McDONALD INSTITUTE MONOGRAPHS

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By Charles French, Chris O. Hunt, Reuben Grima,
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Volume 1 of Fragility and Sustainability – Studies on Early Malta,
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With contributions by
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On the cover: *View towards Nadur lighthouse and Għajnsielem church with the Gozo Channel to Malta beyond, from In-Nuffara (Caroline Malone).*

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Preface and dedication

Caroline Malone

The *FRAGSUS Project* emerged as the direct result of an invitation to undertake new archaeological fieldwork in Malta in 1985. Anthony Bonanno of the University of Malta organized a conference on 'The Mother Goddess of the Mediterranean' in which Colin Renfrew was a participant. The discussions that resulted prompted an invitation that made its way to David Trump (Tutor in Continuing Education, Cambridge University), Caroline Malone (then Curator of the Avebury Keiller Museum) and Simon Stoddart (then a post-graduate researcher in Cambridge). We eagerly took up the invitation to devise a new collaborative, scientifically based programme of research on prehistoric Malta.

What resulted was the original Cambridge Gozo Project (1987–94) and the excavations of the Xagħra Brochtorff Circle and the Għajnsielem Road Neolithic house. Both those sites had been found by local antiquarian, Joseph Attard-Tabone, a long-established figure in the island for his work on conservation and site identification.

As this and the two other volumes in this series report, the original Cambridge Gozo Project was the germ of a rich and fruitful academic collaboration that has had international impact, and has influenced successive generations of young archaeologists in Malta and beyond.

As the Principal Investigator of the *FRAGSUS Project*, on behalf of the very extensive *FRAGSUS* team I want to dedicate this the first volume of the series to the enlightened scholars who set up this now 35 year-long collaboration of prehistoric inquiry with our heartfelt thanks for their role in our studies.

We dedicate this volume to:

Joseph Attard Tabone
Professor Anthony Bonanno
Professor Lord Colin Renfrew

and offer our profound thanks for their continuing role in promoting the prehistory of Malta.

Acknowledgements

This volume records research undertaken with funding from the European Research Council under the European Union's Seventh Framework Programme (FP/2007-2013)/ERC Grant Agreement n. 323727 (*FRAGSUS Project*: *Fragility and sustainability in small island environments: adaptation, cultural change and collapse in prehistory* – http://www.qub.ac.uk/sites/FRAGSUS/). All the authors of this volume are indebted to the ERC for its financial support, and to the Principal Investigator of the *FRAGSUS Project*, Prof. Caroline Malone (Queen's University, Belfast, UK), for her central role in devising the project and seeing this research through to publication.

For Chapter 2, we extend warm thanks to the staff of the ^{14}CHRONO centre at QUB, especially Stephen Hoper, Jim McDonald, Michelle Thompson and Ron Reimer, all of whom took a keen interest in the *FRAGSUS Project*. The success of the *FRAGSUS Project* in general and the radiocarbon dating exercise has depended on their work. We thank the Physical Geography Laboratory staff at the School of Geography, University College Dublin, for the use of their ITRAX XRF core scanner. In particular, we would like to thank Dr Steve McCarron, Department of Geography, National University of Ireland, Maynooth and Dr Jonathan Turner, Department of Geography, National University of Ireland, University College, Dublin. We thank Prof. Patrick Schembri for sourcing and collecting the *Acanthocardia* samples from the Natural Museum of Natural History. Sean Pyne O'Donnell thanks Dr Chris Hayward at the Tephrochronology Analytical Unit (TAU), University of Edinburgh, for help and advice during microprobe work. Dr Maxine Anastasi, Department of Classics and Archaeology, University of Malta, helped identify the pottery from the settlement cores. Dr Frank Carroll helped show us the way forward; but sadly is no longer with us. Chris Hunt, Rory Flood, Michell Farrell, Sean Pyne O'Donnell and Mevrick Spiteri were the coring team. They were helped by Vincent Van Walt, who provided technical assistance. Al Ruffell and John Meneely did geophysical evaluation and GRP location of the cores. During fieldwork, Tim Kinnaird and Charles French were assisted by Sean Taylor, Jeremy Bennett and Simon Stoddart. We are grateful to the Superintendence of Cultural Heritage, Malta and Heritage Malta for permission to undertake the analyses and much practical assistance.

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For Chapter 6, Reuben Grima wrote the first draft of this contribution, receiving comments and additions from the other authors.

For Chapter 7, Simon Stoddart wrote the first draft of this contribution, receiving comments and additions from the other authors.

For Chapter 9, we thank Sharlo Camilleri for providing us with a copy of the GIS data produced by the MALSIS (MALtese Soil Information System) project. We are grateful to Prof. Saviour Formosa and Prof. Timmy Gambin, both of the University of Malta, who facilitated the donation of LiDAR data, together with computer facilities, as part of the European project ERDF156 *Developing National Environmental Monitoring Infrastructure and Capacity*, from the former Malta

Environment and Planning Authority. A number of individuals were happy to share their recollections of shepherding practices in Malta and Gozo over the last sixty or seventy years; others facilitated the encounters. We are grateful to all of them: Charles Gauci, Grezzju Meilaq, Joseph Micallef, Louis Muscat, Ċettina and Anġlu Vella, Ernest Vella and Renata Zerafa.

Simon Stoddart would like to thank Prof. Martin Jones and Rachel Ballantyne for their advice in constructing Figure 11.4. The editors would like to thank Emma Hannah for compiling the index.

Firstly, the FRAGSUS Project is the result of a very generous research grant from the European Research Council (Advanced Grant no' 323727), without which this and its two partner volumes and the research undertaken could not have taken place. We heartily thank the ERC for its award and the many administrators in Brussels who monitored our use of the grant. The research team also wants to record our indebtedness to the administrators of the grant within our own institutions, since this work required detailed and dedicated attention. In particular we thank Rory Jordan in the Research Support Office, Stephen Hoper and Jim McDonald – CHRONO lab, and Martin Stroud (Queen's University Belfast), Laura Cousens (Cambridge University), Glen Farrugia and Cora Magri (University of Malta), the Curatorial, Finance and Designs & Exhibitions Departments in Heritage Malta and Stephen Borg at the Superintendence of Cultural Heritage. Finally, we thank Fr. Joe Inguanez (Emeritus Head of Department, Department of Sociology, University of Malta) for offering us the *leitmotif* of this volume while a visiting scholar in Magdalene College, Cambridge: '*Mingħajr art u ħamrija, m'hemmx sinjorija*' translating as 'without land and soil, there is no wealth'.

Foreword

Anthony Pace

Sustainability, as applied in archaeological research and heritage management, provides a useful perspective for understanding the past as well as the modern conditions of archaeological sites themselves. As often happens in archaeological thought, the idea of sustainability was borrowed from other areas of concern, particularly from the modern construct of development and its bearing on the environment and resource exploitation. The term sustainability entered common usage as a result of the unstoppable surge in resource exploitation, economic development, demographic growth and the human impacts on the environment that has gripped the World since 1500. Irrespective of scale and technology, most human activity of an economic nature has not spared resources from impacts, transformations or loss irrespective of historical and geographic contexts. Theories of sustainability may provide new narratives on the archaeology of Malta and Gozo, but they are equally important and of central relevance to contemporary issues of cultural heritage conservation and care. Though the archaeological resources of the Maltese islands can throw light on the past, one has to recognize that such resources are limited, finite and non-renewable. The sense of urgency with which these resources have to be identified, listed, studied, archived and valued is akin to that same urgency with which objects of value and all fragile forms of natural and cultural resources require constant stewardship and protection. The idea of sustainability therefore, follows a common thread across millennia.

It is all the more reason why cultural resource management requires particular attention through research, valorization and protection. The *FRAGSUS Project* (Fragility and sustainability in small island environments: adaptation, cultural change and collapse in prehistory) was intended to further explore and enhance existing knowledge on the prehistory of Malta and Gozo. The objective of the project as designed by the participating institutional partners and scholars, was to explore untapped field resources and archived archaeological material from a number of sites and their landscape to answer questions that could be approached with new techniques and methods. The results of the *FRAGSUS Project* will serve to advance our knowledge of certain areas of Maltese prehistory and to better contextualize the archipelago's importance as a model for understanding island archaeology in the central Mediterranean. The work that has been invested in *FRAGSUS* lays the foundation for future research.

Malta and Gozo are among the Mediterranean islands whose prehistoric archaeology has been intensely studied over a number of decades. This factor is important, yet more needs to be done in the field of Maltese archaeology and its valorization. Research is not the preserve of academic specialists. It serves to enhance not only what we know about the Maltese islands, but more importantly, why the archipelago's cultural landscape and its contents deserve care and protection especially at a time of extensive construction development. Strict rules and guidelines established by the Superintendence of Cultural Heritage have meant that during the last two decades more archaeological sites and deposits have been protected in situ or rescue-excavated through a statutory watching regime. This supervision has been applied successfully in a wide range of sites located in urban areas, rural locations and the landscape, as well as at the World Heritage Sites of Valletta, Ġgantija, Ħaġar Qim and Mnajdra and Tarxien. This activity has been instrumental in understanding ancient and historical land use, and the making of the Maltese historic centres and landscape.

Though the cumulative effect of archaeological research is being felt more strongly, new areas of interest still need to be addressed. Most pressing are those areas of landscape studies which often become peripheral to the attention that is garnered by prominent megalithic monuments. *FRAGSUS* has once again confirmed that there is a great deal of value in studying field systems, terraces and geological settings which, after all, were the material media in which modern Malta and Gozo ultimately developed. There is, therefore, an interplay in the use of the term sustainability, an interplay between what we can learn from the way ancient communities tested and used the very same island landscape which we occupy today, and the manner in which this landscape is treated in contested economic realities. If we are to seek factors of sustainability in the past, we must first protect its relics and study them using the best available methods in our times. On the other hand, the study of the past using the materiality of ancient peoples requires strong research agendas and thoughtful stewardship. The *FRAGSUS Project* has shown us how even small fragile deposits, nursed through protective legislation and guardianship, can yield significant information which the methods of pioneering scholars of Maltese archaeology would not have enabled access to. As already outlined by the Superintendence of Cultural Heritage, a national research agenda for cultural heritage and the humanities is a desideratum. Such a framework, reflected in the institutional partnership of the *FRAGSUS Project*, will bear valuable results that will only advance Malta's interests especially in today's world of instant e-knowledge that was not available on such a global scale a mere two decades ago.

FRAGSUS also underlines the relevance of studying the achievements and predicaments of past societies to understand certain, though not all, aspects of present environmental challenges. The twentieth century saw unprecedented environmental changes as a result of modern political-economic constructs. Admittedly, twentieth century developments cannot be equated with those of antiquity in terms of demography, technology, food production and consumption or the use of natural resources including the uptake of land. However, there are certain aspects, such as climate change, changing sea levels, significant environmental degradation, soil erosion, the exploitation and abandonment of land resources, the building and maintenance of field terraces, the rate and scale of human demographic growth, movement of peoples, access to scarce resources, which to a certain extent reflect impacts that seem to recur in time, irrespectively of scale and historic context.

Anthony Pace
Superintendent of Cultural Heritage (2003–18).

Appendix 4

Granulometry of the deep cores

Katrin Fenech

Table A4.1. *Marsa 2.*

Depth (cm)	3	8	13	18	23	28	33	38	43
>8 mm	0	13	0	0	0	0	0	0	0
>500 µ	7	12	15	21	15	17	0	0	0
>63 µ	59	53	56	48	56	87	100	100	100
<63 µ	146	123	145	156	135	132	0	0	0
Munsell	10 YR 6/4	10 YR 6/4	10 YR 6/4	10 YR 6/4	10 YR 6/4	10 YR 6/4			

Depth (cm)	48	53	58	63	68	73	78	83	88
>8 mm	0	0	0	0	0	0	0	0	0
>500 µ	0	0	0	0	0	0	0	15	58
>63 µ	100	100	100	100	100	100	100	65	13
<63 µ	0	0	0	0	0	0	0	191	144
Munsell								10 YR 5/4	10 YR 5/4

Depth (cm)	93	98	103	107	113	118	123	128	133
>8 mm	0	0	0	0	12	132	100	100	100
>500 µ	17	15	14	22	25	24	0	0	0
>63 µ	58	65	77	72	90	30	0	0	0
<63 µ	103	127	127	126	81	48	0	0	0
Munsell	10 YR 5/4	2.5 YR 5/2	2.5 YR 5/2	2.5 YR 5/2	2.5 YR 5/2	2.5 YR 5/2			

Depth (cm)	138	143	148	153	158	163	168	173	178
>8 mm	100	100	100	100	100	100	100	49	38
>500 µ	0	0	0	0	0	0	0	38	26
>63 µ	0	0	0	0	0	0	0	90	43
<63 µ	0	0	0	0	0	0	0	116	24
Munsell								2.5 YR 6/1	2.5 YR 6/1

Depth (cm)	183	188	193	198	203	208	213	218	223
>8 mm	8	8	0	0	0	0	0	0	100
>500 µ	57	55	23	10	12	8	10	8	0
>63 µ	54	57	51	28	18	38	36	33	0
<63 µ	45	53	105	136	140	89	98	141	0
Munsell	2.5 YR 6/1	2.5 YR 6/1	2.5 YR 6/1	2.5 YR 5/1	2.5 YR 5/1	2.5 YR 5/1	2.5 YR 5/1	2.5 YR 5/1	

Table A4.1 *(cont.)*.

Depth (cm)	228	233	238	243	248	253	258	263	268
>8 mm	100	100	100	100	100	100	137	42	133
>500 μ	0	0	0	0	0	0	0	7	12
>63 μ	0	0	0	0	0	0	0	9	19
<63 μ	0	0	0	0	0	0	0	16	34
Munsell							2.5 YR 5/1	2.5 YR 5/1	2.5 YR 5/1

Depth (cm)	273	278	283	288	293	298	303	308	313
>8 mm	30	0	0	0	0	0	0	0	0
>500 μ	14	13	7	11	12	14	10	13	14
>63 μ	31	32	31	45	44	34	24	39	29
<63 μ	89	120	108	111	72	105	88	74	91
Munsell	2.5 YR 5/1	2.5 YR 5/1	2.5 YR 5/1	2.5 YR 5/1	2.5 YR 5/1	2.5 YR 5/1	2.5 YR 5/1	2.5 YR 5/1	2.5 YR 5/1

Depth (cm)	318	323	328	333	338	343	348	353	358
>8 mm	0	0	0	0	0	0	0	0	0
>500 μ	12	9	17	12	16	16	16	18	22
>63 μ	24	29	33	41	30	23	38	32	38
<63 μ	103	53	75	60	74	66	62	92	99
Munsell	2.5 YR 5/1	2.5 YR 5/1	2.5 YR 5/1	2.5 YR 5/1	2.5 YR 5/1	2.5 YR 5/1	2.5 YR 5/1	2.5 YR 5/1	2.5 YR 5/1

Depth (cm)	363	368	373	378	383	388	393	398	403
>8 mm	0	0	0	0	0	0	0	0	0
>500 μ	26	14	18	17	18	16	20	34	31
>63 μ	36	48	45	34	48	44	50	54	62
<63 μ	92	50	103	87	66	80	79	48	68
Munsell	2.5 YR 5/1	2.5 YR 5/1	2.5 YR 5/1	2.5 YR 5/1	2.5 YR 5/1	2.5 YR 4/1	2.5 YR 4/1	2.5 YR 4/1	2.5 YR 4/1

Depth (cm)	408	413	418	423	428	433	438	443	448
>8 mm	0	0	0	0	0	0	0	0	0
>500 μ	23	24	34	31	24	12	21	22	29
>63 μ	73	62	72	53	42	27	38	40	46
<63 μ	42	72	101	63	63	23	47	43	52
Munsell	2.5 YR 4/1	2.5 YR 4/1	2.5 YR 4/1	2.5 YR 4/1	2.5 YR 4/1	2.5 YR 4/1	2.5 YR 4/1	2.5 YR 4/1	2.5 YR 4/1

Depth (cm)	453	458	463	468	473	478	483	488	493
>8 mm	0	0	0	0	20	4	0	26	0
>500 μ	19	41	31	38	28	46	30	28	29
>63 μ	44	57	60	61	55	52	50	40	49
<63 μ	46	58	58	83	71	64	76	85	84
Munsell	2.5 YR 4/1	2.5 YR 4/1	2.5 YR 4/1	2.5 YR 4/1	2.5 YR 4/1	2.5 YR 4/1	2.5 YR 4/1	2.5 YR 4/1	2.5 YR 4/1

Depth (cm)	498	503	508	513	518	523	528	533	538
>8 mm	0	14	42	0	17	0	0	0	0
>500 μ	25	41	31	34	10	100	0	0	0
>63 μ	45	49	37	34	46	100	100	100	100
<63 μ	84	69	55	96	112	0	0	0	0
Munsell	2.5 YR 4/1	2.5 YR 4/1	2.5 YR 4/1	2.5 YR 4/1	2.5 YR 4/1				

Table A4.1 *(cont.)*.

Depth (cm)	543	548	553	558	563	568	573	578	583
>8 mm	0	0	0	0	0	0	0	0	0
>500 μ	0	0	0	0	0	0	0	0	0
>63 μ	100	100	100	100	100	100	100	100	100
<63 μ	0	0	0	0	0	0	0	0	0
Munsell									

Depth (cm)	588	593	598	603	608	613	618	623	628
>8 mm	0	0	0	0	11	0	0	2	0
>500 μ	0	28	30	29	26	35	37	23	14
>63 μ	100	29	32	19	29	31	23	29	31
<63 μ	0	24	59	61	62	51	68	59	97
Munsell		2.5 YR 4/1	2.5 YR 4/1	2.5 YR 4/1	2.5 YR 4/1	2.5 YR 4/1	2.5 YR 4/1	2.5 YR 4/1	2.5 YR + 7.5 YR 3/2

Depth (cm)	633	638	643	648	653	658	663	668	673
>8 mm	0	0	8	12	36	16	73	46	55
>500 μ	30	13	22	42	50	45	33	62	65
>63 μ	42	52	30	47	24	29	29	21	16
<63 μ	82	110	106	99	136	91	85	106	85
Munsell	5 YR 3/2	5 YR 3/2	5 YR 3/2 + 10 YR 4/3	10 YR 4/3	10 YR 5/4	10 YR 5/4	10 YR 5/4	10 YR 5/4	10 YR 5/4

Depth (cm)	678	683	688	693	698	703	708	713	718
>8 mm	154	100	100	100	100	12	8	0	0
>500 μ	52	0	0	0	0	25	45	34	30
>63 μ	25	0	0	0	0	4	11	7	54
<63 μ	40	0	0	0	0	3	14	11	68
Munsell	10 YR 5/3					7.5 YR 6/8	7.5 YR 6/8	7.5 YR 6/8	7.5 YR 5/6

Depth (cm)	723	728	733	738	743	748	753	758	763
>8 mm	0	0	0	0	0	16	4	11	0
>500 μ	23	129	65	61	33	65	56	32	22
>63 μ	47	31	41	32	41	30	34	39	26
<63 μ	112	36	109	94	103	109	106	106	29
Munsell	7.5 YR 5/6	7.5 YR 5/6	7.5 YR 5/6	7.5 YR 5/6	7.5 YR 5/6	7.5 YR 5/6	7.5 YR 6/6	7.5 YR 6/6	7.5 YR 6/6

Depth (cm)	768	773	778	783	788	793	798	803	808
>8 mm	8	0	28	16	10	17	0	0	0
>500 μ	25	70	84	115	46	18	22	18	19
>63 μ	20	46	27	26	35	40	39	56	40
<63 μ	37	61	60	45	113	116	107	117	96
Munsell	7.5 YR 6/6	7.5 YR 6/6	7.5 YR 6/6	7.5 YR 6/6	7.5 YR 5/6	7.5 YR 5/6	7.5 YR 4/6	7.5 YR 4/6	5 YR 3/4

Depth (cm)	813	818	823	828	833	838	843	848	853
>8 mm	6	0	13	0	0	0	31	4	0
>500 μ	21	3	95	50	72	75	51	31	40
>63 μ	31	19	27	34	46	33	36	32	39
<63 μ	151	74	55	59	61	46	41	73	128
Munsell	5 YR 3/4	5 YR 3/4	7.5 YR 5/6	7.5 YR 5/6	7.5 YR 5/6	7.5 YR 5/6	7.5 YR 5/6	7.5 YR 5/6	7.5 YR 5/6

Table A4.1 *(cont.).*

Depth (cm)	858	863	868	873	878	883	888	893	898
>8 mm	0	10	183	47	371	0	5	69	186
>500 μ	19	46	31	47	12	23	41	51	31
>63 μ	21	19	14	14	6	31	42	17	9
<63 μ	128	127	27	30	14	46	46	43	12
Munsell	5 YR 3/4	5 YR 3/4	5 YR 3/4	7.5 YR 5/6		7.5 YR 5/6	7.5 YR 5/6	7.5 YR 5/6	7.5 YR 5/6

Depth (cm)	903	908	913	918	923	928	933	938
>8 mm	128	175	62	59	55	24	75	106
>500 μ	81	40	63	64	61	22	42	58
>63 μ	12	18	20	16	10	4	18	14
<63 μ	24	27	33	31	21	9	23	29
Munsell	7.5 YR 5/6	7.5 YR 5/6	7.5 YR 5/6	7.5 YR 5/6	7.5 YR 5/6	7.5 YR 5/6	7.5 YR 5/6	7.5 YR 5/6

Table A4.2. *Mgarr ix-Xini.*

Depth (cm)	56	60	64	67	71	75	79	82	86
>8mm	1	0	2	3	0	4	4	6	0
>500μ	5	5	6	2	7	8	3	5	8
>63μ	7	8	8	4	8	4	4	6	7
<63μ	33	26	33	20	33	13	13	24	25
Munsell	10YR 5/4	10YR 5/4	10YR 5/4	10YR 5/4	10YR 5/4	10YR 5/4	10YR 5/4	10YR 5/4	10YR 5/4

Depth (cm)	90	93	97	100	104	108	111	120	124
>8mm	10	4	8	0	7	2	9	4	15
>500μ	6	6	5	13	12	13	18	25	10
>63μ	7	8	8	9	8	14	7	9	6
<63μ	23	19	19	10	1	10	1	0	1
Munsell	10YR 5/4	10YR 5/4	10YR 5/4	10YR 5/4 + 7/3	10YR 7/3	10YR 7/3	10YR 7/3	10YR 8/2	10YR 8/2

Depth (cm)	132	142	147	152	157	162	167	172	175
>8mm	16	45	16	0	2	0	2	0	0
>500μ	5	7	11	30	20	13	17	11	5
>63μ	7	10	7	9	11	7	8	8	2
<63μ	2	1	1	1	2	1	0	0	0
Munsell	10YR 8/2	10YR 5/2	10YR 5/2	10YR 6/1	10YR 6/1	10YR 6/1	10YR 6/1	10YR 6/1	10YR 6/1

Depth (cm)	191	195	199	204	208	212	216	220	225
>8mm	0	9	5	10	3	3	0	0	0
>500μ	13	14	25	8	10	5	2	2	2
>63μ	10	11	10	3	5	6	5	4	5
<63μ	1	3	4	3	6	30	35	20	40
Munsell	10YR 7/1	10YR 7/1	10YR 7/1	10YR 7/1	10YR 7/1	10YR 5/1	10YR 5/1	10YR 5/1	10YR 6/1

Table A4.2 *(cont.).*

Depth (cm)	229	233	237	246	251	256	261	266	271
>8mm	0	0	0	10	7	11	2	0	4
>500μ	4	1	2	20	31	29	15	9	7
>63μ	5	2	3	9	12	9	6	12	12
<63μ	34	30	17	1	6	6	25	42	33
Munsell	10YR 6/1	10YR 6/1	10YR 6/1	10YR 5/2	10YR 5/2	10YR 5/2	10YR 5/2 + 6/1	10YR 6/1	10YR 6/1 + 4/1

Depth (cm)	276	281	286	291	296	300	309	314	319
>8mm	0	0	0	0	0	0	0	0	0
>500μ	2	1	1	1	1	1	8	9	8
>63μ	5	5	3	2	4	1	8	11	12
<63μ	30	44	55	58	46	0	38	29	34
Munsell	10YR 4/1	10YR 4/1 + 5/1 + 6/1	10YR 6/1	10YR 6/1	10YR 6/1 + 4/1	10YR 6/1	10YR 6/1	10YR 6/1 + 6/6	10YR 6/1

Depth (cm)	324	329	334	339	344	352	359	364	383
>8mm	0	0	0	36	108	132	0	0	0
>500μ	5	2	2	5	4	21	8	4	10
>63μ	6	5	4	6	4	20	14	7	8
<63μ	27	33	35	22	9	42	34	24	2
Munsell	10YR 6/1	10YR 6/1	10YR 6/1 + 3/1	10YR 6/1 + 3/1	10YR 6/1	10YR 3/1	10YR 3/1	10YR 3/1	10YR 7/2

Depth (cm)	387	391	395	399	403	407	411	415	419
>8mm	0	3	0	6	26	19	11	0	0
>500μ	22	21	30	12	18	12	25	31	21
>63μ	10	10	13	5	6	2	4	3	7
<63μ	3	4	5	5	14	4	6	5	21
Munsell	10YR 7/2	10YR 7/2	10YR 7/2	10YR 7/2 + 3/1	10YR 7/2 + 3/1	10YR 7/2 + 3/1	10YR 7/2 + 3/1	10YR 7/2	10YR 7/2 + 3/1

Depth (cm)	423	427	434	439	444	449	454	459	464
>8mm	0	0	94	26	27	19	7	11	6
>500μ	2	10	7	16	25	7	11	21	15
>63μ	9	9	4	8	10	6	7	10	9
<63μ	38	20	0	2	8	8	14	4	13
Munsell	10YR 4/1	10YR 4/1	10YR 7/2	10YR 7/2	10YR 7/2	10YR 6/1	10YR 6/1	110YR 6/2	10YR 4/1 + 6/2

Depth (cm)	469	474	479	484	489	499	502	506	510
>8mm	31	0	1	0	0	1	2	7	0
>500μ	7	8	17	28	46	7	15	7	6
>63μ	10	17	16	9	5	1	4	6	4
<63μ	7	7	6	2		0	3	4	2
Munsell	10YR 4/1 + 6/2	10YR 4/1 + 6/2	10YR 6/2	10YR 6/2	10YR 6/2	10YR 7/1	10YR 7/1	10YR 7/1	10YR 7/1

Table A4.2 *(cont.)*.

Depth (cm)	513	517	520	524	528	531	535	538	542
>8mm	0	0	0	0	15	0	0	0	0
>500µ	3	2	2	3	8	11	23	22	12
>63µ	3	2	2	3	5	5	12	13	10
<63µ	2	2	2	1	4	6	7	9	8
Munsell	10YR 6/1	10YR 6/1	10YR 6/1	10YR 4/1	10YR 4/1	10YR 4/1	10YR 4/1 + 6/4	10YR 4/1 + 6/4	10YR 4/1 + 6/4

Depth (cm)	546	549	553	561	566	571	576	581	586
>8mm	0	0	0	10	24	8	3	1	1
>500µ	6	2	1	24	32	19	8	7	5
>63µ	11	12	8	14	12	8	15	16	14
<63µ	13	22	16	6	8	5	8	12	11
Munsell	10YR 4/1 + 6/4	10YR 5/2	10YR 5/2	10YR 7/2	10YR 7/3	10YR 7/3 + 6/1	10YR 6/1	10YR 6/1	10YR 6/1

Depth (cm)	591	596	601	606	611	615	641	644	648
>8mm	0	0	0	0	0	0	0	1	0
>500µ	2	4	3	2	1	1	7	7	8
>63µ	13	11	11	8	5	7	4	5	5
<63µ	11	16	31	26	25	24	1	0	2
Munsell	10YR 6/1	10YR 6/1	10YR 5/1	10YR 5/1	10YR 5/1	10YR 4/1	10YR 5/1	10YR 5/1	10YR 5/1

Depth (cm)	651	655	658	661	665	668	671	675	678
>8mm	0	0	6	2	7	3	5	7	10
>500µ	13	11	4	5	4	5	8	15	17
>63µ	8	8	7	8	6	4	4	5	6
<63µ	4	4	2	4	1	3	3	5	2
Munsell	10YR 5/1	10YR 5/2	10YR 5/2	10YR 5/2	10YR 5/2	10YR 5/2	10YR 5/2	10YR 7/2	10YR 7/2

Depth (cm)	687	692	697	702	707	712	717	722	727
>8mm	21	16	0	1	1	7	5	34	8
>500µ	15	8	2	7	6	14	14	15	28
>63µ	9	10	6	11	10	8	15	14	9
<63µ	11	10	20	21	24	12	10	13	9
Munsell	10YR 4/1 + 7/2	10YR 4/1	10YR 4/1	10YR 4/1	10YR 4/1	10YR 4/1 + 5/3	10YR 4/1 + 5/3	10YR 5/3	10YR 5/3

Depth (cm)	732	737	741
>8mm	62	40	85
>500µ	17	18	14
>63µ	6	7	10
<63µ	7	5	9
Munsell	10YR 5/3 + 8/2	10YR 5/3 + 8/2	10YR 8/2

Table A4.3. *Salina Deep Core.*

Depth (cm)	1113	1121	1131	1140	1150	1160	1191	1201	1211
>8mm	0	0	0	0	3	0	0	0	0
>500μ	8	26	48	40	70	47	11	62	36
>63μ	112	227	263	156	203	140	128	204	138
<63μ	274	365	384	325	447	374	599	554	589

Depth (cm)	1216	1221	1231	1241	1247	1257	1267	1277	1290
>8mm	0	0	5	3	0	0	0	0	0
>500μ	24	20	43	23	16	36	32	38	48
>63μ	165	127	377	180	135	302	320	305	150
<63μ	183	189	366	435	180	412	454	311	431

Depth (cm)	1300	1310	1384	1394	1404	1414	1425	1434	1444
>8mm	0	12	0	0	0	0	0	0	0
>500μ	121	48	15	9	9	9	6	11	13
>63μ	194	262	86	129	94	121	87	128	178
<63μ	370	435	350	646	466	537	655	507	641

Depth (cm)	1450	1459	1470	1479	1489	1630	1640	1650	1682
>8mm	0	0	0	0	0	0	0	4	0
>500μ	15	47	52	90	69	4	2	28	2
>63μ	70	185	191	257	223	103	87	144	75
<63μ	250	451	439	455	516	438	397	475	521

Depth (cm)	1692	1702	1710	1720	1730	1740	1745	1755	1765
>8mm	0	0	0	0	0	0	0	0	0
>500μ	1	1	1	1	1	1	3	2	1
>63μ	62	57	11	24	47	29	35	18	23
<63μ	391	536	387	701	551	515	193	579	449

Depth (cm)	1770	1780	1790	1841	1851	1861	1869	1879	1889
>8mm	0	0	1	0	0	0	0	0	0
>500μ	3	5	4	2	1	1	1	1	1
>63μ	54	42	62	45	12	15	8	12	6
<63μ	205	519	669	326	523	509	328	575	544

Depth (cm)	1890	1900	1910	1920	1930	1940	1971	1981	1991
>8mm	0	0	0	10	2	0	0	0	0
>500μ	1	1	1	5	4	4	2	2	2
>63μ	8	17	23	30	180	102	17	34	16
<63μ	657	593	669	553	489	529	377	564	462

Depth (cm)	1994	2004	2014	2023	2033	2043	2046	2056	2066
>8mm	0	0	0	0	0	13	0	0	0
>500μ	1	2	3	3	4	3	1	2	2
>63μ	1	13	8	13	17	16	6	6	22
<63μ	221	586	551	514	635	558	275	583	438

Table A4.3 *(cont.)*.

Depth (cm)	2070	2080	2100	2101	2103	2105	2106	2113	2123
>8mm	13	0	0	0	0	0	0	1	0
>500μ	6	13	4	1	1	1	1	1	4
>63μ	4	13	12	2	4	7	2	50	12
<63μ	259	581	469	358	653	662	530	388	628

Depth (cm)	2133	2143	2153	2163	2183	2192	2202	2222	2240
>8mm	0	0	0	0	0	0	0	0	0
>500μ	7	1	1	1	1	1	1	1	2
>63μ	34	8	31	4	26	17	20	13	28
<63μ	523	456	411	337	576	487	502	430	554

Depth (cm)	2260	2285	2295	2305	2308	2318	2328	2338	2348
>8mm	0	0	0	0	0	0	0	0	0
>500μ	2	3	5	4	20	21	37	38	2
>63μ	7	8	19	9	70	88	171	164	2
<63μ	511	513	393	553	263	578	393	483	644

Depth (cm)	2358	2363	2368	2380	2390	2398	2408	2418	2428
>8mm	0	0	0	0	0	0	0	0	0
>500μ	2	5	10	2	1	229	130	160	226
>63μ	20	37	38	18	8	88	61	125	110
<63μ	646	378	244	598	674	238	492	506	298

Depth (cm)	2458	2468	2508	2528	2550	2570	2580	2590	2600
>8mm	0	0	0	0	0	0	0	0	0
>500μ	72	316	74	14	28	235	298	528	479
>63μ	140	178	207	54	106	54	89	147	91
<63μ	499	428	403	511	635	90	169	270	267

Depth (cm)	2613	2625	2638	2646	2656	2665	2670	2687	2693
>8mm	0	9	2	42	0	0	0	0	0
>500μ	399	134	336	288	314	305	159	712	316
>63μ	158	49	70	117	139	141	58	144	45
<63μ	333	132	197	293	317	447	186	434	163

Depth (cm)	2696	2700	2782	2786	2792	2797	2804	2807	2812
>8mm	0	0	0	0	0	6	16	0	0
>500μ	188	174	29	4	7	4	98	10	4
>63μ	37	47	30	13	50	21	26	19	22
<63μ	56	142	282	66	389	198	199	183	223

Depth (cm)	2820	2825	2832	2850
>8mm	393	230	209	1142
>500μ	209	74	171	310
>63μ	44	13	42	164
<63μ	171	44	123	505

Table A4.4. *Wied Żembaq 2.*

Depth (cm)	117	121	125	129	133	137	141	145	149
>8mm	0	0	1	81	10	12	24	11	0
>500µ	5	4	5	1	8	8	10	16	12
>63µ	8	8	8	2	6	6	7	7	11
<63µ	32	33	31	15	26	26	24	25	25
Munsell	10YR 4/6	10YR 4/6	10YR 4/6	10YR 4/6	10YR 4/6 + 10YR 3/3	10YR 4/4	10YR 4/4	10YR 4/4	10YR 4/4

Depth (cm)	153	157	161	165	169	173	177	181	185
>8mm	13	0	77	4	11	5	0	3	6
>500µ	9	9	5	12	12	13	10	9	8
>63µ	8	7	4	6	5	7	6	7	7
<63µ	25	25	19	24	31	36	36	42	42
Munsell	10YR 4/4	10YR 4/4	10YR 4/4	10YR 4/4	10YR 4/4	10YR 4/4	10YR 4/4	10YR 4/4	10YR 4/4

Depth (cm)	189	193	227	230	234	237	240	244	248
>8mm	0	6	0	0	0	1	0	0	0
>500µ	10	6	3	8	7	7	7	5	7
>63µ	9	7	6	8	8	7	7	5	5
<63µ	44	48	38	26	29	28	28	33	33
Munsell	10YR 4/4	10YR 4/4	10YR 5/8	10YR 5/8	10YR 5/8	10YR 5/8	10YR 5/8	10YR 5/8	10YR 5/6

Depth (cm)	251	254	258	262	265	269	272	276	279
>8mm	0	0	1	0	70	14	0	7	10
>500µ	5	3	6	3	2	8	4	3	7
>63µ	5	5	4	3	1	4	2	2	3
<63µ	39	36	33	21	12	23	18	10	16
Munsell	10YR 5/6	10YR 5/6	10YR 5/6	10YR 5/6	10YR 5/6	10YR 5/6	10YR 5/6	10YR 5/6	10YR 5/6

Depth (cm)	283	286	290	293	297	302	307	312	317
>8mm	32	19	22	0	40	5	9	2	2
>500µ	6	10	7	8	3	1	1	2	2
>63µ	2	3	5	8	6	5	6	4	6
<63µ	15	14	29	35	30	53	49	49	62
Munsell	10YR 5/6	10YR 4/2	10YR 4/2	10YR 4/2	10YR 4/2	10YR 4/2	10YR 4/2	10YR 4/2	10YR 4/2

Depth (cm)	322	327	332	337	342	347	352	357	362
>8mm	0	34	5	0	0	3	0	0	0
>500µ	2	1	1	1	2	2	2	2	2
>63µ	5	4	7	7	8	8	9	8	6
<63µ	59	42	56	50	49	61	55	53	56
Munsell	10YR 4/2	10YR 4/2	10YR 4/2	10YR 4/2	10YR 4/2	10YR 4/2	10YR 4/2	10YR 3/3	10YR 3/3

Depth (cm)	367	372	377	382	387	392	461	463	464
>8mm	0	0	0	0	0	0	0	0	2
>500µ	2	2	1	2	1	1	8	7	7
>63µ	6	5	7	8	5	5	4	2	2
<63µ	47	47	44	56	57	63	9	9	6
Munsell	10YR 3/3	10YR 3/3	10YR 3/3	10YR 3/3	10YR 3/2	10YR 3/2	10YR 5/4	10YR 5/4	10YR 5/4

Table A4.4 *(cont.)*.

Depth (cm)	466	468	470	471	473	475	477	479	480
>8mm	0	3	0	0	0	0	0	0	0
>500µ	8	3	2	1	1	1	1	1	1
>63µ	3	2	2	3	3	3	3	3	3
<63µ	8	13	12	13	13	13	12	12	16
Munsell	10YR 5/4	10YR 5/4	10YR 5/4 + 1.7/1	10YR 5/4 + 1.7/1	7.5YR 4/2 + 1/71	7.5YR 4/2 + 1/71	7.5YR 4/2 + 1/71	7.5YR 4/2 + 1/71	7.5YR 4/2 + 1/71

Depth (cm)	481	483	485	487	489	490	492	494	503
>8mm	0	0	0	0	0	0	0	0	0
>500µ	2	4	2	1	1	1	1	1	2
>63µ	4	3	3	4	3	3	4	3	6
<63µ	14	12	15	13	14	14	16	17	37
Munsell	7.5YR 4/2 + 2/1	7.5YR 4/2 + 2/1	7.5YR 4/2 + 2/1	7.5YR 4/2 + 2/1	7.5YR 4/2 + 2/1	7.5YR 4/2 + 2/1	7.5YR 4/2 + 2/1	7.5YR 4/2 + 2/1	7.5YR 2/1 + 5/4

Depth (cm)	507	511	515	519	523
>8mm	0	5	0	0	0
>500µ	2	1	2	1	2
>63µ	6	5	5	3	3
<63µ	35	31	40	18	32
Munsell	7.5 YR 2/1 + 4/3	7.5 YR 2/1	7.5YR 1.7/1 + 4/3	7.5YR 1.7/1 + 4/3	7.5 YR 1.7/1

Table A4.5. *Wied Żembaq 1.*

Depth (cm)	126	131	136	141	145	150	154	159	163
>8mm	7	15	0	0	2	0	0	2	0
>500µ	7	6	14	11	6	11	8	6	11
>63µ	6	7	7	8	6	6	4	4	3
<63µ	22	18	20	19	17	23	13	12	2
Munsell	10YR 3/3	10YR 4/3	10YR 4/3	10YR 4/4	10YR 4/4	10YR 4/3	10YR 4/3	10YR 4/3	10YR 7/6

Depth (cm)	168	173	178	182	187	191	195	199	204
>8mm	8	4	0	2	0	11	0	0	0
>500µ	12	9	6	5	5	7	7	4	8
>63µ	5	6	5	6	5	4	5	5	9
<63µ	30	31	28	30	18	17	32	31	51
Munsell	10YR 4/3	10YR 4/3	10YR 4/3	10YR 4/3	10YR 2/3	10YR 2/3	10YR 2/3	10YR 2/3	10YR 3/2

Depth (cm)	208	213	227	232	237	242	247	253	258
>8mm	0	3	0	6	11	12	7	5	0
>500µ	6	9	8	10	8	8	8	6	4
>63µ	8	9	7	5	4	5	3	7	6
<63µ	44	49	19	9	4	5	2	40	24
Munsell	10YR 3/2	10YR 3/2	10YR 4/3	10YR 6/4	10YR 4/3 + 6/4	10YR 7/4	10YR 7/4	10YR 4/2	10YR 4/2

Table A4.5 *(cont.)*.

Depth (cm)	263	268	273	278	283	288	293	298	303
>8mm	0	0	0	2	6	6	1	7	2
>500μ	6	7	7	6	10	6	3	5	5
>63μ	5	7	8	6	5	5	5	3	4
<63μ	30	33	42	47	27	39	47	42	45
Munsell	10YR 4/2	10YR 4/2	10YR 4/2	10YR 4/2	10YR 4/2	10YR 4/2	10YR 4/2	10YR 4/2	10YR 4/2

Depth (cm)	308	313	318	323	328	333	338	343	348
>8mm	4	7	9	0	0	0	0	0	0
>500μ	5	4	3	2	1	2	3	2	3
>63μ	5	6	4	4	4	6	7	6	5
<63μ	45	44	36	51	42	50	49	37	40
Munsell	10YR 4/2	10YR 3/2	10YR 3/2	10YR 3/2	10YR 3/2	10YR 3/2	10YR 3/2	10YR 3/2	10YR 3/1

Depth (cm)	353	358	363	368	373	378	383	388	393
>8mm	0	3	7	0	0	0	0	0	0
>500μ	6	8	2	1	1	1	1	1	2
>63μ	5	4	5	6	5	5	4	4	5
<63μ	16	21	45	44	50	58	51	48	38
Munsell	10YR 4/3	10YR 4/3	10YR 3/2	10YR 3/2	10YR 3/2	10YR 3/2	10YR 3/1	10YR 4/1 + 4/3	10YR 4/1 + 4/3

Depth (cm)	398	403	408	413	418	423	428	433	438
>8mm	0	0	0	0	0	0	0	0	0
>500μ	1	1	2	2	2	4	5	3	2
>63μ	5	4	5	9	5	7	8	6	6
<63μ	47	37	40	41	41	39	50	43	44
Munsell	10YR 2/1	10YR 2/1	10YR 2/1	10YR 2/1	10YR 2/1	10YR 4/1	10YR 4/1	10YR 4/1	10YR 4/1

Depth (cm)	443	448	456	468	480	492	504	516	528
>8mm	0	0	0	7	9	1	0	0	0
>500μ	3	2	11	26	6	6	3	3	2
>63μ	6	4	12	11	11	14	15	14	12
<63μ	33	25	90	72	109	111	124	104	79
Munsell	10YR 4/1	10YR 4/1	10YR 3/2	10YR 3/2	10YR 4/1	10YR 4/1	10YR 3/1	10YR 3/1	10YR 3/1

Depth (cm)	540
>8mm	7
>500μ	5
>63μ	12
<63μ	84
Munsell	10YR 3/1

Table A4.6. *Xemxija 1.*

Depth (cm)	49	54	59	64	69	72	76	81	86
>8mm	0	0	0	0	0	1	3	0	0
>500μ	1	1	1	1	3	9	7	6	6
>63μ	1	2	2	1	4	4	9	8	5
<63μ	44	41	37	51	54	8	36	47	51
Munsell	10YR 6/4 +4/3	10YR 7/4	10YR 7/3	10YR 7/3	10YR 6/4	10YR 7/3	10YR 7/3	10YR 7/4	10YR 7/4

Depth (cm)	91	96	101	106	111	116	121	126	131
>8mm	7	3	1	18	3	0	5	13	14
>500μ	10	19	17	14	25	18	17	9	10
>63μ	7	9	7	8	12	8	8	3	5
<63μ	32	18	13	20	27	17	23	25	46
Munsell	10YR 8/4	10YR 7/4	10YR 7/4	10YR 7/4	10YR 7/4	10YR 7/4	10YR 7/4	10YR 5/6	10YR 6/4

Depth (cm)	136	141	145	149	154	158	163	168	173
>8mm	6	0	0	0	0	0	0	0	0
>500μ	4	2	0	1	1	1	1	1	1
>63μ	4	3	3	3	2	3	2	2	3
<63μ	55	61	52	51	43	51	54	55	56
Munsell	10YR 6/4 + 7/4	10YR 6/4	10YR 5/4	10YR 5/4	7.5YR 5/3	10YR 5/4	10YR 5/4	10YR 5/3	10YR 5/3

Depth (cm)	178	183	188	193	198	203	208	213	218
>8mm	0	0	0	0	0	0	0	0	0
>500μ	1	1	1	1	1	1	1	1	1
>63μ	1	1	1	1	1	3	3	6	4
<63μ	53	52	53	52	60	49	51	48	53
Munsell	10YR 5/4	10YR 5/4	7.5YR 5/4	7.5YR 6/3	7.5 YR 7/3 + 6/4	7.5 YR 7/3 + 6/4	10YR 5/2	10YR 5/2	10YR 4/1

Depth (cm)	223	238	233	238	243	248	267	271	275
>8mm	0	0	0	0	0	0	0	0	0
>500μ	1	1	1	1	1	1	1	1	1
>63μ	7	4	7	10	11	11	2	2	3
<63μ	51	56	52	56	55	23	50	53	51
Munsell	10YR 4/1	10YR 4/1	7.5 YR 5/1	7.5YR 6/1	10YR 6/2	10YR 5/2	10YR 5/3 +5/2	10YR 6/2	10YR 5/3 +5/2

Depth (cm)	280	284	288	293	297	301	306	310	314
>8mm	0	0	0	2	0	0	0	4	6
>500μ	1	3	5	2	2	2	3	7	9
>63μ	2	2	2	2	3	2	2	1	1
<63μ	52	49	48	50	46	46	49	42	39
Munsell	10YR 6/3	10YR 5/3	10YR 5/3	10YR 5/2	10YR 5/2	10YR 5/2	10YR 6/2 +5/1	10YR 6/2 +5/1	10YR 5/2

Table A4.6 *(cont.)*.

Depth (cm)	318	323	327	331	336	340	344	349	353
>8mm	1	1	1	0	0	0	0	0	0
>500µ	5	3	2	1	2	1	1	1	1
>63µ	2	1	2	2	2	2	2	1	2
<63µ	43	45	49	47	48	49	53	47	52
Munsell	10YR 4/1	10YR 5/2	10YR 6/2 +4/1	7.5YR 3/1 +10YR 6/2	10YR 4/1	10YR 5/1	10YR 5/1	10YR 5/1	10YR 6/1

Depth (cm)	366	370	375	380	384	389	393	398	403
>8mm	0	4	5	7	0	4	4	0	0
>500µ	3	6	9	6	4	5	4	2	2
>63µ	2	1	1	1	3	2	1	2	1
<63µ	51	50	46	44	47	47	48	51	49
Munsell	10YR 6/1	10YR 6/1	10YR 6/1	10YR 6/1	10YR 6/1	10YR 5/2	10YR 5/2	10YR 5/2	10YR 5/2

Depth (cm)	407	412	416	421	426	430	435	439	440
>8mm	0	2	0	0	0	0	0	0	0
>500µ	4	3	3	6	3	2	1	1	1
>63µ	2	2	1	2	3	2	2	2	2
<63µ	52	54	49	50	48	51	54	49	51
Munsell	10YR 5/2	10YR 5/2 +7/2	10YR 5/2	10YR 5/2	10YR 5/1	10YR 6/1	10YR 5/1	10YR 5/1	10YR 5/1

Depth (cm)	449	453	458	483	487	491	495	499	503
>8mm	0	0	0	0	0	0	0	0	0
>500µ	1	1	1	2	1	2	2	0.8	1
>63µ	2	2	2	5	3	6	5	3	3
<63µ	52	52	50	33	37	26	30	36.2	32
Munsell	10YR 5/1	10YR 5/1	10YR 5/1	10YR 1.7/1	10YR 1.7/1	10YR 1.7/1	10YR 1.7/1	10YR 2/2	10YR 1.7/1

Depth (cm)	507	511	515	519	523	527	531	535	539
>8mm	0	0	0	0	0	1	0	1	0
>500µ	1	3	2	0.8	2	4	0.8	2	0.8
>63µ	4	3	4	3	3	2	3	2	2
<63µ	32	28	30	36.2	36	34	34.2	36	39.2
Munsell	10YR 1.7/1	10YR 1.7/1	10YR 1.7/1 +2/1 +7/1	10YR 3/1 +4/1	10YR 2/1 + 5/2	10YR 2/1 +4/1 +5/2	10YR 1.7/1	10YR 2/2 +4/1	10YR 1.7/1

Depth (cm)	543	547	551	555	559	563	582	586	590
>8mm	0	0	0	0	0	0	0	0	0
>500µ	1	1	1	1	0.8	0.8	1	1	1
>63µ	3	2	2	1	2	1	2	4	5
<63µ	37	41	43	40	39.2	38.2	50	46	44
Munsell	10YR 2/1 +4/1	10YR 3/1 +4/1	10YR 3/1	10YR 3/1 +4/1	10YR 3/1	10YR 3/1 +2/1	10YR 2/1	10YR 1.7/1	10YR 1.7/1

Table A4.6 *(cont.)*.

Depth (cm)	595	599	603	607	612	616	621	625	629
>8mm	0	0	0	0	0	0	0	0	0
>500μ	1	1	1	1	1	1	2	1	1
>63μ	4	4	6	6	4	5	5	3	3
<63μ	46	45	42	40	45	42	40	48	48
Munsell	10YR 1.7/1 +3/1	10YR 1.7/1	10YR 1.7/1	10YR 1.7/1	10YR 2/1	10YR 1.7/1	10YR 1.7/1	10YR 1.7/1 +2/2	10YR 2/2

Depth (cm)	633	638	642	646	651	655	659	634	668
>8mm	0	0	0	0	0	0	0	0	0
>500μ	1	2	5	2	2	3	3	6	1
>63μ	3	3	3	4	2	4	3	4	2
<63μ	48	51	39	49	46	42	45	40	36
Munsell	10YR 4/1	10YR 4/1	10YR 4/1	10YR 2/1	10YR 1.7/1 +2/2	10YR 2/2	10YR 1.7/1 +2/2	10YR 2/3	10YR 1.7/1

Depth (cm)	672	682	686	691	696	701	706	710	715
>8mm	0	0	0	0	0	0	0	0	0
>500μ	1	0	1	1	2	2	5	5	4
>63μ	4	1	5	7	8	10	6	6	6
<63μ	53	60	54	52	50	51	57	49	55
Munsell	10YR 2/3	10YR 3/2	10YR 2/3	10YR 3/1	10YR 4/2	10YR 4/2	10YR 4/2	10YR 3/2	10YR 4/2

Depth (cm)	720	725	730	734	739	744	749	754	758
>8mm	0	0	0	0	0	0	0	0	0
>500μ	4	8	6	5	9	8	15	19	19
>63μ	6	7	7	6	7	7	8	5	6
<63μ	51	49	57	49	54	48	57	48	46
Munsell	10YR 2/3	10YR 2/3	10YR 2/3	10YR 3/2	10YR 3/3	10YR 3/2	10YR 4/2	10YR 4/2	10YR 4/2

Depth (cm)	763	768	773	778	802	806	810	814	818
>8mm	0	0	0	0	0	0	0	0	0
>500μ	12	15	9	3	1	2	1	1	1
>63μ	8	8	8	8	10	9	9	10	10
<63μ	54	54	51	68	54	46	47	49	45
Munsell	10YR 4/2	10YR 3/3	10YR 4/2 +5/6	10YR 4/2 +5/6	10YR 4/2	10YR 2/3	10YR 2/3	10YR 2/3	10YR 2/3

Depth (cm)	822	826	831	835	839	843	847	851	855
>8mm	0	0	0	0	0	0	0	0	0
>500μ	1	1	1	2	1	1	1	1	1
>63μ	7	9	12	12	10	12	11	4	10
<63μ	50	43	45	45	44	44	45	51	44
Munsell	10YR 2/3	10YR 2/3	10YR 2/3	10YR 2/3	10YR 2/3	10YR 2/3	10YR 2/3	10YR 2/3	10YR 2/3

Table A4.6 *(cont.)*.

Depth (cm)	859	863	867	871	876	880	884	887	888
>8mm	0	0	0	0	0	0	0	0	0
>500µ	5	8	7	5	6	2	1	1	3
>63µ	13	16	10	9	13	10	8	5	7
<63µ	40	37	37	42	42	48	46	49	61
Munsell	10YR 2/3 +6/8 +5/8	10YR 2/3	10YR 2/3	10YR 2/3	10YR 2/3	10YR 3/2	10YR 2/3	10YR 2/2	10YR 2/2

Depth (cm)	889	894	899	905	910	916	921	927	932
>8mm	0	0	0	0	0	0	0	0	0
>500µ	1	1	1	1	2	1	1	1	2
>63µ	5	4	7	5	8	8	5	7	8
<63µ	69	67	67	69	64	62	72	66	64
Munsell	10YR 2/3	10YR 3/2	10YR 2/3	10YR 3/2	10YR 3/3	10YR 2/3	10YR 2/3	10YR 2/2	10YR 2/2

Depth (cm)	938	943	949	954	960	965	971	976	982
>8mm	2	0	0	11	5	0	0	4	4
>500µ	5	16	18	16	12	11	7	8	7
>63µ	7	8	10	5	7	10	11	8	6
<63µ	51	49	49	21	29	57	47	55	45
Munsell	10YR 3/2	10YR 5/4 +3/2	10YR 5/3 +4/2	10YR 4/2	10YR 4/3	10YR 4/2	10YR 4/3	10YR 4/2	10YR 4/3

Depth (cm)	987
>8mm	0
>500µ	7
>63µ	9
<63µ	51
Munsell	10YR 4/3

Table A4.7. *Xemxija 2.*

Depth (cm)	120	124	129	133	137	141	146	150	154
>8mm	24	0	5	1	28	1	0	4	1
>500µ	6	10	12	6	5	5	2	2	1
>63µ	3	7	5	2	2	3	3	3	3
<63µ	7	34	22	17	18	48	49	48	57
Munsell	10YR 8/4	10YR 6/4	10YR 7/4	10YR 7/4 + 10YR 4/3	10YR 5/6	10YR 5/3	10YR 5/6	10YR 6/3	10YR 6/4

Depth (cm)	158	163	167	171	175	180	184	188	192
>8mm	0	0	0	0	0	0	0	0	0
>500µ	2	1	1	1	1	1	1	1	1
>63µ	3	3	3	3	2	2	2	2	2
<63µ	47	54	54	57	56	56	50	55	46
Munsell	10YR 5/3	10YR 4/3	10YR 4/3	10YR 4/2	10YR 4/3	10YR 4/3	10YR 4/2	10YR 4/3	10YR 4/4

Table A4.7 *(cont.).*

Depth (cm)	197	200	201	206	211	216	223	227	232
>8mm	0	0	0	0	0	0	0	0	0
>500µ	1	1	1	1	1	1	1	1	1
>63µ	2	2	5	2	2	1	2	2	4
<63µ	49	48	41	57	51	53	59	59	63
Munsell	10YR 4/3	10YR 4/2	10YR 6/3	10YR 5/3	10YR 5/2	10YR 5/2	10YR 6/2	10YR 5/1	10YR 5/1

Depth (cm)	237	242	248	253	258	264	269	274	279
>8mm	0	0	0	0	0	0	0	0	0
>500µ	1	2	1	1	1	1	1	1	3
>63µ	4	18	11	4	3	2	1	3	1
<63µ	61	43	52	58	63	60	65	57	61
Munsell	10YR 5/3	10YR 5/3	10YR 5/2	10YR 5/3	10YR 5/2	10YR 4/1	10YR 5/2	10YR 5/3	10YR 5/2

Depth (cm)	285	290	295	300	319	323	328	332	336
>8mm	0	0	0	0	2	0	0	0	0
>500µ	1	1	1	1	2	5	1	1	1
>63µ	1	1	1	2	1	1	1	1	1
<63µ	38	42	35	40	35	41	48	52	49
Munsell	10YR 5/3	10YR 5/2	10YR 5/1	10YR 5/1 + 10YR 5/3	10YR 6/1 + 10YR 4/1	10YR 5/1 + 10YR 4/1	10YR 4/1	10YR 2/1	10YR 4/1

Depth (cm)	340	345	349	353	358	362	366	371	375
>8mm	0	0	0	0	0	0	0	0	4
>500µ	1	1	2	1	2	1	3	4	6
>63µ	1	1	1	1	1	1	1	1	1
<63µ	48	44	45	45	44	47	49	44	44
Munsell	10YR 5/1	10YR 5/1	10YR 6/1	10YR 6/1	10YR 6/1	10YR 6/1 + 10YR 5/1	10YR 6/1 + 10YR 5/1	10YR 6/1	10YR 6/1

Depth (cm)	379	384	388	392	397	401	415	420	424
>8mm	9	0	0	0	0	0	0	0	0
>500µ	9	3	2	2	2	3	5	1	1
>63µ	1	1	1	1	1	1	2	3	3
<63µ	36	44	46	45	40	46	20	43	42
Munsell	10YR 6/1	10YR 6/1	10YR 6/1	10YR 6/1	10YR 5/1	10YR 5/1	10YR 5/2 + 10YR 2/1	10YR 4/1	10YR 4/1 + 10YR 2/1

Depth (cm)	429	433	438	442	447	451	456	460	465
>8mm	0	3	13	0	0	0	0	0	0
>500µ	1	1	1	2	3	1	3	1	2
>63µ	2	1	1	2	1	1	1	2	2
<63µ	35	29	23	37	34	26	15	40	44
Munsell	10YR 4/1	10YR 4/1	10YR 4/1	10YR 4/1	10YR 4/1	10YR 4/1	10YR 4/1	10YR 4/1	10YR 4/1

Table A4.7 *(cont.).*

Depth (cm)	470	474	478	483	488	492	496	501	526
>8mm	0	0	0	0	0	0	0	0	0
>500µ	1	1	1	1	1	1	1	1	2
>63µ	2	3	2	1	2	1	1	1	2
<63µ	41	46	45	45	43	44	47	47	32
Munsell	10YR 4/1	10YR 4/1	10YR 4/1	10YR 4/1	10YR 4/1	10YR 4/1	10YR 4/1	10YR 4/1	10YR 2/1 + 10YR 5/2

Depth (cm)	530	534	539	543	547	551	556	560	564
>8mm	0	0	0	0	0	0	0	0	0
>500µ	1	1	1	2	2	2	2	1	1
>63µ	3	2	2	2	2	2	2	1	1
<63µ	38	41	42	40	39	40	42	45	42
Munsell	10YR 5/2+ 10YR 2/1	10YR 4/2 + 10YR 2/1	10YR 4/2 + 10YR 2/1	10YR 3/1	10YR 4/1	10YR 4/1	10YR 4/1	10YR 4/1	10YR 4/1 + 10YR 5/1

Depth (cm)	568	573	577	581	585	590	594	598	602
>8mm	0	0	0	0	0	0	0	0	0
>500µ	1	1	1	1	2	1	1	1	1
>63µ	2	2	3	2	2	1	1	2	1
<63µ	42	37	44	44	40	41	47	46	42
Munsell	10YR 4/1	10YR 4/1	10YR 4/1	10YR 4/1	10YR 4/1	10YR 4/1	10YR 4/1	10YR 4/1	10YR 4/1

Depth (cm)	606	611	626	630	635	639	644	648	653
>8mm	0	0	0	0	0	0	0	0	0
>500µ	2	4	2	1	1	1	2	2	2
>63µ	2	3	3	4	4	4	5	5	4
<63µ	40	36	49	48	40	42	41	38	40
Munsell	10YR 4/1	10YR 4/3 + 1.7/1	10YR 1.7/1	10YR 1.7/1	10YR 1.7/1	10YR 1.7/1	10YR 1.7/1	10YR 1.7/1	10YR 1.7/1

Depth (cm)	657	662	666	671	675	680	684	689	693
>8mm	0	0	0	0	0	0	0	0	0
>500µ	1	1	1	1	1	1	1	1	2
>63µ	5	4	4	2	2	3	2	3	4
<63µ	40	41	43	52	51	51	49	55	50
Munsell	10YR 1.7/1	10YR 1.7/1	10YR 1.7/1	10YR 3/1	10YR 4/1	25YR 2/1	25YR 2/1	25YR 4/2	25YR 3/2

Depth (cm)	698	702	707	711	716	738	742	746	750
>8mm	0	0	0	0	0	5	1	0	0
>500µ	1	2	2	4	3	9	8	9	9
>63µ	3	4	5	5	4	8	5	4	6
<63µ	53	50	52	54	52	71	43	40	39
Munsell	25YR 4/2	10YR 3/1 + 10YR 4/2	10YR 3/1	10YR 4/2	10YR 4/2	10YR 4/2	10YR 4/2	10YR 4/2	10YR 4/2

Table A4.7 *(cont.).*

Depth (cm)	754	758	763	767	771	775	779	783	788
>8mm	7	4	0	10	1	0	0	0	0
>500µ	7	8	9	6	8	6	4	2	3
>63µ	4	5	5	5	8	8	8	7	7
<63µ	37	39	39	41	45	46	47	49	49
Munsell	10YR 4/2	10YR 4/2	10YR 5/3	10YR 5/3	10YR 5/3 + 10YR 4/2	10YR 5/3	10YR 5/3	10YR 5/3	10YR 4/3

Depth (cm)	792	796	800	804	808	813	817	821	858
>8mm	0	0	0	0	0	0	0	0	0
>500µ	2	2	1	1	1	3	1	1	1
>63µ	8	8	8	6	5	7	5	6	1
<63µ	49	49	52	53	52	49	52	53	23
Munsell	10YR 4/2 + 10YR 4/3	10YR 4/3	10YR 4/3	10YR 3/3	10YR 4/3	10YR 4/3	10YR 4/2 + 10YR 7/8	10YR 4/2	10YR 3/1 + 10YR 4/2

Depth (cm)	861	865	868	872	875	879	882	886	889
>8mm	0	0	0	0	0	0	0	0	0
>500µ	1	1	2	1	2	1	2	2	4
>63µ	2	2	2	2	2	2	2	2	2
<63µ	25	24	24	25	26	29	35	36	37
Munsell	10YR 5/2 + 10YR 3/1	10YR 5/2	10YR 1.7/1 + 10YR 4/1	10YR 1.7/1	10YR 1.7/1 + 10YR 4/2	10YR 4/1	10YR 4/1	10YR 4/1	10YR 4/1

Depth (cm)	893	896	900	903	907	910	914	917	921
>8mm	0	0	0	0	0	0	0	0	0
>500µ	1	1	1	1	1	1	1	1	1
>63µ	1	2	4	6	5	4	7	3	4
<63µ	33	29	35	37	34	33	35	35	38
Munsell	10YR 4/1	10YR 5/2	10YR 4/2 + 10YR 6/2	10YR 5/3 + 10YR 5/2	10YR 4/3	10YR 4/2	10YR 4/2 + 10YR 4/3	10YR 4/2	10YR 4/2

Depth (cm)	924	928	931
>8mm	0	0	0
>500µ	1	1	1
>63µ	4	4	4
<63µ	37	35	35
Munsell	10YR 4/2	10YR 4/3	10YR 4/2

Table A4.8. *Marsaxlokk 1.*

Depth (cm)	15	19	24	28	32	36	41	45	49
>8mm	3	0	1	0	3	0	5	11	12
>500µ	4	4	4	5	7	8	4	5	7
>63µ	9	9	10	10	11	8	8	8	9
<63µ	20	17	22	22	26	31	22	16	32
Munsell	10YR 5/4	10YR 5/4	10YR 5/4	10YR 5/4	10YR 5/4	10YR 5/4	10YR 5/4	10YR 5/4	10YR 5/4

Table A4.8 *(cont.)*.

Depth (cm)	54	58	62	67	71	75	80	84	89
>8mm	0	0	0	0	0	0	0	2	0
>500µ	11	17	10	12	11	8	5	4	2
>63µ	12	9	12	13	12	12	12	11	10
<63µ	44	28	37	22	32	31	48	40	58
Munsell	10YR 5/6	10YR 5/6	10YR 5/6	10YR 5/6	10YR 5/6	10YR 6/4	10YR 6/4 + 10YR 4/3	10YR 4/3 + 10YR 6/4	10YR 6/3 + 10YR 6/2

Depth (cm)	94	99	104	109	114	119	124	129	134
>8mm	0	0	0	0	0	0	0	0	0
>500µ	1	1	1	1	1	1	2	2	1
>63µ	4	3	6	9	8	2	10	16	17
<63µ	60	61	63	55	59	67	56	44	52
Munsell	10YR 6/3 + 10YR 6/2	10YR 6/3	10YR 6/2 + 10YR 7/1	10YR 7/1	10YR 7/1	10YR 7/2	10YR 7/2	10YR 7/2	10YR 7/2

Depth (cm)	139	144	149	154	159	164	169	174	179
>8mm	2	1	0	0	3	1	0	0	0
>500µ	3	3	2	3	27	19	2	3	1
>63µ	16	18	15	14	14	8	6	8	6
<63µ	43	37	42	42	15	22	50	49	64
Munsell	10YR 7/2	10YR 7/2	10YR 7/2	10YR 7/2	10YR 7/2 + 10YR 6/4	10YR 6/4	10YR 3/1 + 10YR 7/2	10YR 7/1	10YR 7/2

Depth (cm)	184	189	194	199	204	209	214	219	224
>8mm	0	12	1	0	0	6	3	0	0
>500µ	3	19	17	8	10	9	9	12	13
>63µ	13	7	10	10	11	7	7	5	6
<63µ	63	7	31	39	38	34	34	40	42
Munsell	10YR 7/2	10YR 6/3	10YR 6/3 + 10YR 4/3	10YR 4/6	10YR 4/6	10YR 4/6	10YR 4/6	10YR 4/6	10YR 5/8

Depth (cm)	229	234	239	244	249	254	259	264	269
>8mm	11	3	6	0	7	0	6	3	2
>500µ	12	9	8	5	5	7	4	4	3
>63µ	2	4	5	5	4	5	3	3	3
<63µ	26	36	33	52	48	40	42	44	44
Munsell	10YR 5/3	10YR 5/8	10YR 4/6	10YR 5/8	10YR 4/4	10YR 4/6	10YR 4/6	10YR 3/4	10YR 3/4

Depth (cm)	274	279	284	289	294	299	304	309	314
>8mm	2	0	0	1	1	3	6	2	1
>500µ	2	3	2	10	19	11	3	5	5
>63µ	3	3	3	2	3	6	6	3	6
<63µ	36	40	53	1	12	34	43	42	50
Munsell	10YR 3/3	10YR 4/4	10YR 4/3	10YR 4/2	10YR 4/4	10YR 3/4	10YR 3/4	10YR 4/6	10YR 3/3

Table A4.8 *(cont.)*.

Depth (cm)	419	324	329	334	339	344	349	354	359
>8mm	5	0	6	3	7	0	0	9	0
>500μ	3	1	4	30	24	31	3	18	6
>63μ	4	2	5	9	6	5	4	8	6
<63μ	49	50	44	35	19	14	61	23	54
Munsell	10YR 3/3	10YR 4/6	10YR 3/3	10YR 8/3 + 10YR 8/4	10YR 8/4 + 10YR 6/6	10YR 5/8	10YR 5/8 + 10YR 8/3	10YR 8/2	10YR 8/3

Depth (cm)	364	369	374	379	384
>8mm	0	1	0	7	0
>500μ	7	1	8	1	2
>63μ	8	2	2	6	10
<63μ	31	34	47	37	47
Munsell	10YR 8/3	10YR 8/3	10YR 8/3	10YR 8/3	10YR 8/3 + 10YR 7/6

Temple landscapes

The ERC-funded *FRAGSUS Project* (*Fragility and sustainability in small island environments: adaptation, cultural change and collapse in prehistory, 2013–18*), led by Caroline Malone (Queens University Belfast) has explored issues of environmental fragility and Neolithic social resilience and sustainability during the Holocene period in the Maltese Islands. This, the first volume of three, presents the palaeo-environmental story of early Maltese landscapes.

The project employed a programme of high-resolution chronological and stratigraphic investigations of the valley systems on Malta and Gozo. Buried deposits extracted through coring and geoarchaeological study yielded rich and chronologically controlled data that allow an important new understanding of environmental change in the islands. The study combined AMS radiocarbon and OSL chronologies with detailed palynological, molluscan and geoarchaeological analyses. These enable environmental reconstruction of prehistoric landscapes and the changing resources exploited by the islanders between the seventh and second millennia BC. The interdisciplinary studies combined with excavated economic and environmental materials from archaeological sites allows Temple landscapes to examine the dramatic and damaging impacts made by the first farming communities on the islands' soil and resources. The project reveals the remarkable resilience of the soil-vegetational system of the island landscapes, as well as the adaptations made by Neolithic communities to harness their productivity, in the face of climatic change and inexorable soil erosion. Neolithic people evidently understood how to maintain soil fertility and cope with the inherently unstable changing landscapes of Malta. In contrast, second millennium BC Bronze Age societies failed to adapt effectively to the long-term aridifying trend so clearly highlighted in the soil and vegetation record. This failure led to severe and irreversible erosion and very different and short-lived socio-economic systems across the Maltese islands.

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