified under this category in the study), significant population growth occurred between 5300 cal BP and 3500 cal BP (Fyfe et al., 2019). According to the researchers, this suggests that human activities influenced vegetation diversity. Another research was done by Blanco Gonzáles et. al. (2018) demonstrates a demographic expansion in Chalcolithic Mediterranean.

The demographic growth observed during the Chalcolithic period coincides with significant environmental changes, including deforestation and the intensification of agriculture. These shifts likely influenced dietary practices, contributing to the nutritional deficiencies and stress markers identified in skeletal remains. For instance, the dominance of legumes, such as lentils and beans, in agricultural production could have resulted in deficiencies in certain vitamins and minerals. These dietary shifts might explain the pathologies observed in the skeletons and teeth, such as hypoplasia. Dental enamel hypoplasia indicates episodes of physiological stress during early childhood, likely tied to nutritional deficiencies or disease. This reflects the broader challenges faced by the population during periods of environmental and dietary transition.

The synthesis of these findings underscores that agricultural shifts, dietary changes, human activities, demographic dynamics, and climatic variations collectively contributed to the observed vegetation diversity and its impact on human societies. The reliance on domesticated crops like cereals, alongside the selective use of wild plants, reflects an adaptive strategy to warm, semi-arid conditions of the thermo-mediterranean climate. However, these shifts also introduced nutritional challenges, evidenced by pathologies such as hypoplasia and porotic structures on the bones. Anthropogenic activities, particularly deforestation, and reshaped the landscape, as seen in the dominance of species like wild olives and heather. Coupled with population growth and the resultant resource strain, these factors paint a nuanced picture of resilience and adaptation within Chalcolithic agrarian communities in Valencia region.

5.3. Valencia in the context of Mediterranean Iberia

Chalcolithic and Early Bronze Age societies of the Valencia region exhibit broader Mediterranean Iberian trends while maintaining distinct local adaptations in diet, burial customs, and social structures during periods of environmental and cultural transition.

The prevalence of dental hypoplasia (8%), antemortem tooth loss (16.60%), dental caries (6.9%), vertebral pathologies, and porotic hyperostosis, cribra orbitalia or cribra femoralis observed in this study reflects the physiological stress and dietary shifts experienced by these populations during the agricultural transition. Similar findings at Cova de l'Or (Roca de Togores and Soler, 2021) and Les Llometes (De Miguel Ibañez et. al., 2019) suggest widespread challenges in meeting dietary needs during the Chalcolithic. These findings align with broader patterns observed in Mediterranean Iberia, where the adoption of agriculture led to a diet heavily reliant on carbohydrate-rich resources; such as, cereals and legumes.

For instance, studies from Cova de la Pastora (McClure et al., 2011) and Coveta Frare (García et al., 2013) demonstrate a similar reliance on C3 terrestrial resources, as well as Cova del

Monedero, reinforcing the idea that the populations of Valencia region followed the broader dietary trends of early agricultural societies. However, these societies stand out for its continued integration of wild resources, which likely mitigated some nutritional deficiencies but did not eliminate the stress markers evident in skeletal and dental remains.

Burial contexts from the caves in the Valencia region reflect local customs and provide information about the social organization of these communities. In Cau Raboser Dalt and Baix, Cova del Monedero, Cova de la Xarta, Cova de la Caiguda, Cova del Pic, and Cova dels Gats, the burial items include silex tools, ceramics, and small amounts of copper artifacts, which are typical of the Valencian Chalcolithic period.

These objects were found together with human remains of men, women, and children buried in the same spaces. This suggests that there were no social differences tied to sex or age within these communities, further supporting the idea of an egalitarian social structure. The lack of grave goods indicating wealth or social differences, combined with the shared burial spaces, suggests that there was no evidence of social hierarchy. This interpretation is supported by the similar patterns seen across the caves and the absence of items that would point to status differences (also see García Puchol, Aura Tortosa, and McClure, 2012).

The discovery of Bell Beaker pottery at Cova dels Gats highlights the cultural influences of the Bell Beaker phenomenon on the Valencia region. This finding demonstrates that, while the region maintained its local burial traditions, it was not isolated from broader cultural interactions that characterized the Chalcolithic period in Europe. Bell Beaker pottery, widely distributed across Europe, often signifies participation in shared social or ritual practices, and its presence in Valencia suggests similar connections.

However, the burial contexts in Cova dels Gats differ from those observed in other Bell Beaker sites. The Bell Beaker pottery in Cova dels Gats was found alongside modest burial items; such as, silex ,tools and ceramics. Also, no differences between sexes and ages were found in burial practices similar to the other sites. This suggests that although the region was influenced by the Bell Beaker culture, it did not adopt the hierarchical social systems of this period.

The funerary practices documented in the caves of Valencia region offer a perspective on the social organization of the Chalcolithic-Bell Beaker-Early Bronze Age communities. In contrast to southern Iberia, particularly Los Millares, where signs of social hierarchy emerge through fortified settlements and opulent grave goods (Afonso and Cámara, 2006), the evidence from Valencian caves in this study points to a simpler, more egalitarian structure. In Los Millares, the defensive architecture, consisting of four concentric stone walls and outer fortifications, implies the presence of a military elite or ruling class (Marquez Romero, 2006; Lillios, 2020). In contrast, in the Valencia region, the absence of fortification walls and the prevalence of open-air settlements, as opposed to fortified structures, reflect a different approach to social organization. The natural caves, including those studied in this research, were primarily used for funerary practices during this period.

Also, it should be noted that the situation at La Muntanya Assolada may be different. This site contains skeletal remains dated to two distinct periods. While the site itself is associated with the Bronze Age, radiocarbon results from the human remain is dated to the 4th millennium. This raises questions about earlier usage of this site and its transition into the Bronze Age. Unfortunately, no funerary remains have been found to clarify the use of this site during that earlier period.

Overall, the findings from this study demonstrates the position of Valencian populations during the Chalcolithic-Bell Beaker-Early Bronze transition. Despite experiencing significant physiological stress, as evidenced by dental and skeletal pathologies, there is no indication that this stress was linked to social inequality. Instead, it likely resulted from environmental changes, including human impact, demographic increases, and climatic shifts. The absence of hierarchical markers, such as wealth-differentiated grave goods or stratified burial practices, suggests an egalitarian social structure. Compared to regions like Los Millares, where pronounced social stratification and fortified settlements are evident, Valencian communities relied on simpler burial customs and shared resource access, reflecting a more communal approach to social organization.

5.4. Comparison with other populations and eras

Dental pathologies from different societies and periods were compared with the overall dental pathology rates of the populations included in this study. The aim was to utilize dental pathology data to understand the physical stress experienced by societies in Europe during the transition to agriculture, starting from the Paleolithic period.

The dental pathology prevalence rates presented in the tables are calculated based on the total number of teeth observed, which includes both deciduous and permanent teeth. This methodological approach ensures consistency across studies, although the inclusion criteria and sampling strategies might slightly vary.

The caries prevalence observed in the Valencia populations (6.9%) is significantly lower than the Early Bronze Age population from El Mirador (22.03%) and slightly lower than Mesolithic populations (7.7%), but is comparable to Neolithic populations, such as the Lengyel Culture (3.5%), Vedrovice (3.28%), Marroquíes (7-10%), and Chalcolithic El Mirador (5.08%). This pattern suggests that carbohydrate intake in Valencia may have been less pronounced than in more agriculturally intensive communities like El Mirador (Early Bronze Age) (Table 5.4.1.). Furthermore, these rates suggest that Valencian populations may have continued to incorporate wild resources into their diets, balancing the impact of agriculture on dental caries. As discussed before, wild resources were available in this period for Valencian prehistoric societies. The absence of the caries rate in Neanderthal population might support the importance of the diet on the dental caries. In Verdovice. Also, it should be noted that not only agricultural practices, but also the other factors such as genetic conditions or cooking methods can play a role for dental health.

Researcher	Period	Region	Archeological Site/Population	Total number of teeth/caries	Caries rate
Brothwell (1963)*	70000-35000	Europe	European Neanderthal	259/0	0%
Pequart et. al. (1937)* Brothwell (1963)*	Mesolithic	European and North African	-	1148/88	7.7%
Lillie (2008)	Neolithic	Chequia	Vedrovice	1219/40	3.28%
Garlowska (2001)	4300-4000 BCE	Poland	Lengyel Culture	1675/56	3.5%
Radovic and Stefanovic (2013)	Neolithic	Serbia	Lepenski Vir	500/7	1.7%
Lozano et. al. (2022)	Chalcolithic	Spain	El Mirador	531/27	5.08%
Lozano et. al. (2022)	Early Bronze	Spain	El Mirador	59/13	22.03%
Beck et. al. (2018)	Late Chalcolithic	Spain	Marroquíes	N1: 559/49 N2: 201/20 N4: 3454/245	N1: 8% N2: 10% N4: 7%

* These studies adopted from Dental Anthropology book of Brothwell (1963)

Table 5.4.1.: Dental caries rates in prehistoric sites

The antemortem tooth loss (AMTL) rate (16.6%) is notably higher than those reported for Marroquíes (5–12%), Neanderthal (4.7%), Upper Paleolithic (4.9%), and Mesolithic (9.1%) populations, whereas is lower than Lengyel Culture (34.5%) (Table 5.4.2.). This may be attributed to dietary practices involving the consumption of harder or inadequately processed foods, which could lead to significant tooth wear and periodontal issues. Alternatively, the higher rate could reflect the demographic composition of the sample, particularly if it includes a larger proportion of older individuals. For example, at Cova de la Caiguda, all antemortem tooth losses belong to the same individual, which can be considered a result of the aging process. The conditions of the remains and the tooth-wear existency on some samples make it difficult to estimate the age range specifically.

Researcher	Period	Region	Archeological Site/Population	Number of socket possible/AMTL	AMTL rate
Brothwell (1963)*	70000-35000	Europe	European Neanderthal	444/21	4.7%
Brothwell (1963)*	Upper Paleolithic	-	-	592/29	4.9%
Brothwell (1963)*	Mesolithic	-	-	1118/102	9.1%
Radovic and Stefanovic (2013)	Neolithic	Serbia	Lepenski Vir	524/8	1.5%
Garlowska (2001)	4300-4000 BCE	Poland	Lengyel Culture	55/19	34.5%
Beck et. al. (2018)	Late Chalcolithic	Spain	Marroquíes	N1: 312/27 N2: 81/12 N4: 1612/88	N1: 9% N2: 12% N4: 5%

*Unpublished data from Dental Anthropology book of Brothwell (1963)

Table 5.4.2.: Antemortem tooth loss rates in prehistoric sites

The hypoplasia rate of Valencian prehistoric populations (8%) fall slightly below that of El Mirador (9.98%) and aligns with the range reported for Marroquíes (4–14%), and shows lower rate compared to the Lepenski Vir population (15.5%) (Table 5.4.3). Dental hypoplasia is commonly associated with episodes of physiological stress during childhood, such as malnutrition or illness. This moderate level of childhood stress aligns with broader trends observed in Valencia region during the Chalcolithic-Early Bronze Age periods, though it may indicate that the dietary, environmental, and social challenges not as hard as the compared societies. While the two groups of Marroquíes population show a slightly lower degree of hypoplasia, this difference may be reflect variations in social structure factors and is beyond the scope of this analysis.

Researcher	Period	Region	Archeological Site/Population	Total number of teeth/hypoplasia	Hypoplasia rate
Radovic and Stefanovic (2013)	Neolithic	Serbia	Lepenski Vir	58/9	15.5%
Lozano et. al. (2022)	Chalcolithic	Spain	El Mirador	531/53	10%
Beck et. al. (2018)	Late Chalcolithic	Spain	Marroquies	N1: 425/17 N2: 114/16 N4: 3325/142	N1: 4% N2: 14% N4: 4%

Table 5.4.3.: Hypoplasia rates in prehistoric sites

The dental pathology results observed in Valencian prehistoric populations are consistent with a transitional phase characterized by a shift toward agriculture when compared to other prehistoric populations. During the Paleolithic period, caries rates were typically low due to a diet rich in proteins and low in carbohydrates. In contrast, the increased prevalence of dental caries in agricultural societies reflects a dietary shift toward carbohydrate-based resources (Larsen, 1997). Although the dental caries prevalence in Valencian societies implies carbohydrate-based consumption, it appears to have been tempered by a continued reliance on diverse food resources, such as wild plants. This dietary diversity may have mitigated the effects of nutritional stress commonly associated with agricultural communities.

On the other hand, sites like Marroquies exhibit varying dental health prevalence among different groups of the population. Researchers (Beck et al., 2018) suggested that dietary differences between these groups may have contributed to these variations. However, due to the condition of the remains, this argument cannot be fully substantiated. Furthermore,

Brothwell (1963) observed higher-than-expected levels of Mesolithic dental caries. Since this data remains unpublished, the reason for this prevalence cannot be determined.

Overall, in the chronological perspective it can be said that Valencian Chalcolithic-Early Bronze Age populations demonstrate meaningful results to the Neolithic transition with their dental pathologies prevalences. The findings suggest that a gradual increase in the consumption of carbohydrate-rich resources, aligning with the Neolithization. Further research, such as isotopic and microscopic wear analyses, could provide additional insights of the populations in this research.

5.5. Methodological Restrictions and Future Directions

One of the challenges of this study is poor preservation of the prehistoric human skeletons. Many of the remains analyzed were excavated during the 1960s, 1970s, and 1980s, and some were later donated to museums. The lack of detailed documentation and illustrations limits the scope of anthropological analysis, making deeper interpretations more difficult. Despite these limitations, it is possible to evaluate the connections between environmental, demographic, and dietary changes through a bioarchaeological perspective.

Another problem is in this research lack of information, burial goods, and scarcity human remains in Cau de la Serp. Unfortunately, no additional data can be gathered from this site.

Furthermore, it should be noted that the human remain from the Bronze Age settlement of La Muntanya Assolada is dated to the end of the 4th millennium BCE whereas the other remian is dated back to Early Bronze Age, according to radiocarbon results. However, the periods of the other remain uncertain. Due to quite difficult to separate the analysis bt time periods, the results evaluated in generalized approach. This finding requires careful evaluation in future research.

Additionally, further research is needed to explore the regional variations in diet and health within the Iberian Mediterranean during the Chalcolithic-Early Bronze Age period. Future studies should also investigate the long-term impact of environmental changes on these populations, potentially inc

orporating isotopic analysis to gain deeper insights into their dietary practices.

Chapter VI: Conclusion

This study examines the health, dietary habits, and environmental adaptations of Chalcolithic and Early Bronze Age populations in the Valencia region. Through dental and skeletal pathologies, it highlights the physiological stress experienced by these communities during a time of significant environmental and societal transformation.

The study includes a minimum of 50 individuals recovered from various burial sites, comprising 29 adults and 21 non-adults. Among the adults, six are identified as female and eight as male, while the remainder could not be determined due to the condition of the remains. This demographic distribution demonstrates the inclusion of individuals across all age groups and sexes in burial practices.

The dental pathologies observed in the skeletal remains provide key insights into the challenges faced by these populations. The prevalence of enamel hypoplasia, dental caries underscores the physiological strain of transitioning to a carbohydrate-rich diet, which likely lacked essential nutrients. These findings align with patterns observed in other Mediterranean agrarian societies, where dietary shifts and sedentary lifestyles led to increased stress and health challenges. Caries rates reveal a dietary shift toward carbohydrate-based consumption, tempered by the continued use of wild plant resources. Enamel hypoplasia reflects episodes of childhood stress, while elevated antemortem tooth loss indicates the physical strain of consuming harder or less processed foods, alongside the possible effects of aging.

Additionally, skeletal pathologies such as osteoarthritis, Schmorl's nodes, and enthesopathy suggest that this transition affected the physical efforts of agricultural societies. The existence of these vertebral pathologies indicates increased labor demands associated with farming and other sedentary activities.

Non-metric variations identified in this study, such as the duplication of the foramen transversarium, Wormian bones, and the vastus notch in the patella, reflect common congenital or developmental traits within the population. The duplication of the foramen transversarium in the cervical vertebrae, noted bilaterally, is a congenital feature often linked to genetic diversity. Similarly, Wormian bones in the lambdoid suture and the vastus notch in the patella suggest inherited skeletal patterns or mechanical influences. These variations are considered normal anatomical traits and do not indicate significant health issues but instead may provide insights into genetic and biological distance.

The adoption of agriculture during this period had a strong impact on both human health and the environment for Valencian populations. The shift from hunting and gathering to agrarian practices reshaped diets and ecosystems. Domesticated crops like wheat, barley, and legumes became central to the diet, although wild plant species, such as wild olives and hazelnuts, continued to supplement their nutrition. Charcoal analysis at Cova del Monedero suggests deforestation and the emergence of thermomediterranean shrublands, reflecting the broader environmental consequences of agricultural expansion. In parallel, isotopic analysis from Cova del Monedero shows that the diet gradually changed to include cultivated crops like wheat and barley, along with legumes and wild plants. This mix of resources suggests a slow move toward farming rather than a sudden change. This flexibility in diet may have reduced the nutritional challenges often linked to early agriculture in other regions.

In terms of funeral practices, no evidence of social hierarchy has been found in the Valencian sites, which contrasts with its neighbor Los Millares. Burial practices in these sites reveal egalitarian lifestyles. Grave goods; such as, flint tools, ceramics, occasional copper elements distributed between female, male, and non-adult individuals demonstrate that this equal social structure. The grave goods do not indicate any social inequality, and there are no distinctions in burials based on sex, age, or status, further highlighting the absence of hierarchical structures in these societies.

Moreover, when Valencian societies compare to the other periods and populations, the caries rates in these populations align with dieatry shifts, which reveals meaningful knowledge into the Neolithic transition in the Valencia region.

Finally, this study faced challenges due to the poor preservation of skeletal remains and limited documentation from earlier excavations, which restricted the depth of analysis. Additionally, the scarcity of data from sites like Cau de la Serp and the overlapping chronologies at La Muntanya Assolada required a generalized approach to the findings. Future research incorporating isotopic analyses, ancient DNA, detailed radiocarbon analyses could provide clearer perspective into these societies and Valencian Late Prehistory.

RESUMEN

Introducción

La bioarqueología es un campo interdisciplinario que combina los métodos y principios de la arqueología y la antropología biológica para estudiar restos humanos y otros materiales biológicos en contextos arqueológicos.

Se centra en analizar e interpretar los aspectos biológicos de las poblaciones del pasado para comprender su salud, dieta, modos de vida, enfermedades, genética y estructuras sociales. A través del análisis de restos óseos, los bioarqueólogos pueden inferir información sobre la edad, el sexo, la estatura y la salud general de los individuos. También examinan indicadores de traumas, estrés, desnutrición y enfermedades, lo que permite arrojar luz sobre las condiciones de vida y el bienestar general de las poblaciones del pasado. Además, la bioarqueología incorpora análisis isotópicos y de ADN para investigar aspectos como las dietas antiguas, los patrones de migración, las relaciones genéticas y los vínculos de parentesco entre comunidades.

Al revisar el proceso histórico, el período de finales del siglo XVIII y la primera mitad del siglo XX se destaca como una etapa en la que los estudios óseos buscaban determinar razas (Little y Sussman, 2010). Los científicos intentaron clasificar a las poblaciones humanas en categorías raciales discretas basándose en características físicas como el color de piel o la forma del cráneo. Durante este período, la antropología era vista como un campo técnico, y los estudios se limitaban a tomar medidas de esqueletos, especialmente cráneos, para respaldar el concepto emergente de raza (Üstündağ, 2015). Este enfoque estuvo influido por los prejuicios sociales y culturales de la época. Métodos como la medición de dimensiones craneales (craniometría) y la frenología —el estudio de la forma del cráneo como indicador de rasgos de personalidad y potencial criminal— fueron populares en los inicios de este campo (Sutton, 2021).

Sin embargo, esta perspectiva cambió con el establecimiento de la antropología biológica en América, que adoptó una escuela diferente a la europea. Las dudas sobre la fiabilidad de la

determinación de razas basadas en mediciones de cráneos, expresadas por científicos como Washburn, abrieron la puerta a una renovación en la antropología (Washburn, 1951). En la segunda mitad del siglo XX, la antropología forense surgió como una subdisciplina destacada. Los antropólogos biológicos aplicaron su experiencia en anatomía esquelética y variación humana para la identificación de restos humanos, especialmente en investigaciones criminales y desastres masivos. El trabajo seminal de Krogman, “A Guide to Identification of Human Skeletal Remains”, encargado por el FBI en 1939, es considerado un hito importante en este campo en evolución (Little y Sussman, 2010).

A partir de esta publicación, los esfuerzos de investigación posteriores se centraron predominantemente en el examen de la morfología craneal y pélvica como medios para determinar el sexo biológico. Investigadores como Stewart (1948), Washburn (1948, 1949), Thieme y Schull (1957), Brues (1958), Phenice (1969) y Coleman (1969) hicieron contribuciones notables, enriqueciendo este período con sus estudios. Como resultado del impacto de las investigaciones forenses y la disminución de la importancia de los estudios raciales, se evidencia que las investigaciones orientadas biológicamente han emergido como una área prominente dentro de la antropología. En particular, ha habido un énfasis notable en estudios dirigidos a determinar la edad y el sexo a través del análisis de restos esqueléticos, reforzando así este cambio de paradigma.

Los estudios de paleopatología han tenido un impacto transformador en el enfoque de la antropología biológica durante el siglo XX. Al examinar restos esqueléticos y momificados, los paleoantropólogos han proporcionado información crucial sobre la salud y el bienestar de las poblaciones del pasado, lo que ha generado cambios significativos en el campo. Estos cambios incluyen el paso de un enfoque en la variación individual a patrones a nivel poblacional, la reconstrucción de perfiles de enfermedades antiguas, el análisis de estilos de vida, dieta y estrés ocupacional, la identificación de patógenos antiguos y sus implicaciones evolutivas, así como la integración de enfoques interdisciplinarios. Varios investigadores, como Aufderheide y Martin (1998), Brothwell (1981) y Buikstra, han realizado contribuciones significativas al campo de la paleopatología a través de sus estudios sobre restos humanos.

Objetivos

Explorar las sociedades del Calcolítico y la Edad del Bronce Temprano en la región de Valencia mediante el análisis de restos humanos, con un enfoque en comprender su salud, dieta, organización social y prácticas funerarias.

- Evaluar la composición demográfica de las poblaciones estudiadas, incluyendo la distribución por edad y sexo.
- Investigar las patologías dentales y vertebrales como indicadores de salud, dieta y estrés ocupacional.
- Analizar las condiciones de preservación de los restos humanos y sus implicaciones para la investigación bioarqueológica.
- Contextualizar los hallazgos dentro de los patrones prehistóricos más amplios del Mediterráneo, con énfasis en las transiciones dietéticas y sociales.
- Utilizar la datación por radiocarbono para establecer el marco cronológico de los sitios estudiados.
- Correlacionar los datos bioarqueológicos con los hallazgos arqueológicos para un entendimiento multidisciplinar.

Prehistoria de la Región de Valencia

La integración del contexto arqueológico, la datación por radiocarbono y el análisis morfológico de los restos óseos permite una comprensión holística de las poblaciones humanas prehistóricas en la región de Valencia. La amalgama fluida de enfoques multidisciplinarios, que abarca la arqueología, la antropología, la bioarqueología y el análisis isotópico, culmina en una interpretación profundamente matizada de las formas de vida prehistóricas y las dinámicas culturales.

La prehistoria de la región de Valencia ofrece un rico tapiz de desarrollo humano, marcado por transformaciones culturales, tecnológicas y sociales significativas desde el Paleolítico. Durante el Paleolítico, las primeras poblaciones humanas demostraron una notable resiliencia y adaptabilidad, prosperando en una amplia variedad de hábitats, desde la tundra ártica hasta los bosques exuberantes y las amplias praderas. Este período fue testigo de la evolución de las industrias de herramientas de piedra, caracterizadas por innovaciones tecnológicas que mejoraron la caza, la recolección y la explotación de recursos. El dominio de las técnicas de talla de sílex permitió la creación de herramientas de filo afilado utilizadas para cortar, raspar y perforar, lo que aumentó significativamente las capacidades humanas primarias.

Las expresiones artísticas de esta era, como las pinturas rupestres, los grabados y el arte portátil, revelan un lenguaje simbólico sofisticado y ofrecen valiosos conocimientos sobre las creencias, rituales e interacciones de los primeros humanos con el mundo natural. Sitios como Cova Forada, Cova del Parpalló y Cova Negra han arrojado importantes hallazgos arqueológicos, incluidos restos óseos estudiados por investigadores como Lozano et al. (2013), Garralda (1975), Arsuaga et al. (2007) y Bermúdez (1992). Estos estudios proporcionan una visión de la salud dental, las prácticas dietéticas, la determinación de género y las características morfológicas de las poblaciones antiguas, lo que mejora la comprensión de los comportamientos neandertales y la evolución humana en la región.

Al pasar al período Mesolítico las sociedades de la región de Valencia experimentaron cambios en respuesta a cambios ambientales significativos tras la última Edad de Hielo. La recesión de los glaciares y la llegada de un clima más cálido facilitaron la expansión de los bosques y el surgimiento de nuevos nichos ecológicos (Fortea, 1971; Lillios, 2020). Como resultado, las estrategias de subsistencia humana, los patrones de asentamiento, las estructuras sociales y las prácticas culturales se transformaron para adaptarse a estas nuevas condiciones.

Una característica definitoria del Mesolítico fue el desarrollo de tecnologías de herramientas de piedra más refinadas. Si bien las herramientas de piedra siguieron siendo fundamentales, se volvieron más pequeñas, especializadas y cuidadosamente elaboradas. Los microlitos, diminutas astillas o láminas de piedra, ganaron prominencia y se utilizaron como componentes de herramientas compuestas como flechas, arpones y utensilios de pesca. Estos avances tecnológicos mejoraron la eficiencia de las prácticas de caza, recolección y pesca, reflejando una adaptación sofisticada a los recursos diversificados disponibles en el entorno posterior al glaciar.

Las sociedades mesolíticas se dedicaban principalmente a la caza, la recolección y la pesca. La mayor disponibilidad de áreas boscosas presentó nuevas oportunidades para explotar los recursos del bosque, incluidos los pequeños animales, nueces, frutas y plantas comestibles. El uso de embarcaciones como canoas o balsas aumentó, facilitando las actividades de pesca y el transporte a través de cuerpos de agua. Las comunidades se caracterizaban generalmente por grupos pequeños y móviles con estilos de vida semi-sedentarios o nómadas, estableciendo campamentos temporales o asentamientos estacionales cerca de áreas ricas en recursos como ríos, lagos o regiones costeras.

Las expresiones culturales de este período fueron testigos de la aparición de nuevas formas de expresión artística, simbolizando fenómenos culturales importantes. Las pinturas rupestres, el arte rupestre y los objetos de arte portátil como huesos o piezas de cuerno grabadas revelan un creciente énfasis en la representación de animales y figuras humanas (Lillios, 2020). Estas expresiones artísticas ofrecen valiosos conocimientos sobre los sistemas de creencias, rituales e identidades sociales de las comunidades mesolíticas.

Este período Neolítico se caracteriza por cambios socio-culturales significativos, marcados por el desarrollo de la agricultura, los asentamientos permanentes y avances tecnológicos que transformaron las sociedades humanas. Durante este período, las sociedades humanas pasaron del estilo de vida cazador-recolector a prácticas agrícolas. Esta transición, influenciada por cambios climáticos, condujo al surgimiento de asentamientos al aire libre, la agricultura y la domesticación de animales. Además, el período Neolítico es reconocido a menudo como un momento en que ocurrieron cambios demográficos significativos, marcados por un rápido aumento del tamaño de la población (por ejemplo, Bocquet-Appel y De Miguel Ibañez, 2002).

La teoría original propone que la revolución neolítica se extendió a Europa desde sociedades inmigrantes originarias del Cercano Oriente (Childe, 1925; Clark, 1965 de Pardo Gordó et al., 2017). Algunos académicos, incluidos Pardo Gordó et al. (2017), argumentan que las pruebas arqueológicas son insuficientes para respaldar completamente esta teoría de los agricultores inmigrantes. En su estudio, los investigadores evalúan el conjunto de datos de radiocarbono de la península ibérica provenientes de restos humanos, animales, plantas y carbón para comprender la expansión del Neolítico en el suroeste de Europa.

Por lo tanto, los datos de este estudio sugieren que la llegada del Neolítico a la región de Valencia se produjo a través de un proceso de propagación de conocimiento y tecnología agrícola. Los humanos comenzaron a adaptar y transformar su entorno para cultivar cereales como trigo y cebada, domesticando animales como cerdos, caballos y vacas.

En la región de Valencia, el período Calcolítico se divide en dos fases según los investigadores (por ejemplo, Bernabeu, 1979); la primera fase representa el período anterior a la aparición de la cerámica de la cultura Campaniforme, mientras que la segunda se denomina Horizonte de Transición Campaniforme (Fernández et al., 2007). En la primera fase, de manera general, el Calcolítico puede caracterizarse por una variedad de rituales funerarios y el establecimiento generalizado de asentamientos al aire libre, lo que refleja un alejamiento gradual de la habitabilidad en cuevas (Muñoz, 1985). No obstante, las poblaciones del Calcolítico siguen utilizando las cuevas como sitios funerarios (Lillios, 2020). En términos generales, se puede decir que el Calcolítico se caracteriza por la multiplicidad de rituales funerarios y el

establecimiento generalizado de asentamientos al aire libre, alejándose progresivamente de la vida en las cuevas (Muñoz, 1985).

Dentro de este contexto, Ereta del Pedregal se destaca como uno de los sitios arqueológicos más relevantes de la región valenciana. Su importancia radica en dos aspectos fundamentales: la abundante colección de artefactos y estructuras de vivienda que ha proporcionado, así como su excepcional y bien documentado continuo cronológico, que abarca desde el final del Neolítico hasta la Edad del Bronce en esta región geográfica específica (por ejemplo, Fletcher et al., 1961; Bernabeu, 1984a; Juan-Cabanilles, 1994; Fernández et al., 2007).

La Cultura del Campaniforme se refiere a un fenómeno arqueológico extendido que existió durante el Final del Calcolítico y el Primer Bronce en Europa, aproximadamente entre el 2800 y el 1800 a.C., es decir, en el tercer milenio a.C. Se caracteriza por la presencia de vasos cerámicos distintivos, con forma de campana y botones perforados en forma de V, junto con equipos de arqueros, hachas de cobre, dagas de cobre, adornos de oro, entre otros (Fernández et al., 2007; Garrido Peña, 2007; García Puchol et al., 2013; Lillios, 2020). Durante este período, se evidencian importantes cambios socioculturales. La hipótesis predominante sugiere que el fenómeno del Campaniforme está vinculado a rituales específicos y simbolismo de élite, proporcionando evidencia de transformación social (Sherratt, 1987; Garrido Peña, 2005, según García Puchol et al., 2013).

Los materiales del Campaniforme fueron inicialmente identificados en la región de Valencia, en Villa Filomena y en los alrededores del municipio de Bèlgida (Bernabeu, 1984b). Entre finales de la década de 1960 y mediados de la de 1970, la investigación eneolítica valenciana adoptó un marco estructural en dos fases, siendo la fase posterior caracterizada predominantemente por la cerámica campaniforme (Bernabeu, 1979; Bernabeu, 1984b; Fernández, 2007).

Metodología

En este estudio, se han analizado restos humanos de Cau Raboser, Cova del Monedero (o Avenc dels Dos Forats), Cova de la Caiguda, Cova de la Xarta, Cova del Pic, Cova dels Gats, La Muntanya Assolada y Cova de la Serp, todos ubicados en la región de la Ribera Alta (Mapas 3.1.1. y 3.1.2.). De estos sitios arqueológicos, Cova dels Gats y La Muntanya Assolada se encuentran en el distrito de Alzira, mientras que los demás están en el distrito de Carcaixent. Las metodologías utilizadas son las siguientes: En la pelvis, se examinan varios rasgos: el surco preauricular, el ancho de la muesca ciática y el ángulo púbico, la forma del foramen obturador, y el tamaño y la forma general de la pelvis (Workshop of European Anthropologists, 1980; Brothwell, 1981; Ubelaker, 1991; Buikstra & Ubelaker, 1994; Bass, 1995; White et al., 2011). El surco preauricular, ubicado entre la facies auricular, donde las coxas se articulan con el sacro, y la incisura isquiática mayor, se manifiesta como una estructura en forma de surco que muestra variaciones en grados entre individuos. Este rasgo se observa principalmente en la población femenina. Debido a ser la región más fuerte de la pelvis, el área donde se encuentra la incisura isquiática mayor se recupera frecuentemente intacta durante las excavaciones. Esta muesca, que es más ancha en las mujeres, se observa más estrecha en los hombres. El ángulo púbico, en las mujeres, parece ser considerablemente más ancho y, a veces, incluso en forma de arco, mientras que en los hombres, esta característica es más estrecha y toma la forma de un triángulo. El componente arco se obtiene trazando un arco desde la dirección superior de la facies auricular y continuando hacia la dirección posterior de la incisura isquiática mayor. Si el arco trazado es único, se atribuye a individuos masculinos, mientras que si es doble, se atribuye a individuos femeninos. El foramen obturador presenta una estructura más ancha y ovalada en los individuos masculinos, mientras que en los individuos femeninos, es más pequeño y de forma triangular (Tabla 3.2.1.1.).

En el cráneo, se examinan diversas características, como la robustez de la glabella, la forma y el tamaño de las tuberosidades frontales, el hueso cigomático, las cavidades orbitarias, los procesos mastoideos, la cresta nuchal y la protuberancia occipital; la inclinación del hueso frontal; la robustez del arco supraorbital y la mandíbula; y la estructura de la eminencia mental y el ángulo del ramo (Workshop of European Anthropologists, 1980; Brothwell, 1981; Ubelaker, 1991; Buikstra & Ubelaker, 1994; Bass, 1995; White y Folkens, 2005). En las

mujeres, la cresta nuchal se manifiesta con un contorno más suave, mientras que en los hombres, tiene una apariencia mucho más pronunciada y destacada. El proceso mastoideo es considerablemente más pequeño y corto en las mujeres, mientras que en los hombres, es más largo y robusto. El margen supraorbital presenta una estructura delgada, afilada y puntiaguda en las mujeres, mientras que en los hombres se muestra grueso, redondeado y curvado. La glabella es prominente en los hombres, mientras que en las mujeres, es más suave o plana. La mandíbula, aunque a menudo fragmentada en las excavaciones arqueológicas, es un hueso frecuentemente utilizado para la determinación del sexo en estudios de esqueleto craneal. Al analizar sus características morfológicas generales, se observa que la mandíbula tiene una configuración delgada y redondeada en las mujeres, mientras que en los hombres tiene una morfología más robusta y cuadrada. Además, la prominencia del mentón es relativamente plana en las mujeres, pero más destacada en los hombres, y el ángulo gonial muestra una estructura más amplia en los hombres (Tabla 3.2.1.2.).

La estimación de la edad en individuos adultos implicó la evaluación de diversas características relacionadas con la edad presentes en la superficie auricular, tal como se describe en la literatura antropológica y establecida por Lovejoy et al. (1985). También se utilizaron los cambios en las fases de la sínfisis del pubis a lo largo del tiempo como indicadores de edad, basándose en estudios de Todd (1920, 1921), McKern y Stewart (1957), Acsadi y Nemeskeri (1970), Gilbert y McKern (1973), y Brooks y Suchey (1990). Se tuvo en cuenta el momento de la erupción de los terceros molares en la dentición, basándose en investigaciones de Brothwell (1981) y Ubelaker (1991). Además, se examinó el momento de cierre de las epífisis en otros elementos esqueléticos para estimar la edad, incorporando investigaciones realizadas por el Workshop of European Anthropologists (1980), Brothwell (1981), Meindl y Lovejoy (1985), Ubelaker (1991), Buikstra y Ubelaker (1994), Bass (1995), y White et al. (2012).

La estimación de la edad en individuos no adultos presenta desafíos distintos en comparación con los adultos debido al desarrollo esquelético incompleto. Las metodologías comúnmente empleadas para la estimación de la edad en adultos pueden no ser completamente aplicables a los no adultos. Además, la naturaleza frágil de los esqueletos de infantes y niños, que a menudo se encuentran en estados incompletos durante las excavaciones arqueológicas, complica aún más la estimación precisa de la edad. Los métodos de estimación de edad en adultos, como la fusión epifisaria y las suturas craneales, pueden no estar completamente desarrollados o ser

observables en individuos no adultos. El desarrollo dental sirve como un indicador confiable en los no adultos, pero tiene limitaciones en cuanto a la precisión y exactitud de la edad.

En este estudio, el análisis se centró en examinar fragmentos dentales y de mandíbula obtenidos de individuos infantes y niños. La estimación de la edad se realizó determinando el momento de la erupción dental utilizando este método, tal como lo describen Ubelaker (1991), White y Folkens (2005), White et al. (2012) y Al Qahtani et al. (2010).

En los casos donde faltaban restos de dientes y mandíbula, la estimación de la edad se basó en la medición de la longitud de los huesos largos, según lo expuesto por Johnston (1962), Anderson, Messner y Green (1964), y Stewart (1968). Para los individuos dentro del grupo de edad adolescente, la estimación de la edad se basó en la evaluación de la longitud de los huesos largos y el grado de fusión epifisaria, según lo discutido por Anderson (1964), Stewart (1968) y Sheuer y Black (2004).

En este estudio, el examen paleopatológico se centró en identificar diversas condiciones patológicas macroscópicas específicas: patologías óseas y dentales.

Las patologías óseas incluyen la osteoartritis, que es la segunda patología más común observada en el esqueleto después de las enfermedades dentales, caracterizada por la pérdida de cartílago en las articulaciones. La osteoporosis, un trastorno sistémico que disminuye la masa ósea y deteriora la microarquitectura del hueso, se asocia con el envejecimiento, cambios hormonales y deficiencias de calcio y vitamina D. La entesopatía, que afecta los sitios de inserción de tendones y ligamentos en los huesos, se desarrolla generalmente por estrés mecánico repetitivo o enfermedades sistémicas. La hiperostosis porótica, que se presenta como lesiones porosas en los huesos craneales, está vinculada a la anemia, especialmente la anemia por deficiencia de hierro, lo que provoca hipertrofia de la médula ósea. La cribra orbitalia, caracterizada por porosidad en el techo de las órbitas, también se asocia con la anemia y deficiencias nutricionales, siendo un marcador de estrés metabólico, especialmente en la infancia. Los nódulos de Schmorl son indentaciones en las vértebras causadas por la herniación del disco intervertebral, indicando estrés en la columna vertebral y asociados con la osteoporosis, trauma o anomalías congénitas.

Las patologías dentales incluyen la caries dental, una enfermedad multifactorial que afecta los tejidos calcificados de los dientes, caracterizada por la desmineralización de los componentes inorgánicos y la destrucción del material orgánico. La pérdida dental antemortem, evidenciada por la resorción alveolar en el hueso de la mandíbula, indica la pérdida de dientes durante la vida del individuo, debido a enfermedades periodontales, trauma o caries. La hipoplasia, identificada por la presencia de hipoplasia esmalte lineal, se manifiesta como surcos o depresiones horizontales en el esmalte dental, indicando períodos de estrés o malnutrición durante el desarrollo dental, generalmente en la infancia.

Se han utilizado las investigaciones de Brothwell (1981), Buikstra y Ubelaker (1994), Aufderheide y Martin (1998), Mays (2002), Ortner (2003), Hillson (2005), White y Folkens (2005), y Waldron (2009) para identificar las condiciones patológicas.

Resultados

Los resultados de radiocarbono de Cau Raboser de Dalt, Cau Raboser de Baix, Cova del Monedero, Cova de la Xarta y Cova del Pic fueron datados al inicio del tercer milenio a.C. La Muntanya Assolada, sin embargo, fue fechada inesperadamente al cuarto milenio a.C., a pesar de que este sitio se había datado previamente a la Edad del Bronce. Este resultado sugiere un uso más temprano del sitio. La discrepancia en la datación de La Muntanya Assolada resalta la necesidad de una investigación adicional sobre su doble uso como sitio funerario en diferentes períodos.

En Cau Raboser de Dalt, se identificaron al menos seis individuos en total. De estos, tres eran niños, uno era un infante, uno un adolescente y uno un adulto. La edad de los individuos fue determinada utilizando diversas metodologías antropológicas (Tabla 4.1.1.2.). En Cau Raboser de Baix, también se excavaron al menos seis individuos. Entre ellos, dos eran no adultos: uno de aproximadamente 8 años y otro de 12 años. Además, se identificó un individuo perinatal o natal (Tabla 4.1.2.2.). Al menos un individuo ha sido identificado en Cova del Monedero, y las características de los restos sugieren que podría tratarse de un joven adulto. Según el envejecimiento dental, se estima que este individuo tiene entre 18 y 20 años (Lovejoy, 1985). La cueva, Cova de la Caiguda, data del periodo Calcolítico (Eneolítico). Se han descubierto al menos tres individuos (Tabla 4.3.2), compuestos por dos adultos y un no adulto. Al examinar los restos humanos recuperados de Cova de la Xarta, se han identificado al menos cuatro individuos (Tabla 4.4.2.), compuestos por un adulto y tres individuos no adultos. Se han detectado al menos 10 individuos en la Cova dels Gats (Tabla 4.5.2.), incluyendo dos individuos no adultos y ocho adultos. Se han identificado al menos 14 individuos en Cova del Pic (Tabla 4.6.2.), de los cuales cuatro son no adultos, uno es un adolescente y nueve son adultos. En La Muntanya Assolada se han identificado al menos cinco individuos (Tabla 4.7.2.), de los cuales tres son adultos, uno es un niño y uno es un infante. No se ha encontrado información sobre Cau de la Serp. Además, la falta de restos no ha permitido definir ningún dato bioarqueológico a partir de un fragmento de cráneo y cuatro dientes aislados (Tabla 4.8.1.).

En todos los sitios arqueológicos, se han recuperado un mínimo de 50 individuos. De estos, 29 han sido identificados como adultos y 21 como no adultos. Además, entre los adultos, se han

recuperado seis individuos femeninos y ocho masculinos, mientras que el sexo de los demás no pudo ser determinado debido al estado de los restos.

En los resultados paleopatológicos, no se han identificado problemas de salud graves ni causas de muerte. Esto podría atribuirse a la mala condición de los restos. Además, las condiciones patológicas potenciales pueden no haber afectado los huesos. Sin embargo, se han identificado varios resultados patológicos. En general, los registros dentales de todos los sitios indican enfermedades dentales como caries, pérdida de dientes antemortem e hipoplasia. Según las observaciones, son principalmente los molares los que presentan pérdida de dientes antemortem (ver tabla 4.3.).

El número total de dientes encontrados fue de 376, compuesto por 46 dientes deciduos y 330 dientes permanentes. Además, se identificaron un total de 265 posibles alvéolos dentales. Se excluyeron del análisis de pérdida de dientes antemortem dos mandíbulas y un maxilar de Cova del Pic, tres mandíbulas de Cova dels Gats y un maxilar de Cau Raboser de Baix debido a su estado de conservación extremadamente deficiente. Entre las mandíbulas con pérdida de dientes antemortem, se identificaron una femenina, tres masculinas y siete no identificadas. No se observaron diferencias significativas entre individuos femeninos y masculinos.

Se detectaron patologías vertebrales, como osteoartritis, osteofitos y nódulos de Schmorl, en estas sociedades, lo que apunta a trabajo físico y estrés repetitivo. También se observaron hiperostosis porótica, cribra orbitalia y cribra femoralis, lo que sugiere anemia por deficiencia de hierro u otros defectos nutricionales.

Con base en los datos disponibles, se observó una pérdida de dientes antemortem en el 16.6% de los alvéolos (44/265), la hipoplasia del esmalte dental estuvo presente en el 7.98% de los dientes (30/376), y las caries dentales afectaron al 6.91% de los dientes (26/376). La preservación de los restos óseos (BPI) se evaluó, arrojando una tasa de conservación total (Tabla 4.2.) de 26.58%.

Discusión y Conclusión

Los hallazgos demuestran el estrés fisiológico experimentado por estas comunidades agrícolas durante la transición a la agricultura. La prevalencia de patologías dentales se ajusta a patrones más amplios observados en la Iberia mediterránea. Si bien la dependencia de alimentos ricos en carbohidratos como los cereales contribuyó a las caries dentales, la inclusión de recursos silvestres probablemente mitigó los efectos de la transición.

La interacción entre la dinámica de la vegetación y las actividades antropogénicas desde el inicio del Neolítico en la región de Valencia ha sido estudiada por muchos investigadores. Carrión Marco (en García Puchol et al., 2010), por ejemplo, investigó los datos paleoambientales de la Cova del Monedero. El resultado ilustra cómo las primeras comunidades agrícolas moldearon sus paisajes. Según el análisis de carbono, el investigador identificó varias especies, como el madroño, el cisto, la brea, el fresno, el enebro, el tomillo, las leguminosas, el lentisco, el romero, las olivas silvestres, entre otras. También señaló que las olivas silvestres y la brea dominan la zona, especialmente las olivas silvestres, lo que indica un clima termomediterráneo, caracterizado por ser cálido y semiárido (Figura 5.2.1.). En general, estos hallazgos demostraron un período de deforestación generalizada observado en el cinturón termomediterráneo después de los primeros 500-1000 años del establecimiento agrícola en la región (Carrión Marco, citado en García Puchol et al., 2010).

Los otros sitios arqueológicos analizados en este estudio presentan fechas de radiocarbono similares, lo que indica una alta probabilidad de que hayan experimentado condiciones comparables a las de la Cova del Monedero. Estos sitios también se encuentran ubicados en la misma región geográfica, lo que refuerza la probabilidad de patrones similares de vegetación e impacto humano a lo largo de la zona.

Los contextos funerarios revelaron la ausencia de bienes funerarios, lo que sugiere una falta de jerarquía social. Tanto hombres como mujeres, así como niños, fueron enterrados en los mismos espacios y con prácticas similares. Esto sugiere una estructura social igualitaria, en contraste con sitios como Los Millares, donde la evidencia de jerarquía es más evidente.

Además, al comparar las sociedades valencianas con otros períodos y poblaciones, las tasas de caries en estos grupos corresponden con los cambios dietéticos, ofreciendo una perspectiva valiosa sobre la transición neolítica en la región de Valencia.

En general, los resultados de este estudio demuestran la posición de las poblaciones valencianas durante la transición del Chalcolítico, la Cultura de los Campaniformes y la Edad del Bronce Temprano. A pesar de experimentar un estrés fisiológico significativo, como lo evidencian las patologías dentales y esqueléticas, no hay indicios de que este estrés estuviera relacionado con la desigualdad social. En cambio, probablemente fue resultado de cambios ambientales, incluidos el impacto humano, el aumento demográfico y los cambios climáticos. La ausencia de marcadores jerárquicos, como bienes funerarios diferenciados por riqueza o prácticas funerarias estratificadas, sugiere una estructura social igualitaria. En comparación con regiones como Los Millares, donde la estratificación social pronunciada y los asentamientos fortificados son evidentes, las comunidades valencianas confiaban en costumbres funerarias más simples y en un acceso compartido a los recursos, lo que refleja un enfoque más comunal de la organización social.

Desde una perspectiva cronológica se puede afirmar que las poblaciones valencianas del Chalcolítico y la Edad del Bronce Temprano muestran resultados significativos en relación con la transición neolítica, especialmente en cuanto a la prevalencia de patologías dentales. Los hallazgos sugieren un aumento gradual en el consumo de recursos ricos en carbohidratos, lo que se alinea con la Neolitización, al compararlas con otros períodos y sociedades.

Uno de los desafíos de este estudio es la mala conservación de los esqueletos humanos prehistóricos. Muchos de los restos analizados fueron excavados durante las décadas de 1960, 1970 y 1980, y algunos fueron posteriormente donados a museos. La falta de documentación detallada e ilustraciones limita el alcance del análisis antropológico, lo que hace más difícil realizar interpretaciones más profundas. A pesar de estas limitaciones, es posible evaluar las conexiones entre los cambios ambientales, demográficos y dietéticos desde una perspectiva bioarqueológica.

Otro problema en esta investigación es la falta de información, bienes funerarios y restos humanos escasos en Cau de la Serp. Lamentablemente, no se pueden obtener más datos de este sitio.

Además, cabe señalar que los restos humanos del asentamiento de la Edad del Bronce de La Muntanya Assolada están datados al final del 4º milenio a.C., mientras que otros restos están fechados en la Edad del Bronce Temprano, según los resultados de radiocarbono. Sin embargo, los periodos de los otros restos no son ciertos. Debido a la dificultad para separar el análisis por periodos de tiempo, los resultados se evaluaron de manera generalizada. Este hallazgo requiere una evaluación cuidadosa en futuras investigaciones.

Además, se necesita más investigación para explorar las variaciones regionales en la dieta y la salud dentro del Mediterráneo ibérico durante el período Chalcolítico y la Edad del Bronce Temprano. Los estudios futuros también deberían investigar el impacto a largo plazo de los cambios ambientales en estas poblaciones, incorporando potencialmente el análisis isotópico para obtener una comprensión más profunda de sus prácticas dietéticas.

Este estudio contribuye a conocer mejor la salud, la dieta y las estructuras sociales de las poblaciones del Chalcolítico y la Edad del Bronce Temprano en la región de Valencia. A pesar de los desafíos en la conservación, los restos esqueléticos proporcionan información valiosa sobre las dinámicas fisiológicas y sociales de estas comunidades agrícolas. Investigaciones futuras, especialmente análisis isotópicos y estudios comparativos, permitirán afinar estas interpretaciones y situar mejor a Valencia en el contexto prehistórico mediterráneo.

BIBLIOGRAPHY

Acsádi, G.Y., & Nemeskéri, J. (1970). *History of human life span*. Budapest.

Afonso Marrero, J.A., & Cámara Serrano, J.A. (2006). The role of the means of production in social development in the Late Prehistory of the Iberian southeast. *Social inequality in Iberian Late Prehistory*. BAR International Series 1525.

Alcácer, J. (1945). Dos estaciones argáricas de la región levantina. *Archivo de Prehistoria Levantina, II*, Valencia, 151-163.

Alcácer, J. (1954). El Puntal de Cambra (Villar del Arzobispo, Valencia). *Archivo de Prehistoria Levantina, V*. Valencia, 65-84.

AlQahtani, S.J., Hector, M.P., & Liversidge, H.M. (2010). Brief communication: the London atlas of human tooth development and eruption. *American Journal of Physical Anthropology*, 142(3), 481-490.

Al-Shammari, K.F., Al-Khabbaz, A.K., Al-Ansari, J.M., Neiva, R., & Wang, H.L. (2005). Risk indicators for tooth loss due to periodontal disease. *Journal of periodontology*, 76(11), 1910-1918.

Álvarez Fernández, E., Blanco González, A., & Rivero Vilá, O. (2020). *Prehistoria de la península ibérica* (Vol. 96). Ediciones Universidad de Salamanca.

Anderson, J.E., Messner, M.B., & Green, W.T., (1964). Distribution of Lengths of the Normal Femur and Tibia in Children from One to Eighteen Years of Age. *The Journal of Bone and Joint Surgery*, 46(6), 1197-1202.

Angel, J.L. (1966). Porotic hyperostosis, anemias, malarias, and marshes in the prehistoric eastern Mediterranean. *Science*, 153(3737), 760-763.

Angel, J.L. (1978). Porotic hyperostosis in the eastern Mediterranean. *MCV/Q, Medical College of Virginia Quarterly*, 14(1), 10-16.

Aparicio Pérez, J. (1978). Sima de la Pedrera (Benicull, Poliñá del Júcar) (Valencia). *Archivo de Prehistoria Levantina Valencia*, 15, 69-91.

Apellaniz, J.M. (1973). Corpus materiales de las culturas prehistóricas con cerámica de la población de cavernas del País Vasco meridional. *Munibe, suplemento*, 1, 52-58. San Sebastian.

Arsuaga, J.L., Villaverde, V., Quam, R., Martínez, I., Carretero, J. M., Lorenzo, C., & Gracia, A. (2007). New Neandertal remains from Cova Negra (Valencia, Spain). *Journal of Human evolution*, 52(1), 31-58.

Aufderheide, A.C., Rodríguez Martín, C. (1998). *The Cambridge Encyclopedia of Human Paleopathology*, Cambridge University Press.

Aura Tortosa, J.E., Carrión, Y., Estrelles, E., Pérez Jordá, G. (2005). Plant economy of hunter-gatherer groups at the end of the last Ice Age: plant macroremains from the cave of Santa Maira (Alacant, Spain) ca. 12000-9000 BP, *Vegetation History*, 14, 542-550.

Aura Tortosa, J.E., Gallello, G., Roldán, C., Cavallo, G., Pastor, A. & Murcia Mascarós, S. (2020). Characterization and sources of Paleolithic–Mesolithic ochre from Coves de Santa Maira (Valencian Region, Spain). *Geoarchaeology*, 36(1), 72-91.

Aytek, A.İ. (2016). Antik Anadolu Toplumlarının Geometrik Morfometrik Karşılaştırmaları. Yayımlanmamış doktora tezi. *Ankara Üniversitesi Sosyal Bilimler Enstitüsü*, Ankara.

Babior, B.M., & Bunn, H.F. (2001). Megaloblastic anemias. *Harrisons Principles of Internal Medicine*, 1, 674-680.

Balaguer Comes, A. (2020). Els jaciments Romans de la Ribera del Xúquer. *Història d'Alzira des de la prehistòria fins a l'actualitat*, 72-82. Universitat de València.

Barberà, A.B., Lozano, S., Adrià, F., Buxó, R., Palomo, A. (2022). Food plants and commensality among early farmers in the Iberian Peninsula: connecting pioneering and modern kitchens. *Cooking with plants in ancient Europe and beyond: interdisciplinary approaches to the archaeology of plant foods*. Sidestone Press, Leiden.

Bass, W.M. (1995). *Human Osteology, A Field Guide and Manual*, Fourth Edition, Columbia: Missouri Archaeological Society.

Beck, J., Bonilla, M. D. Z., Bocherens, H., & Díaz-del-Río, P. (2018). Feeding a third millennium BC mega-site: Bioarchaeological analyses of palaeodiet and dental disease at Marroquíes (Jaén, Spain). *Journal of Anthropological Archaeology*, 52, 23-43.

Bergman, J. (1998). Are wisdom teeth (third molars) vestiges of human evolution. *Journal of Creation*, 12(3), 297-304.

Bermúdez de Castro, J.M. (1992). Dientes humanos del yacimiento Pleistoceno de Cova Negra (Valencia). *Revista Española de Paleontología*, 17-20.

Bernabeu Aubán, J. (1979). Los elementos de adorno en el eneolítico valenciano. *SAGVNTVM, Papeles del Laboratorio de Arqueología de Valencia*, 14, 109-126.

Bernabeu Aubán, J. (1981). La Cova del Garrofer (Ontinyent, Valencia). *Archivo de prehistoria levantina*, (16), 59-94.

Bernabeu Aubán, J. (1982a). La evolución del Neolítico en el País Valenciano: Aportaciones al estudio de las culturas neolíticas en el extremo occidental del Mediterráneo. *Revista del Instituto de Estudios Alicantinos*, 37, 85-137.

Bernabeu Aubán, J. (1982b). La Cova del Llidoner de Carcaixent. Informe de la campaña de excavación. *La Labor del SIP y su Museo el año 1982*. Diputació de València.

Bernabeu Aubán, J. (1984a). El Eneolítico Valenciano: ¿Horizonte Cultural o Cronológico? *El Eneolítico en el País Valenciano: actas de coloquio. Alcoy, 1-2 de diciembre de 1984* (pp. 9-14). Instituto Alicantino de Cultura Juan Gil-Albe.

Bernabeu Aubán, J. (1984b). El vaso campaniforme en el país valenciano. *Servicio de Investigación Prehistórica Diputación Provincial de Valencia, Serie de Trabajos Varios*, 80.

Bernabeu Aubán, J., & Badal García, E. (1992). A view of the vegetation and economic exploitation of the forest in the Late Neolithic sites of Les Jovades and Niuët (Alicante, Spain). *Bulletin de la Société Botanique de France. Actualités Botaniques*, 139(2-4), 697-714.

Bernabeu Aubán, J., Molina Balaguer, L., & García Puchol, O. (2001). El mundo funerario en el horizonte Cardial valenciano: Un registro oculto. *SAGVNTVM. Papeles del Laboratorio de Arqueología de Valencia*, 33, 27-36.

Bernabeu Aubán, J., & Molina Balaguer, L. (2009). La Cova de les Cendres (Moraira-Teulada, Alicante). *Serie Mayor*, 6. Museo Arqueológico de Alicante.

Bernabeu, J., Balaguer, L.M., Bebiá, M.A.E., Pérez, J.R.O., & Soler, J.D.D.B. (2009). La cerámica impresa mediterránea en el origen del Neolítico de la península Ibérica. *De Méditerranée et d'ailleurs...: mélanges offerts à Jean Guilaine*, 83-95.

Bernabeu Aubán, J. (2010). El mundo funerario entre el VI y el II milenio A.C. *Restos de vida, restos de muerte: La muerte en la prehistoria*, 45-54. Museu de Prehistòria de València.

Bernabeu, J., Guerra, M.R., & Balaguer, L.M. (2011). *Las primeras producciones cerámicas: el VI milenio cal AC en la Península Ibérica*. Universitat de València. Departament de Prehistòria i Arqueologia.

Berry, A.C., & Berry, R.J. (1967). Epigenetic variation in the human cranium. *Journal of Anatomy*, 101(2), 361-379.

Bertilsson, C., Borg, E., Sten, S., Hessman, E., Sjöblom, H., & Lingström, P. (2022). Prevalence of dental caries in past European populations: a systematic review. *Caries Research*, 56(1), 15-28.

Bini, M., Zanchetta, G., Perşoiu, A., Cartier, R., Català, A., Cacho, I., ... & Brisset, E. (2019). The 4.2 ka BP Event in the Mediterranean region: an overview. *Climate of the Past*, 15(2), 555-577.

Blanco-González, A., Lillios, K.T., López-Sáez, J.A., & Drake, B.L. (2018). Cultural, demographic and environmental dynamics of the Copper and Early Bronze Age in Iberia (3300–1500 BC): towards an interregional multiproxy comparison at the time of the 4.2 ky BP event. *Journal of World Prehistory*, 31, 1-79.

Bocquet-Appel, J.P., & De Miguel Ibañez, M.P. (2002). Demografía de la difusión neolítica en Europa y lo datos paleoantropológicos. *SAGVNTVM*, 5, 23-44.

Bosch Gimpera, P. (1932). *Etnología de la Península Ibérica*. Editorial Alpha, Barcelona.

Brickley, M.B. (2018). Cribra orbitalia and porotic hyperostosis: A biological approach to diagnosis. *American journal of physical anthropology*, 167(4), 896-902.

Brooks, S., Suchey, J.M. (1990). Skeletal age determination based on the os pubis: A comparison of the Acsádi-Nemeskéri and Sucher-Brooks methods. *Human Evolution*, 5(3), 227–238.

Broseta Prades, M., & Martínez-Almagro, A. (1981). Estudio de los restos humanos procedentes de la Covacha Botia. *Archivo de Prehistoria Levantina Valencia*, 16, 119-127.

Brothwell, D.R. (1963). *Dental Anthropology: volume V: society for the study of human biology* (Vol. 5). Elsevier.

Brothwell, D.R. (1981). *Digging Up Bones: The Excavation, Treatment and Study of Human Skeletal Remains*. London: Oxford University Press.

Brues, A.M. (1958). Identification of Skeletal Remains. *The Journal of Criminal Law, Criminology and Police Science*, 48(5), 551-563.

Buikstra, J.E. & Ubelaker, D.H. (1994). *Standarts for Data Collection from Human Skeletal Remains*. Arkansas: Arkansas Archaeological Survey.

Burguera Serrano, A.C. (1921). Historia fundamental documentada de Sueca y sus alrededores, en los aspectos geográficos, militar, político, civil, estadístico, religioso, moral, productivo, económico, filosófico, sociológico, cultural, arqueológico, artístico y bio-bibliográfico; con notables il·lustracions, t. 1, València, Impremta de A. López.

Carter, K., & Worthington, S. (2015). Morphologic and demographic predictors of third molar agenesis: a systematic review and meta-analysis. *Journal of dental research*, 94(7), 886-894.

Chaudhari, M.L., Maheria, P.B., & Bachuwar, S.P. (2013). Double foramen transversarium in cervical vertebra: Morphology and clinical importance. *Indian J Basic Appl Med Res*, 8(2), 1084-1088.

Childe, V.G. (1925). The dawn of European civilisation. Londres: Kegan Paul.

Childe, V.G. (1930). The Origin of the Bell-Beaker. *Man XXX*, 200-201.

Clark, G. (1965). Radiocarbon dating and the expansion of farming cultural from the near east over Europe. *Proceedings of the Prehistoric Society*, 31, 58–73.

Clarke, D.L. (1976). The Beaker network-social and economic models. *Glockenbecher Symposium, Oberried, 18–23 März 1974*, 460-77.

Coleman, W.H. (1969). Sex Differences in the Growth of the Human Bony Pelvis, *American Journal of Physical Anthropology*, 31, 125-151.

Corral Cañón, M. (1984). La cultura del Bronce en el País Valenciano. *Quaderns de prehistòria i arqueologia de Castelló*, 10, 35-46.

Cox, M., & Mays, S. (2013). Sex Determination in Skeletal Remains. *Human Osteology: In Archaeology and Forensic Science*, 117-130. Greenwich Medical Media Limited, London.

Crusafont, M., Golpe, J.M. & Perez, M. (1976). Nuevos restos del Preneandertaliense de Cova Negra (Jativa). *Acta. Geologica Hispanica*, 6(5), 137-141.

Cucina, A., & Tiesler, V. (2003). Dental caries and antemortem tooth loss in the Northern Peten area, Mexico: a biocultural perspective on social status differences among the Classic Maya. *American Journal of Physical Anthropology: The Official Publication of the American Association of Physical Anthropologists*, 122(1), 1-10.

Davidson, I. (1989). La economía del final del Paleolítico en la España oriental. *Serie de trabajos varios-Servicio de Investigación Prehistórica*, 85.

Déchelette, J. (1908). *Manuel d'archéologie préhistorique celtique et gallo-romaine*. Picard. Paris.

De Miguel Ibáñez, M.P. (2008). La Cova de la Sarsa (Bocairent, Valencia): Osteoarqueología de un yacimiento del neolítico cardial. *IV Congreso del Neolítico Peninsular: 27-30 de noviembre de 2006*, 85-91. Museo Arqueológico de Alicante-MARQ.

De Miguel Ibáñez, M.P., Ballesteros, J. M., De Pedro Michó, M. J., & Oliver, B. M. (2009). Malformación congénita cervical en una mujer de la edad del Bronce procedente de la Muntanya Assolada (Alzira, Valencia). *Investigaciones histórico-médicas sobre salud y enfermedad en el pasado: Actas del IX Congreso Nacional de Paleopatología Morella (Castelló), 26-29 septiembre de 2007*, 373-378. Sociedad Española de Paleopatología.

De Miguel Ibáñez, M.P., García Puchol, O., Salazar García, D.C., & Romero, A. (2019). Paleopatología y paleogenética en la población de Les Llometes (Alcoi, Alacant) durante el III milenio a.C. *Recerques del Museu d'Alcoi*, 28, 49-78.

De Miguel Ibañez, M.P., & Siles González, J. (2020). Perinatales en el registro funerario del yacimiento de la Edad del Bronce de El Mas del Corral (Alcoi, Alicante, España). *Recerques del Museu d'Alcoi*, 1(29), 19-28.

De Pedro Michó, M.J. (1984). Les coves d'enterrament eneolítiques: la Cova del Pic (Carcaixent, València). *El Eneolítico en el País Valenciano: actas de coloquio. Alcoy*, 65-72. Instituto Alicantino de Cultura Juan Gil-Albert.

De Pedro Michó, M.J. (1998). La Lloma de Betxí (Paterna, Valencia) Un Poblado de la Edad del Bronce. *Servicio de Investigación Prehistórica Serie de Trabajos Varios*, 94.

De Pedro Michó, M.J. (2010). Cuevas, fosas y cistas. Evidencias funerarias del II milenio AC en tierras valencianas. En torno al argar y el bronce valenciano. *Restos de vida, restos de muerte: La muerte en la Prehistoria*, 55-72. Museu de Prehistòria de València.

De Pedro Michó, M.J., Martí Oliver, B., Pardo Gordo, S. (2020). La Muntanya Assolada (Alzira, Ribera Alta). *Història d'Alzira des de la prehistòria fins a l'actualitat*, 43-51. Universitat de València.

Díaz-Navarro, S., García-González, R., Cirotto, N., & Uriarte, M. H. (2023). New insight into prehistoric craft specialisation. Tooth-tool use in the Chalcolithic burial site of Camino del Molino, Murcia, SE Spain. *Journal of Archaeological Science: Reports*, 50, 104066.

Dioguardi, M., Spirito, F., Lo Muzio, E., Sovereto, D., Ballini, A., Alovise, M., ... & Di Cosola, M. (2024). Investigation of the presence of non-carious cervical lesions (NCCs) in ancient adult skulls: analyzing data from prehistoric and historical samples through a systematic review and meta-analysis. *BMC Oral Health*, 24(1), 370.

Drake, B.L., Blanco-González, A., & Lillios, K.T. (2017). Regional demographic dynamics in the Neolithic transition in Iberia: results from summed calibrated date analysis. *Journal of Archaeological Method and Theory*, 24, 796-812.

Ellis, H. (2006). *Clinical Anatomy: A revision an applied anatomy for clinical students*. Eleventh edition. Blackwell Publishing.

Enguix Alemany, R. (1973) La Cova de la Malla Verda (Corbera de Alcira, Valencia). *Crónica del XIII Congreso Arqueológico Nacional*, 333-340. Seminario de Arqueología.

Enguix Alemany, R., & Martí Oliver, B. (1988). La Cultura del Bronce Valenciano y la Muntanya Assolada de Alzira: aproximación al estado actual de su investigación. *Archivo de Prehistoria Levantina*, 18, 241-250.

Fernández, M.M., Cornellà, M.M., & Álvarez, A.M. (2007). *Prehistoria y protohistoria de la Península Ibérica, Tomo II*. Universidad Nacional de Educación a Distancia.

Ferrer Clari, A. (2020). L'Illa del Xúquer. *Història d'Alzira des de la prehistòria fins a l'actualitat*, 83-139. Universitat de València.

Finnegan, M. (1978). Non-metric variation of the infracranial skeleton. *Journal of Anatomy*, 125(1), 23-37.

Fletcher, D., & Alcácer, J. (1958). El Castillarejo de los Moros (Andilla, Valencia). *Archivo de Prehistoria Levantina*, VII, València, 93-110.

Fletcher, D. (1961). La Ereta del Pedregal (Navarrés, Valencia). *Archivo de Prehistoria Levantina IX*, 79-96.

Fletcher, D., Pla Ballaster, E., & Llobregat, E. (1961). *La Ereta del Pedregal (Navarrés, Valencia)*. Excavaciones Arqueológicas en España, 42.

Fletcher, D. (1966). Nuevos vasos campaniformes de la provincia de Valencia. *Crónica del IX Congreso Nacional de Arqueología (Valladolid, 1965)*, 106-108.

Forteza Pérez, J. (1971). La Cueva de la Cocina: Ensayo de cronología del epipaleolítico (Facies geométricas). *Serie de Trabajos Varios*, 40.

Fumanal, M.P. (1990). El habitat del Bronce Valenciano: Aspectos geoarqueológicos". *Archivo de Prehistoria Levantina*, XX, València, 317-325.

Furgús, J. (1937). Col·lecció de treballs del P. J. Furgús sobre Prehistòria valenciana. *Sèrie de Treballs Solts del Servei d'Investigació Prehistòrica*, 5, València.

Fyfe, R. M., Woodbridge, J., Palmisano, A., Bevan, A., Shennan, S., Burjachs, F., ... & Roberts, C. N. (2019). Prehistoric palaeodemographics and regional land cover change in eastern Iberia. *The Holocene*, 29(5), 799-815.

Gao, L., Xu, T., Huang, G., Jiang, S., Gu, Y., & Chen, F. (2018). Oral microbiomes: more and more importance in oral cavity and whole body. *Protein & cell*, 9(5), 488-500.

García Atiénzar, G., Barciela, V., Martínez Amorós, S., Jover Maestre, F. J., Molina Hernández, F. J., Tormo Cuñat, C., ... & López Sáez, J. A. (2020). El asentamiento neolítico de Limoneros (Elche, Alicante). *Complutum*, 31(1), 25-48.

García Borja, P., Pérez Fernández, Á., Biosca Cirujeda, V., Ribera Gómez, A., & Salazar García, D. C. (2013). Los restos humanos de la Coveta del Frare (La Font de la Figuera, València).

García Borja, P., Salazar-García, D. C., Collado Beneyto, I., Cortell Pérez, E. (2016). Los restos humanos de la Coveta Emparetà: Contexto cronológico y cultural. *Recerques del Museu d'Alcoi*, 25, 31-46.

García Borja, P., Pérez Fernández, Á., Pascual Benito, J. L., Miret Estruch, C., Orozco Köhler, T., Salazar García, D. C., Velasco Berzosa, Á. (2020). El conjunto funerario del Neolítico final de la Cova del Cara-solde Vernissa (Xàtiva, València). *Archivo de Prehistoria Levantina*, 33, 77-118.

García, E.G., Richards, M.P. & Subira, M.E. (2006). Palaeodiets of humans and fauna at the Spanish Mesolithic site of El Collado. *Current anthropology*, 47(3), 549-556.

García, M.J.R., Cebrián, C.V., Tortosa, J.E.A., Marco, Y.C., Puchol, O.G., Giner, P.J., ... & Ripoll, M.P. (2006). Epipaleolítico-Mesolítico en las comarcas centrales valencianas. *El mesolítico de muescas y denticulados en la cuenca del Ebro y el litoral mediterráneo peninsular*, 65-120. Departamento de Cultura.

García Puchol, O., Cotino Villa, F., Miret Estruch, C., Pascual Benito, J. L., McClure, S. B., Molina Balaguer, L., ... & Culleton, B. (2010). Cavidades de uso funerario durante el Neolítico final/Calcolítico en el territorio valenciano: trabajos arqueológicos en Avenc dels Dos Forats o Cova del Monedero (Carcaixent, Valencia). *Archivo de Prehistoria Levantina*, vol. XXVIII, 139-206.

García Puchol, O., Aura Tortosa, J.E., & McClure, S.B. (2012). Mesolithic and Neolithic funerary practices in the central Mediterranean region of Spain. *Funerary practices in the Iberian Peninsula from the Mesolithic to the Chalcolithic*. BAR International Series 2417.

García Puchol, O., Bernabeu Auban, J., Carrión Marco, Y., Molina Balaguer, L., Perez Jorda, G., & Gómez Puche, M. M. (2013). A funerary perspective on the Bell Beaker period in the

Wester Mediterranean Reading the social context of individual burials at La Vital (Gandia, València).

Garłowska, E. (2001). Disease in the neolithic population of the Lengyel culture (4300–4000 BC) from the Kujawy region in north-central Poland. *Zeitschrift für Morphologie und Anthropologie*, 43-57.

Garralda, M.D. (1975). Nuevos restos humanos de la Cueva de Parpalló:(Gandía, Valencia). *Archivo de prehistoria levantina*, 14, 37-47.

Garrido Pena, R. (2005). *El campaniforme en la Península Ibérica y su contexto europeo*. In M. RojoGuerra, R. Garrido-Pena and I. García Martínezde Lagrán (eds.): *El campaniforme en la Península Ibérica y su contexto europeo/Bell Beakers in the Iberian Peninsula and their European context*. Serie Arte y Arqueología 21, Universidad de Valladolid, 29-60.

Garrido Pena, R. (2007). El fenómeno campaniforme: un siglo de debates sobre un enigma sin resolver. C. Cacho, R. Maicas, M. ^a I. Martínez y JA Martos (eds.): *Acercándonos al pasado: Prehistoria en*, 4, 1-16.

Gilbert, B.M., & McKern, T.W. (1973). A method for aging the female Os pubis. *American Journal of Physical Anthropology*, 38(1), 31–38.

Gkantidis, N., Tacchi, M., Oeschger, E. S., Halazonetis, D., & Kanavakis, G. (2021). Third molar agenesis is associated with facial size. *Biology*, 10(7), 650.

Goodman, A. H., & Armelagos, G. J. (1985a). Factors affecting the distribution of enamel hypoplasias within the human permanent dentition. *American journal of physical anthropology*, 68(4), 479-493.

Goodman, A.H., & Armelagos, G.J. (1985b). The chronological distribution of enamel hypoplasia in human permanent incisor and canine teeth. *Archives of oral biology*, 30(6), 503-507.

Goodman, A.H., & Rose, J.C. (1991). Dental enamel hypoplasias as indicators of nutritional status. *Advances in dental anthropology*, 5, 225-240.

Gracia, A., Arsuaga, J.L. & Martinez, I. (1992). Los restos humanos craneales de Cova Negra, Valencia. *Revista Española de Paleontología*, 77-81.

Green, R., & Mitra, A.D. (2017). Megaloblastic anemias: nutritional and other causes. *Medical Clinics*, 101(2), 297-317.

Greenberg, M.H., Day, A.L., Alradawi, S. (2023). *Enthesopathy. In: Manual of Musculoskeletal Ultrasound*. Springer, Cham.

Gual, F. (1953). Hace tres mil años. *Murta, Revista del Instituto Laboral de Alcira*, octubre-diciembre, 4-5.

Guilaine, J. (2017). The Neolithic Transition: From the Eastern to the Western Mediterranean. *Times of Neolithic transition along the Western Mediterranean*, 15-31.

Gupta, V.K., Paul, S., & Dutta, C. (2017). Geography, ethnicity or subsistence-specific variations in human microbiome composition and diversity. *Frontiers in microbiology*, 8, 1162.

Harrison, R.J. (1974). El Vaso Campaniforme como horizonte delimitador en el Levante español. *Cuadernos de prehistoria y arqueología castellonenses*, 1, 63-70.

Hernández Pérez, M.S. (1997a). Espacio y tiempo en la Edad del Bronce del País Valenciano. *Espacio, Tiempo y Forma, Serie I, Prehistoria y Arqueología*, 10, 279-315.

Hernández Pérez, M.S. (1997b). Desde la Periferia de El Argar. La Edad del Bronce en las tierras meridionales valencianas. *SAGVNTVM. Papeles del Laboratorio de Arqueología de Valencia*, 30, 93-114.

Hillson, S. (1996). *Dental Anthropology*. Cambridge University Press.

Hillson, S. (2005). *Teeth*. Cambridge University Press.

Hrdlička, A. (1932). The humerus: septal apertures. *Anthropologie (1923-1941)*, 31-96.

Irish, J.D. (1997). Characteristic high-and low-frequency dental traits in sub-Saharan African populations. *American Journal of Physical Anthropology*, 102(4), 455-467.

İşcan, M. Y., Steyn, M. (2013). *The Human Skeleton in Forensic Medicine, Third Edition*. Charles C Thomas Publisher, Springfield, Illinois, USA.

Johnston, F. E., (1962). Growth of the Long Bones of Infants and Young Children at Indian Knoll. *American Journal of Physical Anthropology*, 20(3), 249-254.

Jover Maestre, F.J., Lorrio Alvarado, A., & Díaz Tena, M. (2016). El Bronce Final en el Levante de la península Ibérica: bases arqueológicas y periodización. *Complutum*, 27(1), 81-108.

Juan-Cabanilles, J. (1994). Estructuras de habitación en la Ereta del Pedregal (Navarrés, Valencia). Resultados de las campañas de 1980-1982 y 1990. *Saguntum: Papeles del Laboratorio de Arqueología de Valencia*, 27, 67-97.

Juan-Cabanilles, J., García Puchol, O. & McClure, S. B. (2023). Refining chronologies and typologies: Cueva de la Cocina (Dos Aguas, Valencia, Spain) and its central role in defining the Late Mesolithic sequence in the Iberian Mediterranean area. *Quaternary International*.

Kahn, S., Ehrlich, P., Feldman, M., Sapolsky, R., & Wong, S. (2020). The jaw epidemic: Recognition, origins, cures, and prevention. *Bioscience*, 70(9), 759-771.

Kaidonis, J.A. (2007). Tooth wear: the view of the anthropologist. *Clinical oral investigations*, 12, 21-26.

Krogman, W.M. (1939). A Guide to the Identification of Human Skeletal Material. *FBI Law Enforcement Bulletin*, 3, 3-31.

Lambacher, N., Gerdau-Radonic, K., Bonthorne, E., & de Tarazaga Montero, F.J.V. (2016). Evaluating three methods to estimate the number of individuals from a commingled context. *Journal of Archaeological Science: Reports*, 10, 674-683.

La Roca, N. (1991). Interpretación geomorfológica de un movimiento de masa: La Muntanya Assolada (Alzira). *VIII Reunión Nacional sobre Cuaternario. Guía de las excursiones*, València, 147-154.

Larsen, C.S., Shavit, R., & Griffin, M. C. (1991). Dental caries evidence for dietary change: an archaeological context. *Advances in dental anthropology*, 179, 202.

Larsen, C.S. (1997). *Bioarchaeology: interpreting behavior from the human skeleton*. Cambridge University Press.

Lieberman, D.E. (2008). Speculations about the selective basis for modern human craniofacial form. *Evolutionary Anthropology*, 17, 55-68.

Lillie, M. (2008). Vedrovice: demography and palaeopathology in an early farming population. *Anthropologie*, 46(2/3), 135-152.

Lillios, K. (2020). *The Archaeology of the Iberian Peninsula: From the Paleolithic to the Bronze Age*. Cambridge: Cambridge University Press.

Little, M.A., & Sussman, R.W. (2010). History of Biological Anthropology. *A Companion to Biological Anthropology*, 13-38.

Llobregat Conesa, E.A. (1975): Nuevos enfoques para el estudio del periodo del Neolítico al Hierro en la región valenciana. *Papeles de Laboratorio de Arqueología de Valencia*, 11, 119-140.

López Terrada, M.L. (1995). La geografía y los recursos sanitarios. *Salud, Enfermedad y Terapéutica Popular en la Ribera Alta*. Instituto de Estudios documentales e Históricos sobre la Ciencia, Universitat de València.

Loth, S.R., & Henneberg, M. (2001). Sexually Dimorphic Mandibular Morphology in the First Few Years of Life. *American Journal of Physical Anthropology*, 115, 179-186.

Lovejoy, C.O., Meindl, R.S., Pryzbeck, T.R., & Mensforth, R.P. (1985). Chronological metamorphosis of the auricular surface of the ilium: A new method for the determination of adult skeletal age at death. *American Journal of Physical Anthropology*, 68(1), 15-28.

Lozano, M., Subirà, M. E., Aparicio, J., Lorenzo, C., & Gómez-Merino, G. (2013). Toothpicking and periodontal disease in a Neanderthal specimen from Cova Foradà site (Valencia, Spain). *PloS one*, 8(10), e76852.

Lozano, M., Jiménez-Brobeil, S.A., Willman, J. C., Sánchez-Barba, L.P., Molina, F., & Rubio, Á. (2021). Argaric craftswomen: Sex-based division of labor in the Bronze Age southeastern Iberia. *Journal of Archaeological Science*, 127, 105239.

Lozano, M., Gamarra, B., Hernando, R., & Cerepuelo, D. (2022). Dental and Oral Pathologies At El Mirador Cave (Sierra de Atapuerca, Spain). *Prehistoric Herders and Farmers: A Transdisciplinary Over view to the Archaeological Record from El Mirador Cave*. Springer.

Lukacs, J. R. (2007). Dental trauma and antemortem tooth loss in prehistoric Canary Islanders: prevalence and contributing factors. *International Journal of Osteoarchaeology*, 17(2), 157-173.

Lukacs, J. R., Nelson, G. C., & Walimbe, S. R. (2001). Enamel hypoplasia and childhood stress in prehistory: new data from India and Southwest Asia. *Journal of Archaeological Science*, 28(11), 1159-1169.

Lukacs, J.R. (2017). *Bioarchaeology of oral health: sex and gender differences in dental disease*. Exploring sex and gender in bioarchaeology, 263–290. University of New Mexico Press.

Maestre, F.J.J., & De Miguel, M.P. (2002). Peñón de la Zorra y Puntal de los Carniceros (Villena, Alicante): revisión de dos conjuntos de yacimientos campaniformes en el corredor del Vinalopó. *SAGVNTVM. Papeles del Laboratorio de Arqueología de Valencia*, 34, 59-74.

Mann, R.W., & Hunt, D.R. (2005). *Photographic regional atlas of bone disease: A guide to pathologic and normal variation in the human skeleton*. Third edition. Charles C Thomas Publisher.

Márquez Romero, J.E. (2006). Neolithic and Copper Age ditched enclosures and social inequality in the south of the Iberian Peninsula (IV-III millennia cal BC). *Social inequality in Iberian late prehistory*. BAR International Series 1525.

Marklein, K.E., Torres Rouff, C., King, L.M., & Hubbe, M. (2019). The precarious state of subsistence: reevaluating dental pathological lesions associated with agricultural and hunter-gatherer lifeways. *Current Anthropology*, 60(3), 341-368.

Martí Oliver, B. (1977). Cova de l'Or (Beniarrés-Alicante) Vol I. *Serie de Trabajos Varios*, 51.

Martí Oliver, B., & Gil Sancho, J. (1978). Perlas de aletas y globulos del Cau Raboser (Carcaixent, Valencia) (Algunas consideraciones sobre el Eneolitico Valenciano). *Archivo de Prehistoria Levantina Valencia*, 15, 47-68.

Martí Oliver, B., Pascual Pérez, V., Gallart Martí, M.D., López García, P., Pérez Ripoll, M., Acuña Hernández, J.D., & Robles Cuenca, F. (1980). Cova de l'Or (Beniarrés-Alicante) Vol II. *Serie de Trabajos Varios*, 65.

Martí Oliver, B. (1981a). La Cova Santa (Vallada, Valencia). *Archivo de prehistoria levantina*, (16), 159-196.

Martí Oliver, B. (1981b). El Eneolítico. *Nuestra Historia*. Vol. 1. Valencia.

Martí Oliver, B. (1983a). La Muntanya Assolada (Alzira, Valencia). *Lucentum*, II, 43-67. Valencia.

Martí Oliver, B. (1983b). *El nacimiento de la agricultura en el País Valenciano: Del Neolítico a la Edad del Bronce*. Universidad de Valencia Secretariado de Publicaciones.

Martí Oliver, B., & Enguix Alemany, R. (1991). El poblado de la Edad del Bronce de la Muntanya Assolada d'Alzira. *VIII Reunión Nacional sobre Cuaternario. Guía de las excursiones*, València, 144-147.

Martí Oliver, B., & De Pedro, M.J. (1994). Los poblados de la Cultura del Bronce Valenciano: Modelo tradicional y nuevas excavaciones. *XXIVe Congrés Prehistorique de France*, Carcassonne (e.p.).

Martí Oliver, B., De Pedro Michó, M.J., & Enguix Alemany, R. (1995). La Muntanya Assolada de Alzira y las necrópolis de la cultura del Bronce Valenciano. *SAGVNTVM. Papeles del Laboratorio de Arqueología de Valencia*, 28, 75-91.

Martí Oliver, B., & De Pedro Michó, M.J. (1997). Sobre el final de la Cultura del Bronce Valenciano: problemas y progresos. *SAGVNTVM. Papeles del Laboratorio de Arqueología de Valencia*, 30, 59-91.

Martí Oliver, & De Pedro Michó, M.J. (1999). La Ribera del Xúquer a l'Edat del Bronze: cap a un paisatge antròpic. *Geoarqueologia i Quaternari litoral. Memorial Maria Pilar Fumanal*, 153-165.

Martí Oliver, B.M., Aura Tortosa, J.E., Juan Cabanilles, J., Garcia Puchol, O., & de Pablo, J.F.L. (2009). El Mesolítico geométrico de tipo “Cocina” en el País Valenciano. *El mesolítico geométrico en la Península Ibérica*, 205-258. Universidad de Zaragoza.

Martínez Pérez, A. (1981). La Cova de Alfonso (Alzira, Valencia). *Archivo de Prehistoria Levantina*, 16, 223-250.

Martínez Pérez, A. (1986). La Cova dels Gats (Alzira, Valencia). *Al Gezira*, 2, 9-55.

Martínez Rubio, T., & Villaverde, V. (2013). El poblament prehistòric, *La Universitat de València i els seus entorns. L'horta de València, el Massís del Caroig i els parcs naturals del carrascal de la Font Roja i de la Serra de Mariola*, 118-121. Universitat de València.

Mathew, A.J., Gopidas, G.S., & Sukumaran, T.T. (2016). A study of the supratrochlear foramen of the humerus: anatomical and clinical perspective. *Journal of clinical and diagnostic research: JCDR*, 10(2), AC05.

Mays, S. (2002). *The Archaeology of Human Bones*. Routledge, London and New York.

McClure, S.B., García, O., de Togores, C.R., Culleton, B.J., & Kennett, D.J. (2011). Osteological and paleodietary investigation of burials from Cova de la Pastora, Alicante, Spain. *Journal of Archaeological Science*, 38(2), 420-428.

McKern, T.W., Stewart, T.D. (1957). Skeletal Age Changes in Young American Males Analyzed from the Standpoint of Age Identification. *Headquarters Quartermaster Research & Development Command Technical Report EP-45*.

Meindl, R.S., & Lovejoy, C.O. (1985). Ectocranial suture closure: A revised method for the determination of skeletal age at death based on the lateral-anterior sutures. *American journal of physical anthropology*, 68(1), 57-66.

Molina Balaguer, L., Escribá Ruiz, P., Jiménez Puerto, J. & Bernabeu Aubán, J. (2023). Sequence and context for the Cocina cave neolithic pottery: An approach from social networks analysis. *Quaternary International*, 677-678, 65-77.

Molleson, T., Cruse, K. (1998). Some Sexually Dimorphic Features of the Human Juvenile Skull and their Value in Sex Determination in Immature Skeletal Remains. *Journal of Archaeological Science*, 25, 719-728.

Montelius, O. (1900). *Die chronologie der ältesten bronzezeit in nord-deutschland und skandinavien*. F. Vieweg und Sohn.

Mutlu, H. (2022). *The Analysis of Humerus and Femur Variations of Belentepe, Nif Başpınar and Patara Populations*. Unpublished Master Thesis, University of Ankara.

Nikiforuk, G., & Fraser, D. (1981). The etiology of enamel hypoplasia: a unifying concept. *The Journal of pediatrics*, 98(6), 888-893.

Ortner, D.J. (2003). *Identification of Pathological Conditions in Human Skeletal Remains*. Academic Press, Elsevier.

Oygucu, I. H., Kurt, M. A., Ikiz, I., Erem, T., & Davies, D. C. (1998). Squatting facets on the neck of the talus and extensions of the trochlear surface of the talus in late Byzantine males. *The Journal of Anatomy*, 192(2), 287-291.

Pamukcu, U., Ispir, N. G., Toraman Alkurt, M., Altunkaynak, B., & Peker, I. (2021). Evaluation of the frequency of third molar agenesis according to different age groups. *American Journal of Human Biology*, 33(3), e23487.

Panel, N. C. (2001). Osteoporosis prevention, diagnosis, and therapy. *Jama*, 285, 785-795.

Pardo Gordó, S., Bergin, S.M., Aubán, J.B., & Barton, C.M. (2017). Alternative stories of agricultural origins: the Neolithic spread in the Iberian Peninsula. *Times of Neolithic transition along the Western Mediterranean*, 101-131.

Pardo Gordó, S., De Pedro Michó, M.J., & Martí Oliver, B. (2020). L'Alzira prehistòrica al context de la Ribera del Xúquer. *Història d'Alzira des de la prehistòria fins a l'actualitat*, 23-44. Universitat de València.

Pasies Oviedo, T., Renovell Angles, C., Domenech Carbo, M. T., Madrid Garcia, J. A., & Carrascosa Moliner, B. (2020). Sobre el cráneo de la Cova del Parpalló (Gandia): novedades en su estudio diagnóstico y restauración. *Archivo de Prehistoria Levantina*, 33, 255-281.

Patir, A., Seymen, F., Yildirim, M., Deeley, K., Cooper, M. E., Marazita, M. L., & Vieira, A. R. (2008). Enamel formation genes are associated with high caries experience in Turkish children. *Caries research*, 42(5), 394-400.

Peña-Chocarro, L., & Pérez-Jordá, G. (2022). Trends and evolution of the plant-based diet in prehistoric Iberia: a view from archaeobotany. *Cooking with plants in ancient Europe and beyond: interdisciplinary approaches to the archaeology of plant foods*. Sidestone Press, Leiden.

Péquart, M., Péquart, S.J., Boule, M., & Valois, H. (1937). Tévéc: Station-nécropole mésolithique du Morbihan Paris, *Archives de l'Institut de paléontologie humaine*, 18.

Pérez Jordá, G., Bernabeu, J., Carrión, Y., García, O., Molina, L., & Gómez, M. (2011). La Vital (Gandía, Valencia). Vida y muerte en la desembocadura del Serpis durante el III y el I milenio AC.

Petrie, W.M.F. (1901). *Diospolis Parva: the cemeteries of Abadiyeh and Hu*, Vol. 20. Egypt Exploration Fund.

Phenice, T.W. (1969). A Newly Developed Visual Method of Sexing the Os Pubis. *American Journal of Physical Anthropology*, 30, 297-302.

Pindborg, J.J. (1970). *Pathology of the Dental Hard Tissues*. Philadelphia: Saunders.

Pla Ballester, E. (1958). La covacha de Ribera (Cullera, Valencia). *Archivo de Prehistoria Levantina*, (7), 23-54.

Pla Ballaster E., Martí Oliver, B., & Bernabeu J. (1983). La Ereta del Pedregal (Navarrés, Valencia) y los inicios de la Edad del Bronce. *XVI Congreso Nacional de Arqueología, Murcia-Cartagena, 1982*, 239 y SS. Zaragoza.

Quagliariello, A. & Modi, A. (2023). Ancient skeletal remains and the invention of agriculture: effects on the oral microbiome. *The microbiologist*. <https://www.the-microbiologist.com/features/ancient-skeletal-remains-and-the-invention-of-agriculture-effects-on-the-oral-microbiome/1436.article>.

Radović, M., & Stefanović, S. (2013). The bioarchaeology of the Neolithic transition: evidence of dental pathologies at Lepenski Vir (Serbia). *Documenta Praehistorica*, 40, 74-83.

Ramos Fernández, R. (1981). El Promontorio del Agua Dolça i Sala de Elche. Avance de su Estudio. *Archivo de Prehistoria Levantina*, XVI, 197-222.

Ricketts, R.M. 1972. The principle of arcial growth of the mandible. *The Angle Orthodontist*, 42(4), 141–150.

Rivera, F., & Mirazón Lahr, M. (2017). New evidence suggesting a dissociated etiology for cribra orbitalia and porotic hyperostosis. *American Journal of Physical Anthropology*, 164(1), 76-96.

Roca de Togores, C., & Soler Díaz, J.A. (2010). Trepanaciones en la prehistoria. Los casos datados por C14 de las Cuevas de la Pastora. *Restos de vida, restos de muerte: La muerte en la prehistoria*, 117-140. Museu de Prehistòria de València.

Roca de Togores, C. (2011). Estudio antropológico y paleopatológico de los enterramientos calcolíticos. In *La Vital (Gandia, Valencia): vida y muerte en la desembocadura del Serpis durante el III y el I milenio aC*, 151-158. Museu de Prehistòria de València.

Roca de Togores, C. & Soler Diaz, J.A. (2021). Estudio antropologico de los restos humanos recuperados en las intervenciones de 2013 a 2019 en la Cova de L'Or. *Cova de L'Or: Museo de Sitio Investigacion, Proteccion y Apertura de un Santuario del VI milenio A.C.*, 166-173.

Romero, A., Rial, R. E. B., Maestre, F. J. J., Herrero-Otal, M., Cuesta-Aguirre, D. R., Fiorin, E., ... & Padilla, J. A. L. (2024). Dental evidence of textile-related task activities in the Bronze Age site of Laderas del Castillo (Alicante, Spain). *Journal of Archaeological Science: Reports*, 60, 104818.

Ruiz Pérez, J.M., Carmona González, P., & Mateu Bellés, J.F. (2006). El marco físico del regadío de la Ribera. In *Las riberas del Xúquer: paisajes y patrimonio valenciano*, 22-44. Servicio de Publicaciones. Universitat de València.

Salazar García, D.C. (2016). Repaso a la evidencia isotópica sobre alimentación en la prehistoria valenciana durante el Mesolítico y el Neolítico. *Byliana*, 1, 31-46.

Salazar-García, D.C., García-Puchol, O., De Miguel-Ibáñez, M.P., & Talamo, S. (2016). Earliest evidence of Neolithic collective burials from eastern Iberia: radiocarbon dating at the archaeological site of Les Llometes (Alicante, Spain). *Radiocarbon*, 58(3), 679-692.

Salvadei, L., Ricci, F., & Manzi, G. (2001). Porotic hyperostosis as a marker of health and nutritional conditions during childhood: studies at the transition between Imperial Rome and the Early Middle Ages. *American Journal of Human Biology: The Official Journal of the Human Biology Association*, 13(6), 709-717.

Sangmeister, E. (1963). La civilisation du vase campaniforme. In *Actes du Premier Colloque Atlantique (Brest, 1961): Les civilisations atlantiques du néolithique à l'Age du Fer*, 25-56.

Sarrion, I. (2006). Hallazgo de un parietal humano del tránsito Pleistoceno medio-superior procedente de la Cova del Bolomor: Tavernes de la Valldigna, Valencia. *Archivo de prehistoria levantina*, 26, 11-24.

Schirrmacher, J., Kneisel, J., Knitter, D., Hamer, W., Hinz, M., Schneider, R.R., & Weinelt, M. (2020). Spatial patterns of temperature, precipitation, and settlement dynamics on the Iberian Peninsula during the Chalcolithic and the Bronze Age. *Quaternary Science Reviews*, 233, 106220.

Schuhmacher, T.X. (1996). Acerca de la neolitización en el País Valenciano. *Quaderns de prehistòria i arqueologia de Castelló*, 17, 21-46.

Schutkowski, H. (1993). Sex Determination of Infant and Juvenile Skeletons: I. Morphognostic Features. *American Journal of Physical Anthropology*, 90, 199-205.

Scott, G.R. (1991). Dental anthropology. *Encyclopedia of human biology*, 2, 789-804.

Sheuer, L., Black, S. (2004). *The Juvenile Skeleton*. Elsevier.

Sherratt, A.G. (1987). Cups that cheered. In Waldren, W. H. & Kennard, R.C. (eds), *Bell Beakers of the Western Mediterranean. Definition, Interpretation, Theory and New Site Data. The Oxford International Conference 1986*, 81–114. Oxford: British Archaeological Report S331.

Slice, D.E. (2007). Geometric Morphometrics. *The Annual Review of Anthropology*, 36, 261-281.

Smith, M.O., & Woollen, K.C. (2020). Tibiotalar and metatarsophalangeal squatting facets in a Late Woodland period context in west-central Illinois. *Bioarchaeology International*, 4(1), 57.

Soler, J.A.D., Roca de Togores, C.M., & Ferrer, C.G. (2010). Cova d'En Pardo. Precisiones sobre la cronología del fenómeno de la inhumación múltiple (Planes, El Comtat, Alicante). *Restos de Vida, restos de muerte: La muerte en la prehistoria*, 195-201. Museu de Prehistòria de Valencia-Diputació de València.

Spatafora, G., Li, Y., He, X., Cowan, A., & Tanner, A. C. (2024). The evolving microbiome of dental caries. *Microorganisms*, 12(1), 121.

Stewart, T.D. (1948). Age, Sex, Race and Stature. *Medico-Legal Aspects of The Skeleton*.

Stewart, T.D. (1968). Identification by the Skeletal Structure. *Gradwohl's Legal Medicine, Second Edition*, F. E. Camps(ed.), 123-154. Baltimore: Williams and Wilkins.

Stuart Macadam, P. (1989). Porotic hyperostosis: relationship between orbital and vault lesions. *American Journal of Physical Anthropology*, 80(2), 187-193.

Sutton, M.Q. (2021). *Bioarchaeology: An Introduction to the Archaeology and Anthropology of the Dead*, London and New York.

Tarradell Mateu, M. (1961). Sobre la identificación de los poblados eneolíticos valencianos. *VI Congreso Nacional de Arqueología*, Oviedo, 86-91.

Tarradell Mateu, M. (1962). El Pais Valenciano del neolítico a la iberización. Ensayo de síntesis. *Anales de la Universidad de Valencia*, 36(2), 1-214.

Tarradell Mateu, M. (1963). Ensayo de identificación de las necrópolis del Bronce Valenciano. *Archivo de prehistoria levantina*, 10, 59-68.

Thieme, F. P., & Schull, W.J. (1957). Sex Determination from The Skeleton. *Human Biology*, 29(3), 242-273.

Tracy, M.R., Dormans, J. P., & Kusumi, K. (2004). Klippel-Feil syndrome: clinical features and current understanding of etiology. *Clinical Orthopaedics and Related Research (1976-2007)*, 424, 183-190.

Ubelaker, D.H. (1991). *Human Skeletal Remains: Excavation, Analysis, Interpretation*, Second Edition, Washington.

Vendrell Betí, A. (2020). Alzira en la protohistòria. *Història d'Alzira des de la prehistòria fins a l'actualitat*, 60-71. Universitat de València.

Vieira, A.R., Gibson, C.W., Deeley, K., Xue, H., & Li, Y. (2015). Weaker dental enamel explains dental decay. *PLoS One*, 10(4), e0124236.

Vilaseca, S., Capafons, F. (1967). La cueva sepulcral eneolítica de l'Arbones (Término de Pradell). *Trabajos de Prehistoria*, XXIII. Madrid.

Villaverde, V. (1984). La industria magdalenienense del Abric de la Senda Vedada (Sumacàrker, Valencia): Nuevas consideraciones sobre el Magdalenienense mediterráneo peninsular. *Saguntum-PLAV*, 18, 29-47.

von Cramon Taubadel, N. (2011). Global human mandibular variation reflects differences in agricultural and hunter-gatherer subsistence strategies. *Proceedings of the National Academy of Sciences*, 108(49), 19546-19551.

Vukelic, A., Cohen, J. A., Sullivan, A. P., & Perry, G. H. (2017). Extending genome-wide association study results to test classic anthropological hypotheses: Human third molar agenesis and the “probable mutation effect”. *Human biology*, 89(2), 157-169.

Waldron, T. (2009). *Paleopathology*, Cambridge University Press, New York.

Walker, P.L. (1985). Anemia among prehistoric Indians of the American Southwest. *Health and disease in the prehistoric Southwest*, 34, 139-64.

Walker, P.L., Bathurst, R.R., Richman, R., Gjerdrum, T., & Andrushko, V.A. (2009). The causes of porotic hyperostosis and cribra orbitalia: A reappraisal of the iron-deficiency-anemia hypothesis. *American Journal of Physical Anthropology: The Official Publication of the American Association of Physical Anthropologists*, 139(2), 109-125.

Walkup, T.N., Winburn, A.P., & Stock, M. (2023). Antemortem tooth loss as a biomarker of poverty: Dental evidence of “weathering” in a contemporary US skeletal sample. *Forensic Science International: Synergy*, 6, 100333.

Washburn, S.L. (1948). Sex Differences in The Pubic Bone. *American Journal of Physical Anthropology*, 6, 199-208.

Washburn, S.L. (1949). Sex Differences in The Pubic Bone of Bantu and Bushman. *American Journal of Physical Anthropology*, 7, 425-432.

Washburn, S.L. (1951). The New Physical Anthropology. *Transactions of the New York Academy of Sciences*, 13(2), 298-304.

White, T. D., Folkens, P. A. (2005). *The human bone manual*. Elsevier.

White, T.D., Black, M.T., Folkens, P.A. (2012). *Human Osteology*, Third Edition, Elsevier.

Workshop of European Anthropologists (1980). Recommendations for age and sex diagnoses of skeletons. *Journal of Human Evolution*, 9, 517-549.