

Contents

1	Of Mounds and Cold-Water Corals	1
1.1	Recent Carbonate Mounds	2
1.1.1	From Ancient Mud Mounds to Recent Carbonate Mounds	2
1.1.2	Occurrence and Distribution of Recent Carbonate Mounds	4
1.2	Cold-Water Corals	8
1.3	Aim of the Study	11
2	Challenger Mound: A Case Study	13
2.1	Site Survey	15
2.1.1	Geological Evolution of Porcupine Basin	15
2.1.2	Geomorphology of the Belgica Mound Province	26
2.1.3	Oceanographic Template	30
2.2	Drilling Challenger Mound (Site U1317)	33
2.3	Drilling the Off-Mound Regions	39
2.3.1	Site U1316	39
2.3.2	Site U1318	43
2.4	Summary	43
3	Imaging	45
3.1	Methodology	46
3.1.1	Shipboard Measurements	46
3.1.2	Shore Based Measurements: X-ray Computed Tomography	47
3.2	Cyclic Record of the Carbonate Mound	49
3.2.1	Spectral Colour Reflectance	50
3.2.2	What's in the Matrix?	54
3.3	Cold-Water Corals: The Framework Builders	57
3.3.1	Quantification of Coral Fragments	57
3.3.2	Dissolution and Fragmentation of Coral Fragments	61
3.4	Porosity Analysis in Recent Carbonate Mounds	65
3.5	Imaging the Off-Mound Records	69
3.5.1	Site U1316	69
3.5.2	Site U1318	71
3.6	Discussion	73

3.6.1	Western Ireland as Source for Terrigenous Material?	73
3.6.2	Justification of the Name “Carbonate Mound”	74
3.7	Summary	76
4	Geophysical and Geochemical Core Logging	79
4.1	Methodology	80
4.1.1	Geophysical Logging	80
4.1.2	Geochemical Logging	84
4.2	Geophysical Records	85
4.2.1	Cyclic Record	85
4.2.2	Interpretation and Correlation	91
4.3	Geochemical Records	93
4.3.1	Cyclic Record	93
4.3.2	Relationship with Physical Properties	97
4.4	Logging the Off-Mound Records	98
4.4.1	Site U1316	98
4.4.2	Site U1318	104
4.5	Discussion	109
4.5.1	Cyclic Record: Revealing Glacial-Interglacial Variations?	109
4.5.2	Early Diagenesis in the Mound Record	111
4.5.3	Depositional Processes in the Off-Mound Records	117
4.6	Summary	119
5	Magnetic Record of a Carbonate Mound	121
5.1	Methodology	122
5.1.1	Shipboard Magnetic Measurements	122
5.1.2	Shore Based Magnetic Measurements	123
5.2	Magnetostratigraphy	126
5.2.1	Magnetostratigraphic Framework	126
5.2.2	Palaeointensity	131
5.2.3	Sedimentation Rates	135
5.3	Environmental Magnetism	136
5.3.1	Magnetic Susceptibility	136
5.3.2	Anisotropy in Magnetic Susceptibility	141
5.3.3	Time Series Analysis	144
5.4	Magnetostratigraphy in the Off-Mound Regions	148
5.4.1	Site U1316	148
5.4.2	Site U1318	153
5.5	Discussion	158
5.5.1	Pre-mound Phase	158
5.5.2	Mound Initiation	162
5.5.3	Mound Evolution	164
5.5.4	Mound Decline	164
5.6	Summary	166

6	The Top of the Record: On-Mound and Off-Mound	167
6.1	Material and Methodology	167
6.2	Off-Mound Records	172
6.2.1	MD01-2450: SW Flank of Challenger Mound	173
6.2.2	MD01-2452: Magellan Mound Province	177
6.3	On-Mound Records	179
6.3.1	MD01-2451G: Top of Challenger Mound	180
6.3.2	MD01-2459G: Top of Mound Perseverance	184
6.4	Discussion	186
6.4.1	Off-Mound Records and Palaeoenvironmental Changes	186
6.4.2	On-Mound Records: Revealing Episodes of Coral Growth?	189
6.5	Summary	191
7	Surface Processes	193
7.1	Material and Methodology	194
7.2	Moira Mounds	197
7.2.1	What are the “Moira Mounds”?	197
7.2.2	Micro-Bathymetric Mapping	200
7.3	ROV-Imagery: New Ways of Looking to the Surface	208
7.3.1	Sedimentary Facies Distribution and Faunal Presence	208
7.3.2	Video Mosaicing: A Quantitative Approach	213
7.4	Discussion	219
7.4.1	Moira Mounds: A Form of Stressed Coral Growth?	219
7.4.2	“Dead” Mounds Next to “Live” Mounds?	223
7.5	Summary	224
8	Carbonate Mounds in the Gulf of Cadiz	225
8.1	General Setting	225
8.1.1	Geological Setting	225
8.1.2	Oceanographic Setting	228
8.1.3	Palaeoenvironmental Setting	231
8.2	Material and Methodology	232
8.3	Data Description and Interpretation	233
8.3.1	Pen Duick Mound Province	233
8.3.2	Renard Mound Province	241
8.3.3	Vernadsky Mound Province	245
8.3.4	Al Idrisi Mound Province	248
8.4	Discussion	249
8.4.1	Initiation of Cold-Water Coral Growth (or Settlement)	249
8.4.2	Extinction of Cold-Water Corals	250
8.4.3	Cold-Water Coral Dissolution and Carbonate Precipitation	251
8.4.4	Model for the Development of Carbonate Mounds	253
8.5	Summary	254

9 Conclusions and Outlook 257

 9.1 Conclusions 257

 9.1.1 Findings and Statements 257

 9.1.2 Controversy 260

 9.2 A Look Ahead 264

References 267

Index 293