

LIST OF CONTENTS

ACKNOWLEDGEMENTS	i
LIST OF CONTENTS	iii
LIST OF TABLES	v
LIST OF FIGURES	vi
ABBREVIATIONS	viii
CHAPTER 1: INTRODUCTION	1
1.1. Definition and aims of the thesis	1
1.2. Theoretical background of mortuary analysis in Greece	3
1.3. The study of ancient human remains in Greece	3
1.4. Structure and significance of this thesis	4
CHAPTER 2: HISTORICAL, CHRONOLOGICAL, ENVIRONMENTAL AND ARCHAEOLOGICAL BACKGROUND OF THE CASE STUDY REGION	5
2.1. Historical context: History of prehistoric research in the study area	5
2.2. Chronological context of the study	7
2.3. Geographical location and present-day natural environment	7
2.4. The prehistoric natural environment	8
2.5. Archaeological background to the study area	9
2.5.1. Settlement patterns	9
2.5.2. Subsistence	14
2.5.3. Social organisation	15
CHAPTER 3: HISTORICAL, CHRONOLOGICAL, ENVIRONMENTAL AND ARCHAEOLOGICAL CONTEXT OF THE STUDY CEMETERIES	18
3.1. Historical Context	18
3.2. Chronological definition of the study cemeteries	19
3.3. Environmental background of the case study cemeteries	19
3.4. Archaeological background	21
3.4.1. Neolithic assemblages	21
3.4.2. Early Bronze Age assemblages	22
3.4.3. Late Bronze Age assemblages	24
3.4.4. Transitional (Late Bronze/Early Iron Age) assemblages	26
3.4.5. Early Iron Age assemblages	26
CHAPTER 4: PALAEODEMOGRAPHY	30
4.1. Introduction: Aims of the analysis	30
4.2. Limitations and problems: What's left?	30
4.3. Methodology	35
4.4.1. Inter-cemetery analysis: Is everybody here?	37
4.4.2. What about sex groups?	41
4.4.3. Analysis of geographical and chronological groupings	43
4.4.4. Analysis of geographical/chronological groupings: what about the sexes?	45
4.5. Conclusions	46
CHAPTER 5: MANIPULATION OF THE DECEASED	47
5.1. Definition and aims of the analysis	47
5.2. The case of Neolithic Makrigialos	47
5.3. Single versus secondary and multiple burials	55
5.4. Discussion: Manipulation of the deceased. How does it change?	57
CHAPTER 6: PATTERNS OF HEALTH STATUS	66
6.1. Introduction	66
6.2. Methodology	67
6.3. Degenerative Joint Disease	67
6.3.1. Introduction	67
6.3.2. Results	68

6.3.2.1. Prevalence of degenerative joint disease	68
6.3.2.2. Prevalence of degenerative joint disease part of skeleton	73
6.3.3. Conclusions	75
6.4. Trauma	76
6.4.1. Introduction	76
6.4.2. Results	79
6.4.2.1. Overall prevalence of trauma	79
6.4.2.3. Type of fractures. location. healing and complications	83
6.4.3. Conclusions	85
6.4.4. Dental trauma	88
6.5. Vertebral pathology (spondylolysis. sacralisation and spina bifida)	90
6.5.1. Introduction	90
6.5.2. Results	92
6.6. Non-specific infectious lesions	94
6.6.1. Introduction	94
6.6.2. Results	94
6.7. Anaemia	98
6.7.1. Introduction	98
6.7.2. Results	103
6.7.2.1. Prevalence of anaemia	103
6.7.3. Conclusions	108
6.8. Enamel hypoplasia	108
6.8.1. Introduction	108
6.8.2. Methodology	109
6.8.3. Results	109
6.8.4. Conclusions	113
6.9. Discussion	114
CHAPTER 7: DIETARY INDICATORS AND ORAL HEALTH STATUS	117
7.1. Introduction	117
7.2. Dental Palaeopathology	118
7.2.1. Methodology	118
7.2.2. Caries	118
7.2.2.1. Introduction	118
7.2.2.2. Results	120
7.2.2.3. Conclusions	122
7.2.3. Calculus	122
7.2.3.1. Introduction	122
7.2.3.2. Results	123
7.2.3.3. Conclusions	126
7.2.3.4. Caries versus calculus: Implications for differential dietary patterns?	126
7.2.4. Antemortem Tooth Loss	127
7.2.4.1. Introduction	127
7.2.4.2. Results	127
7.2.4.3. Conclusions	130
7.2.5. Periapical abscess	130
7.2.5.1. Introduction	130
7.2.5.2. Results	130
7.2.5.3. Conclusions	130
7.3. Stable isotope analysis	133
7.3.1. Introduction	133
7.3.2. Sampling: Limitations and aims of the analysis	134
7.3.3. Results	135
7.4. Discussion	139
CHAPTER 8: CONCLUSIONS	142
BIBLIOGRAPHY	148

LIST OF TABLES

Table 3.1:	List of the published prehistoric cemeteries and isolated burials from the study area	20
Table 3.2:	Features of mortuary behaviour in the different archaeological periods	22
Table 4.1:	Overall frequencies of completeness of the skeletal remains (expected/observed and percentage rate) in the case study populations	31
Table 4.2:	Skeletal elements and bone parts selected to be tested for bone representation in the case study populations	32
Table 4.3:	Overall frequencies of completeness of the skeletal remains (expected/observed and percentage rate) by age group	33
Table 4.4:	Overall frequencies of completeness of the skeletal remains (expected/observed and percentage rate) by sex group	35
Table 4.5:	Number of individuals by age group before proportionate redistribution	36
Table 4.6:	Grouping of the case study populations according to geographical and chronological variables	37
Table 4.7:	Number of individuals (D_x), mortality (d_x), survivorship (l_x) and probability of dying (q_x) in the case study populations	38
Table 4.8:	Distribution of the case study populations by sex group (adults only)	41
Table 4.9:	Distribution of the sexes by age group in the case study populations (excluding adults of indeterminate age)	42
Table 4.10:	Number of individuals (D_x), mortality (d_x), survivorship (l_x) and probability of dying (q_x) in the case study cemeteries	43
Table 4.11:	Distribution of the sexes in the geographical/chronological groupings	45
Table 5.1:	The articulated skeletal remains of Neolithic Makrigialos I	49
Table 5.2:	List of the skeletal elements counted in the analysis of the disarticulated assemblages based on Lyman (1994)	50
Table 5.3:	Distribution of burial types by age group in the case study populations	57
Table 6.1:	Overall prevalence of degenerative joint disease in the case study populations (raw data)	70
Table 6.2:	Prevalence of degenerative joint disease by age group (crude rates)	71
Table 6.3:	Prevalence of degenerative joint disease by sex versus age groups (crude rates)	72
Table 6.4:	Prevalence of degenerative joint disease in the upper and lower skeleton (crude and standardised rates)	74
Table 6.5:	Overall prevalence of trauma in the case study populations (raw data)	79
Table 6.6:	Prevalence of trauma by age group (crude rates)	80
Table 6.7:	Prevalence of trauma in the upper and lower skeleton (crude and standardised rates)	82
Table 6.8:	Complications of traumatic lesions in the case study populations	84
Table 6.9:	Overall prevalence of vertebral abnormalities in the case study populations (raw data)	93
Table 6.10:	Overall prevalence of non-specific infectious lesions in the case study populations (raw data)	96
Table 6.11:	Prevalence of non-specific infectious lesions by age group (crude rates)	97
Table 6.12:	Prevalence of non-specific infectious lesions in the upper and lower appendicular skeleton (crude and standardised rates)	98
Table 6.13:	Overall prevalence of anaemia in the case study populations (raw data)	103
Table 6.14:	Prevalence of skeletal manifestations of anaemia in the Neolithic and Early Bronze Age populations by age group (crude rates)	105
Table 6.15:	Prevalence of skeletal manifestations of anaemia in the Late Bronze and Early Iron Age populations by age group (crude rates)	106
Table 6.16:	Overall prevalence of enamel hypoplasia in the case study populations (raw data)	109
Table 6.17:	Prevalence of enamel hypoplasia by age group (crude rates)	111
Table 6.18:	Prevalence of enamel hypoplasia by tooth category (crude rates)	112
Table 6.19:	Frequency distribution of enamel hypoplasia lines by half-year periods	113
Table 7.1:	Overall prevalence of caries in permanent dentition of the case study populations (raw data)	120
Table 7.2:	Prevalence of caries in permanent dentition by age group (crude rates)	121
Table 7.3:	Overall prevalence of calculus in permanent dentition of the case study populations (raw data)	124
Table 7.4:	Prevalence of calculus in permanent dentition by age group (crude rates)	125
Table 7.5:	Overall prevalence of antemortem tooth loss in permanent dentition of the case study populations (raw data)	128
Table 7.6:	Prevalence of antemortem tooth loss in permanent dentition by age group (crude rates)	129
Table 7.7:	Overall prevalence of periapical abscesses in the case study populations (raw data)	131
Table 7.8:	Prevalence of periapical abscesses in permanent dentition by age group (crude rates)	132
Table 7.9:	Stable isotope values from the Late Bronze Age skeletal assemblages	135
Table 7.10:	Stable isotope values from the Makrigialos skeletal assemblages	136
Table 7.11:	Stable isotope values from the LN Makrigialos II animal bone samples	136

LIST OF FIGURES

Figure 1.1:	Map of the study area indicating the case study populations	2
Figure 2.1:	Map of the excavated prehistoric sites in the case study region	6
Figure 2.2:	Map of the case study area	8
Figure 2.3:	Plan of Kastanas phase 17 (LH IIIA) indicating single-room houses (Hänsel 1989: 24)	11
Figure 2.4:	Plan of Kastanas phase 16 (LH IIIB) indicating single- and multiple-room houses (Hänsel 1989: 31)	11
Figure 2.5:	Reconstruction of Kastanas phase 12 (LH IIIC) indicating multiple-room houses (Hänsel 1989: 71)	11
Figure 2.6:	Plan of Assiros phase 6 (Wardle 1989: Figure 2)	12
Figure 2.7:	Plan of Assiros phase 7 (Wardle 1987: Figure 5)	12
Figure 2.8:	Plan of Toumba phase 4 (Andreou and Kotsakis 1994: Figure 7)	13
Figure 2.9:	Reconstruction of Assiros phase 9 storeroom (Wardle 1986: Figure 8b)	13
Figure 2.10:	Reconstruction of Kastanas House A (EBA) (Aslanis 1985: Figure 24)	13
Figure 3.1:	Map of the published and excavated prehistoric cemeteries in the case study area	18
Figure 3.2:	Picture of a built grave from the EBA Koilada cemetery	24
Figure 3.3:	Picture of a pithos burial from the EBA Koilada cemetery	24
Figure 3.4:	Picture of a stone pile from the EBA Koilada cemetery	25
Figure 3.5:	Plan of an Early Iron Age tumulus (Andronikos 1969: Plate H)	27
Figure 3.6:	Picture of chamber tomb 11 from the Early Iron Age Makrigrigalos	28
Figure 3.7:	Plan of chamber tomb 11 from the Early Iron Age Makrigrigalos cemetery	28
Figure 4.1:	Mortality profiles (d_x) in the Neolithic and Early Bronze Age case study populations	39
Figure 4.2:	Mortality profiles (d_x) in the Late Bronze and Early Iron Age case study populations	39
Figure 4.3:	Survivorship (l_x) in the Neolithic and Early Bronze Age case study populations	40
Figure 4.4:	Survivorship (l_x) in the Late Bronze and Early Iron Age case study populations	40
Figure 4.5:	Mortality profiles (d_x) in the case study populations	44
Figure 4.6:	Survivorship (l_x) in the case study populations	44
Figure 4.7:	Distribution of sex versus age groups in the case study early populations	45
Figure 4.8:	Distribution of sex versus age groups in the case study late populations	46
Figure 5.1:	Plan of Neolithic Makrigrigalos (Bessios and Pappa 1998 a: Figure 4)	47
Figure 5.2:	Distribution of articulated versus disarticulated skeletal remains in LN Makrigrigalos I (Minimum Number of Individuals)	48
Figure 5.3:	Bone representation in disarticulated versus articulated skeletal elements of LN Makrigrigalos I	49
Figure 5.4:	Expected skeletal representation in a complete adult skeleton	51
Figure 5.5:	Bone part representation in the disarticulated versus the articulated skeletal remains of Ditch A	51
Figure 5.6:	Distribution of disarticulated versus articulated skeletal remains in LN Makrigrigalos I by age group	52
Figure 5.7:	Distribution of disarticulated versus articulated skeletal remains in LN Makrigrigalos I by sex group	53
Figure 5.8:	Distribution of the LN Makrigrigalos II disarticulated skeletons (Minimum Number of Individuals)	53
Figure 5.9:	Distribution of the LN Makrigrigalos II disarticulated skeletal elements	54
Figure 5.10:	Distribution of the age groups in LN Makrigrigalos II	54
Figure 5.11:	Distribution of burial type in the case study cemeteries	55
Figure 5.12:	Distribution of single versus multiple/secondary burials by age group	56
Figure 5.13:	Distribution of single versus multiple/secondary burials by sex group	56
Figure 5.14:	Distribution of the individuals disposed of in multiple and secondary burials in each grave assemblage of the case study cemeteries	58
Figure 6.1:	Osteophytic development on lumbar vertebrae (Karitsa Tum 5b)	68
Figure 6.2:	Severe degenerative changes causing ankylosis of the ankle (Koilada 45)	69
Figure 6.3:	Severe degenerative changes causing ankylosis of L ₅ and S ₁ (Koilada Lith44)	69
Figure 6.4:	Prevalence of degenerative joint disease in the case study populations (standardised rates)	71
Figure 6.5:	Prevalence of degenerative joint disease by sex group (standardised rates)	73
Figure 6.6:	Prevalence of degenerative joint disease by side in the upper and lower skeleton (standardised rates)	74
Figure 6.7:	Prevalence of degenerative joint disease by sex group in the upper and lower skeleton (standardised rates)	75
Figure 6.8:	Long-term healed oblique fracture on right radius (Koilada 100)	76
Figure 6.9:	Long-term healed fractures on left ribs (Koilada 83)	77
Figure 6.10:	Long-term healed fracture on the left third metacarpal causing degenerative joint disease on the metacarpophalangeal joint (Goules 20)	77
Figure 6.11:	Long-term healed fracture on the distal right forearm causing osteophytic development on the radiocarpal joint (Karitsa Tum 5,b)	78
Figure 6.12:	Prevalence of trauma in the case study populations (standardised rates)	80
Figure 6.13:	Prevalence of trauma by sex group (crude rates)	81
Figure 6.14:	Prevalence of trauma by side in the upper and lower skeleton (standardised rates)	82
Figure 6.15:	Prevalence of trauma by sex group in the upper and lower skeleton (crude rates)	83

Figure 6.16:	Prevalence of bones developing post-traumatic complications	84
Figure 6.17:	Long-term healed oblique fracture on the midshaft of right radius accompanied by malalignment of the affected bone ends (Spathes 14b)	85
Figure 6.18:	Long-term healed fracture on both sides distal radii (Treis Elies 7)	86
Figure 6.19:	Severe degenerative joint disease with evidence of arthritic cysts on the inferior surface of both sides distal radii (Treis Elies 7)	86
Figure 6.20:	Long-term healed fracture on the left distal lower leg causing malalignment and overlapping of the affected bone ends (Koilada 106)	87
Figure 6.21:	Dental trauma showing shallow groove on the anterior maxillary teeth (Koilada Lith39)	88
Figure 6.22:	Dental trauma showing shallow groove on the anterior maxillary teeth (Koilada Lith2)	89
Figure 6.23:	Shallow groove on anterior maxillary teeth (Lukacs and Pastor 1988: Figure 12)	89
Figure 6.24:	Shallow groove on anterior maxillary teeth (Irish and Turner 1987: Figure 1)	90
Figure 6.25:	Spondylolysis of L ₅ (Nea Nikomedeia XXI)	91
Figure 6.26:	Sacralisation of L ₅ (Nea Nikomedeia I)	91
Figure 6.27:	Spina Bifida (Nea Nikomedeia XXI)	92
Figure 6.28:	Prevalence of vertebral abnormalities in the case study populations (standardised rates)	93
Figure 6.29:	Prevalence of vertebral abnormalities by sex group (standardised rates)	94
Figure 6.30:	Periostitis on the midshaft of left femur (Makrighalos 19)	95
Figure 6.31:	Osteomyelitis on the proximal left humerus (Makrighalos 56prim)	95
Figure 6.32:	Prevalence of non-specific infectious lesions in the case study populations (standardised rates)	96
Figure 6.33:	Prevalence of non-specific infectious lesions by sex group (crude rates)	97
Figure 6.34:	Porotic hyperostosis on the roofs of the orbits (Cribra Orbitalia) (Karitsa Tum 15c)	99
Figure 6.35:	Porotic hyperostosis on the occipital (Nea Nikomedeia V)	99
Figure 6.36:	Bulgy eminence on both parietals (Nea Nikomedeia XIV)	100
Figure 6.37:	Enlarged nutrient foramina on hand phalanges (Nea Nikomedeia X)	100
Figure 6.38:	Enlarged nutrient foramina on immature long bones (Nea Nikomedeia #3)	101
Figure 6.39:	Flaring ends of immature femora (Nea Nikomedeia #8)	101
Figure 6.40:	Prevalence of anaemia in the case study populations (standardised rates)	104
Figure 6.41:	Prevalence of anaemia by sex group (crude rates)	107
Figure 6.42:	Enamel hypoplasia lines on mandibular teeth (Makrighalos 100prim)	108
Figure 6.43:	Prevalence of enamel hypoplasia in the case study populations (standardised rates)	110
Figure 6.44:	Prevalence of enamel hypoplasia by sex group (crude rates)	111
Figure 6.45:	Prevalence of enamel hypoplasia in posterior versus anterior dentition	112
Figure 6.46:	Prevalence of pathological conditions by archaeological period (standardised rates)	115
Figure 6.47:	Overall prevalence of pathological conditions in the case study populations (standardised rates)	115
Figure 7.1:	Severe caries on right mandibular molar (Makrighalos 19)	119
Figure 7.2:	Severe caries on right mandibular molars (Makrighalos 260prim)	119
Figure 7.3:	Prevalence of caries in the case study populations (standardised rates)	121
Figure 7.4:	Prevalence of caries by sex group (standardised rates)	122
Figure 7.5:	Moderate calculus deposits on the lingual surface of posterior mandibular teeth (Koilada Lith10.)	123
Figure 7.6:	Prevalence of calculus in the case study populations (standardised rates)	124
Figure 7.7:	Prevalence of calculus by sex group (standardised rates)	125
Figure 7.8:	Prevalence of caries versus calculus in the case study populations (standardised rates)	126
Figure 7.9:	Prevalence of caries versus calculus by sex group (standardised rates)	127
Figure 7.10:	Antemortem tooth loss on left posterior mandibular dentition (Makrighalos 260prim)	128
Figure 7.11:	Prevalence of antemortem tooth loss in the case study populations (standardised rates)	129
Figure 7.12:	Prevalence of antemortem tooth loss by sex group (standardised rates)	130
Figure 7.13:	Large periapical abscess on left mandible (Karitsa Tum15i)	131
Figure 7.14:	Prevalence of periapical abscesses in the case study populations (standardised rates)	132
Figure 7.15:	Prevalence of periapical abscesses by sex group	133
Figure 7.16:	Mean values of stable isotope ratios from Northern Greece	137
Figure 7.17:	Stable isotope values from Northern Greece	137
Figure 7.18:	Distribution of stable isotope values from EIA Makrighalos by sex group	138
Figure 7.19:	Distribution of stable isotope values from EIA Makrighalos by age group	139
Figure 7.20:	Distribution of stable isotope values from EIA Makrighalos by grave type	140
Figure 7.21:	Prevalence of dental disease by archaeological period (standardised rates)	140
Figure 7.22:	Overall prevalence of dental disease in the case study populations (standardised rates)	141