

Table of Contents

1 Introduction	1
Ashraf M. T. Elewa	1
References	4
2 Application of geometric morphometrics to the study of shape polymorphism in Eocene ostracodes from Egypt and Spain.....	7
Ashraf M. T. Elewa	7
2.1 Abstract	7
2.2 Introduction	7
2.3 Brief notes on morphometrics	9
2.4 Polymorphism in ostracodes.....	10
2.5 Materials and methods.....	11
2.6 Results	14
2.6.1 The Egyptian material.....	14
2.6.2 The Spanish material.....	19
2.7 Conclusions	24
2.8 Acknowledgements	26
References	26
3 Morphometric analysis of population differentiation and sexual dimorphism in the blue spiny lobster <i>Panulirus inflatus</i> (Bouvier 1895) from NW Mexico	29
Francisco Javier García-Rodríguez, José de la Cruz Agüero, Ricardo Pérez-Enriquez and Norman MacLeod.....	29
3.1 Abstract	29
3.2 Introduction	29
3.3 Material and methods	31
3.4 Results	33
3.5 Discussion	37
3.6 Acknowledgements	40
References	40
4. The effect of alcohol and freezing preservation on carapace size and shape in <i>Liocarcinus depurator</i> (Crustacea, Brachyura)	45
Marta Rufino, Pere Abelló and Andrew B. Yule.....	45
4.1 Abstract	45
4.2 Introduction	45

4.3 Materials and methods	47
4.4 Results	48
4.5 Discussion	51
4.6 Acknowledgements	52
References	52
5 Allometric field decomposition – an attempt at morphogenetic morphometrics.....	55
Øyvind Hammer	55
5.1 Abstract	55
5.2 Introduction.....	55
5.3 Allometric fields.....	56
5.4 Allometric field decomposition.....	61
5.5 Case study: Ammonite allometry	62
5.6 Conclusion	64
References	65
6 A combined landmark and outline-based approach to ontogenetic shape change in the Ordovician trilobite <i>Triarthrus becki</i>.....	67
H. David Sheets, Keonho Kim and Charles E. Mitchell.....	67
6.1 Abstract	67
6.2 Introduction.....	68
6.3 Materials.....	70
6.4 Methods.....	71
6.5 Results	76
6.6 Concerns about the use of semi-landmarks.....	80
6.7 Acknowledgements	81
References	81
7 Morphological analysis of two- and three-dimensional images of branching sponges and corals	83
Jaap A. Kaandorp and Rafael A. Garcia Leiva	83
7.1 Abstract	83
7.2 Introduction.....	83
7.3 Methods.....	87
7.3.1 Measurements in two-dimensional images.....	87
7.3.2 Three-dimensional data acquisition	90
7.3.3 Three-dimensional measurements based on the morphological skeleton.....	90
7.4 Results	92
7.5 Discussion	92
7.6. Acknowledgements	94
References	94

8 Geometric morphometric analysis of head shape variation in four species of hammerhead sharks (Carcharhiniformes: Sphyrnidae).....	97
Mauro J. Cavalcanti	97
8.1 Abstract	97
8.2 Introduction	98
8.3 Materials and methods.....	99
8.3.1 Samples.....	99
8.3.2 Data acquisition	100
8.3.3 Data analysis	100
8.4 Results	102
8.5 Discussion	110
8.6 Acknowledgements	111
References	111
9 Morphometric stock structure of the Pacific sardine <i>Sardinops sagax</i> (Jenyns, 1842) off Baja California, Mexico	115
José De La Cruz Agüero and Francisco Javier García Rodríguez	115
9.1 Abstract	115
9.2 Introduction	116
9.3 Materials and methods.....	117
9.3.1 Sample collection and treatment of data	117
9.3.2 Data analysis	119
9.4 Results	120
9.4.1 Data improvement.....	120
9.4.2 Univariate analysis.....	120
9.4.3 Multivariate analysis.....	121
9.5 Discussion	122
9.6 Acknowledgements	124
References	125
10. Sauropod Tracks – a geometric morphometric study	129
Luis Azevedo Rodrigues and Vanda Faria dos Santos	129
10.1 Abstract	129
10.2 Introduction	129
10.3 Materials and methods.....	130
10.3.1 Samples.....	130
10.3.2 Obtaining landmarks coordinates.....	131
10.3.3 Description of landmarks.....	132
10.4 Relative warp analysis.....	133
10.5 Multiple regression analysis	133
10.6 Software	134
10.7 Results	134
10.7.1 Relative warps analysis.....	134
10.7.2 Multiple regression analysis	136
10.8 Discussion and conclusions.....	136

10.9 Acknowledgements	139
References	139
11 Morphometric approach to Titanosauriformes (Sauropoda, Dinosauria) femora: Implications to the paleobiogeographic analysis	143
José I. Canudo and Gloria Cuenca-Bescós	143
11.1 Abstract	143
11.2 Introduction	143
11.3 Materials and methods	146
11.4 Results and discussions	149
11.4.1 Titanosauriformes of the Lower Cretaceous	149
11.4.2 Titanosauria and Titanosauridae	150
11.4.3 Titanosauria of Laurasia	151
11.4.4 Titanosauria of Gondwana of Upper Cretaceous. <i>Alamosaurus</i> , the emigrant	152
11.5 Conclusions	153
11.6 Acknowledgements	154
References	154
12 Geometric morphometrics in macroevolution: morphological diversity of the skull in modern avian forms in contrast to some theropod dinosaurs ...	157
Jesús Marugán-Lobón and Ángela D. Buscalioni	157
12.1 Abstract	157
12.2 Introduction	158
12.2.1 Theoretical perspective	158
12.2.2 Morphology	159
12.2.3 Phylogenetic context	160
12.3 Materials and methods	161
12.4 Results	162
12.5. Discussion and conclusions	168
12.6 Acknowledgements	171
References	171
13 Correlation of foot sole morphology with locomotion behaviour and substrate use in four passerine genera.....	175
Fränzi Korner-Nievergelt	175
13.1 Abstract	175
13.2 Introduction	175
13.3. Species and data	176
13.3.1 Species and sample size	176
13.3.2 Morphological data	177
13.2.3 Behavioural data	178
13.2.4 Statistics	180
13.3 Results	183
13.4 Discussion	187
13.4.1 Reconstruction of mean foot sole shapes	187

13.4.2 Parallelism	188
13.4.3 Functional aspects of plantar morphological traits	189
13.5 Acknowledgements	191
References	192
Appendix	195
Mean ecological scores	195
14 Maximum-likelihood identification of fossils: taxonomic identification of Quaternary marmots (Rodentia, Mammalia) and identification of vertebral position in the pipesnake <i>Cylindrophis</i> (Serpentes, Reptilia)	197
P. David Polly and Jason J. Head	197
14.1 Abstract	197
14.2 Introduction	198
14.3 Materials and methods	200
14.3.1 Marmots	200
14.3.2 Snakes	203
14.3.3 ML identification procedure	205
14.3.4 Cross-validation assessment	206
14.3.5 Identification of unknowns	207
14.4 Results	207
14.4.1 Marmots	207
14.4.2 Snakes	211
14.5 Discussion	213
14.6 Conclusions	217
14.7 Acknowledgements	218
References	218
15 Geometric morphometrics of the upper antemolar row configuration in the brown-toothed shrews of the genus <i>Sorex</i> (Mammalia)	223
Igor Y. Pavlinov	223
15.1 Abstract	223
15.2 Introduction	223
15.3 Materials and methods	225
15.4 Results	226
15.5 Conclusions	229
15.6 Acknowledgements	230
References	230
16 Geometric morphometrics in paleoanthropology: Mandibular shape variation, allometry, and the evolution of modern human skull morphology	231
Markus Bastir and Antonio Rosas	231
16.1 Abstract	231
16.2 Introduction	231
16.2 Material and methods	234
16.3 Geometric morphometry	234
16.3.1 Thin-plate splines	235

16.3.2 Missing data.....	235
16.3.3 Geometric morphometric software and data analyses	236
16.4 Results	236
19.5. Discussion	238
19.7 Conclusions	240
16.9. Acknowledgements	241
References	241
17 3-D geometric morphometric analysis of temporal bone landmarks in Neanderthals and modern humans.....	245
Katerina Harvati	245
17.1 Abstract	245
17.2 Introduction	245
17.3 Materials and methods	246
17.4 Results	248
17.5 Discussion	253
17.5.1 Modern humans	253
17.5.2 Neanderthals	253
17.5.3 Upper Paleolithic Europeans	254
17.5.4 Kabwe.....	255
17.6 Conclusions.....	256
17.7 Acknowledgements	256
References	256
Index	259