

## Contents

Abbreviations .....	15
Greek and Latin sources .....	15
Arabic sources .....	16
Historical sources .....	17
General .....	17
Figures .....	23
Tables .....	27
1. Introduction .....	31
1.1 Material basis and problems .....	31
1.2 The present study .....	33
2. Methodology .....	35
2.1 Previous approaches to marine resources in antiquity .....	35
2.2 Theoretical framework of the present enquiry .....	36
2.3 Methodological approach and research questions .....	38
2.3.1 Chronology .....	39
2.3.2 Site types .....	40
3. Contexts, data sources and applications .....	49
3.1 Environmental context and data .....	49
3.2 Archaeological data .....	50
3.2.1 Marine animal remains .....	50
Preservation and recovery biases .....	52
Quantification issues .....	53
Present analyses .....	54
3.2.2 Fishing equipment .....	55
Hook-and-line fishing .....	56
Nets .....	59
Other methods .....	68
Fishing boats .....	71
Economics of fishing .....	73
Shore-based activities .....	74
Present study .....	75

3.2.3 Fish-salting production .....	75
<i>Salsamenta</i> and fish sauces .....	75
Purple-dye production .....	77
Fish-salting and purple-dye facilities .....	78
Quantification issues .....	80
Salt sources .....	80
Salazón amphorae .....	81
3.3 Descriptive data .....	85
3.3.1 Written sources .....	85
3.3.2 Pictorial representations .....	86
3.3.3 Ethnography .....	87
4. Historical background .....	91
4.1 Prehistory .....	91
4.2 The western Phoenician and Punico-Mauretanian periods .....	94
4.3 The Roman province of <i>Mauretania Tingitana</i> .....	98
4.4 The Late Roman province .....	103
5. Environmental context .....	107
5.1 The western-most African province .....	107
5.2 The geology of the northwest Maghreb .....	110
5.3 Coastal topography and maritime environment .....	111
5.3.1 The Mediterranean coast: Oued Moulouya to Ceuta .....	111
Mediterranean maritime environment .....	117
5.3.2 The Strait of Gibraltar coast: Ceuta to Cap Spartel .....	121
Strait of Gibraltar maritime environment .....	125
5.3.3 The Atlantic coast: Cap Spartel to Essaouira .....	129
Atlantic maritime environment .....	135
5.4 Changes in the littoral of the northwest Maghreb .....	139
5.4.1 Factors affecting the coastal environment .....	140
5.4.2 The ‘reconstructed’ ancient littoral .....	151
6. Regional characterisations .....	153
6.1 The Mediterranean littoral .....	153
6.1.1 Finds .....	154
6.1.2 Summary .....	154
6.2 The Strait of Gibraltar littoral .....	163
6.2.1 Finds .....	163
6.2.2 Summary .....	163
6.3 The Atlantic littoral .....	170
6.3.1 Finds .....	170
6.3.2 Summary .....	173
6.4 Discussion .....	183

7. Case studies .....	185
7.1 <i>Tamuda</i> .....	185
7.1.1 The history of the site .....	185
7.1.2 The maritime environment .....	190
7.1.3 Evidence of marine resource exploitation .....	192
Marine species exploited: habitats and seasonality .....	192
Fishing methods .....	196
Fish-salting practices .....	196
7.1.4 Discussion .....	197
7.1.5 Summary .....	198
Areas and methods of fishing effort .....	199
The chronology of exploitation .....	202
7.1.6 Conclusions: the role of fishing at <i>Tamuda</i> .....	204
7.2 <i>Septem Fratres</i> .....	206
7.2.1 The history of the site .....	206
7.2.2 The maritime environment .....	212
7.2.3 Evidence of marine resource exploitation .....	213
Marine species exploited: habitats and seasonality .....	213
Fishing methods .....	219
Fish-salting practices .....	220
7.2.4 Discussion .....	222
7.2.5 Summary .....	224
Areas and methods of fishing effort .....	224
The chronology of exploitation .....	228
7.2.6 Conclusions: the role of fishing at <i>Septem Fratres</i> .....	232
7.3 <i>Lixus</i> .....	234
7.3.1 The history of the site .....	234
7.3.2 The maritime environment .....	239
7.3.3 Evidence of marine resource exploitation .....	241
Marine species exploited: habitats and seasonality .....	242
Fishing methods .....	248
Fish-salting practices .....	248
7.3.4 Discussion .....	252
7.3.5 Summary .....	254
Areas and methods of fishing effort .....	254
The chronology of exploitation .....	258
7.3.6 Conclusions: the role of fishing at <i>Lixus</i> .....	262
8. Discussion .....	265
8.1 The role of marine resources in the northwest Maghreb .....	265
8.1.1 'Fresh' consumption .....	265
8.1.1.1 'Fresh' marine resources and other foodstuffs .....	271
8.1.1.2 Discussion .....	276

8.1.2 Processing .....	277
8.1.2.1 Fish-salting .....	277
8.1.2.2 Possible oil extraction .....	283
8.1.2.3 Purple-dye production .....	283
8.1.2.4 Marine resources and agricultural production .....	289
Rural production .....	290
Urban production .....	293
8.1.2.5 Discussion .....	294
8.2 ‘Romanisation’ and marine resource exploitation .....	301
8.2.1 Punico-Mauretanian period .....	301
8.2.2 Roman period .....	305
8.2.3 Late Roman period .....	308
8.2.4 Discussion .....	310
9. Conclusions .....	313
Appendix 1. Marine animal remains .....	319
Metadata .....	319
Appendix 1.1 Fish bones .....	322
Appendix 1.1.1 Mediterranean .....	322
Appendix 1.1.2 Strait of Gibraltar .....	325
Appendix 1.1.3 Atlantic .....	336
Appendix 1.2 Marine invertebrates .....	355
Appendix 1.2.1 Mediterranean .....	355
Appendix 1.2.2 Strait of Gibraltar .....	370
Appendix 1.2.3 Atlantic .....	381
Appendix 2. Fishing equipment .....	413
Metadata .....	413
Appendix 2.1 Mediterranean .....	416
Appendix 2.2 Strait of Gibraltar .....	422
Appendix 2.3 Atlantic .....	425
Appendix 3. Fish-salting production .....	441
Metadata .....	441
Appendix 3.1 Fish-salting facilities .....	445
Appendix 3.2 Salt sources .....	459
Appendix 3.3 Salazón amphorae .....	466
Appendix 3.3.1 Kilns .....	466
Appendix 3.3.2 Amphorae .....	476
Appendix 3.3.2.1 Mediterranean .....	478
Appendix 3.3.2.2 Strait of Gibraltar .....	483
Appendix 3.3.2.3 Atlantic .....	492

Appendix 4. Written sources .....	525
Metadata .....	525
Appendix 4.1 Texts .....	527
Appendix 4.2 <i>Tituli picti</i> .....	530
Appendix 5. Pictorial representations .....	537
Metadata .....	537
Appendix 6. Ethnography .....	545
Metadata .....	545
Appendix 6.1 Mediterranean coast .....	547
Appendix 6.2 Strait of Gibraltar coast .....	555
Appendix 6.3 Atlantic coast .....	556
Appendix 6.4 Southwest Iberian coast .....	573
Appendix 7. Historical maps .....	577
Metadata .....	577
Bibliography .....	591
Indices .....	647
Literary texts .....	647
Inscriptions .....	653
Marine animals .....	654
Persons and groups .....	658
Places and geographical features .....	658
General .....	663