Contents

Preface ix
Frédéric MUTTIN and Hélène THOMAS

Chapter 1. Baseline Biomarkers in the Eastern Oyster *Crassostrea gigas* and the Blue Mussel *Mytilus edulis* 1
Marine BARBARIN, Frédéric MUTTIN and Hélène THOMAS

1.1. Introduction 1
1.2. Materials and methods 3
1.2.1. Study area and sampling collection 3
1.2.2. Biochemical analysis 5
1.2.3. Data treatments 5
1.3. Results 7
1.3.1. Hollow oysters *Crassostrea gigas* 10
1.3.2. Blue mussels *Mytilus edulis* 12
1.4. Discussion 13
1.5. Conclusion 14
1.6. Funding and acknowledgments 15
1.7. References 15

Chapter 2. The Use of Limpets and Mussels to Biomonitor Chronic Pollution in North Corsica Port Areas (Mediterranean Sea): A Multibiomarker Approach 19
Marion PILLET, Justine CASTREC, Claire GILLET, Lise LE VERN, Michel MARENGO, Lovina FULLGRABE, Stéphane LE FLOCH, Valérie HUET, Carine CHURLAUD, Pierre LEJEUNE and Hélène THOMAS

2.1. Introduction 20
2.1.1. The chemical contaminants 20
2.1.2. The context of coastal area 21
2.1.3. Biomonitoring in the environment 21

2.1.4. Objectives of the study . . . 22
2.2. Materials and methods . . . 23
2.2.1. Study sites . . . 23
2.2.2. Caging and sampling activities . . . 23
2.2.3. Biomarkers of exposure (bioaccumulation) . . . 24
2.2.4. Biomarkers of effect analyses . . . 26
2.2.5. Statistical analyses . . . 27
2.3. Results and discussion . . . 30
2.4. Acknowledgment . . . 40
2.5. Funding . . . 40
2.6. Appendix: Supplementary material . . . 41
2.7. References . . . 44

Chapter 3. *Paracentrotus lividus*: Its Use for the Biomonitoring of Trace Elements in Coastal Environments . . . 51
Ouafa EL IDRISSI, Vanina PASQUALINI, Sylvie GOBERT and Sonia TERNENGO

3.1. Introduction . . . 52
3.2. Materials and methods . . . 53
3.2.1. Study area and sampling collection . . . 53
3.2.2. Sampling preparation . . . 56
3.2.3. Trace element analysis . . . 56
3.2.4. Biochemical analysis . . . 57
3.2.5. Numerical procedures . . . 57
3.3. Results . . . 58
3.3.1. Trace element concentrations . . . 58
3.3.2. Biotic factors of the sea urchin . . . 58
3.3.3. Temporal variations of trace elements . . . 59
3.3.4. Spatial variations of trace elements . . . 60
3.3.5. Bioaccumulation, biomagnification and biota–sediment accumulation factors . . . 61
3.3.6. Biochemical analyses . . . 61
3.4. Discussion . . . 62
3.5. Conclusion . . . 64
3.6. Funding and acknowledgments . . . 65
3.7. References . . . 65

Chapter 4. Lessons Learned and Best Practices in Developing an Information System for Interdisciplinary, Heterogeneous, Multidimensional Environmental Data: The WIBE (Water Interdisciplinary Biology and Ecology) Information System . . . 69
Bénédicte MADON, Romain DAVID, Clémence EPINOUX, Cécilia PIGNON-MUSSAUD, Elie ARNAUD, Yvan LE BRAS and Hélène THOMAS

4.1. Introduction . . . 70

4.2. The WIBE Information System (IS) concept 72
4.2.1. Context: EMFF QUAMPO and QUALIPERTUIS. 72
4.2.2. The WIBE IS Development 73
4.3. Challenges 83
4.3.1. Phase 1 – Towards a broader semantic standards community approval 84
4.3.2. Phase 2 – In creating an Information System a posteriori 84
4.3.3. Phase 3 – In ensuring (meta)data quality 85
4.3.4. Phase 4 – In keeping working links between data and metadata 85
4.3.5. Phase 5 – In finding a repository for interdisciplinary data 86
4.4. Lessons learned and recommendations 86
4.5. Acknowledgments 88
4.6. References 88

Chapter 5. Developing a Digital Interface to Visualize WIBE Information System Data 91
Eduardo HIDALGO FORT, Alejandro LUCAS RODRÍGUEZ, Alejandro SALGADO CERDEIRA, Bénédicte MADON, Antonio TORRALBA, Romain DAVID, Elie ARNAUD, Yvan LE BRAS and Hélène THOMAS

5.1. Introduction 91
5.2. Materials and methods 92
5.2.1. System architecture 92
5.2.2. Graphical user interface design 96
5.3. Conclusion 107
5.4. Funding and acknowledgments 108
5.5. References 108

Chapter 6. Potential Impacts of Sacrificial Anodes on the Black Scallop *Mimachlamys varia* in a Controlled Environment 111
Marine BARBARIN, Emmanuel DUBILLOT, Valérie HUET, Carine CHURLAUD, Clément GENIN, Frédéric MUTTIN, Philippe REFAIT and Hélène THOMAS

6.1. Introduction 111
6.2. Material and methods 114
6.2.1. Experimental design 114
6.2.2. Water physico-chemical assessments 115
6.2.3. Trace element assessments 116
6.2.4. Biomarker assessments 116
6.2.5. Statistical analysis 116
6.3. Results 119
6.3.1. Levels of trace elements 119
6.3.2. Biomarker responses 119

6.3.3. Factor analysis to underline relationships between biomarker responses and trace element assessments 122
6.4. Discussion 123
6.5. Conclusion 126
6.6. Funding and acknowledgments 126
6.7. Appendix: Supplementary material 126
6.8. References 128

List of Authors 133

Index 137