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Vol. 25, 2012

to the memory of David Ridgway
11 May, 1938–20 May, 2012

ABBREVIATIONS

The reference system adopted by *Meditarch* is modelled on that of the German Archaeological Institute, and the bibliographical abbreviations are those listed in *Archäologischer Anzeiger* 1997, 612–24, with the addition of the following:

ABNGV	Annual Bulletin of the National Gallery of Victoria, Melbourne
ABVic	Art Bulletin of Victoria, Melbourne
AION ArchStAnt	Annali dell'Istituto Universitario Orientale de Napoli, Archeologia e storia antica
ANES	Ancient Near Eastern Studies
Atti I CMGr	Atti del primo Convegno di studi sulla Magna Grecia
AWE	Ancient West and East
Beazley, ABV	J. D. Beazley, Attic Black-figure Vase-painters (1956)
Beazley, Addenda	Beazley Addenda. Additional References to ABV, ARV (2nd ed.) & Paralipomena, compiled by L. Burn & R. Glynn (1982)
Beazley, Addenda^2	Beazley Addenda. Additional References to ABV, ARV (2nd ed.) & Paralipomena, ed. by T. H. Carpenter (1989)
Beazley, ARV	J. D. Beazley, Attic Red-figure Vase-painters (2nd ed., 1963)
Beazley, EVP	J. D. Beazley, Etruscan Vase Painting (1947)
Beazley, Paralipomena	J. D. Beazley, Paralipomena. Additions to Attic Black-figure Vase-painters and to Attic Red-figure Vase-painters (1971)
BTCGI	G. Nenci–G. Vallet (eds.), Bibliografia topografica della colonizzazione Greca in Italia, Iff. (1977ff.)
CBJ	Cahiers du Centre Jean Bérard
DACL	Dictionnaire d'archéologie chrétienne et de liturgie
DOP	Dumbarton Oaks Papers
OEANE	E. M. Meyers (ed.), The Oxford Encyclopedia of Archaeology in the Near East (1997)
ProcBritAc	Proceedings of the British Academy
QBNGV	Quarterly Bulletin of the National Gallery of Victoria, Melbourne
RGVV	Religionsgeschichtliche Versuche und Vorarbeiten
SHAJ	Studies in the History and Archaeology of Jordan (Department of Antiquities, Amman)

Abbreviations of ancient authors and works, and transliterations of Greek names conform to those listed in *The Oxford Classical Dictionary*.

Zagora in Context

Settlements and Intercommunal Links in the Geometric Period (900–700 BC)

Proceedings of the conference held by
The Australian Archaeological Institute at Athens
and
The Archaeological Society at Athens

Athens, 20–22 May, 2012

Edited by Jean-Paul Descœudres and Stavros A. Paspalas

CONTENTS

PROLOGUE

The excavations by an Australian team at the site of Zagora on the island of Andros under the sponsorship of the Archaeological Society at Athens and the University of Sydney were carried out between the years 1967 and 1977 in alternating digging and study seasons. The expedition was financed to some extent by the Archaeological Society, but mainly by the Australian Research Grants Committee, the University of Sydney, and funds generously provided by the Association for Classical Archaeology founded in Sydney in 1967 under the chairmanship of the late Sir Arthur T. George.

My attention had been drawn to the site in 1965 by the late Professor Nicolas Kontoleon following a first digging campaign that had been carried out in 1960 by the then Ephor of Antiquities of the Cyclades, the late Nicolas Zapheiropoulos. He generously yielded the rights of further research on the Geometric town to me. Archaeological fieldwork is by definition collaborative, and the excavations at Zagora owe a lot to the participation of two very distinguished scholars, Dr J. J. Coulton and Professor J. R. Green. It also owes a lot to Dr Ann Birchall who proved to be an outstanding excavator.

The work carried out at Zagora owes a debt of gratitude for the assistance of the following former Vice Chancellors of the University of Sydney, Sir Stephen Roberts, Sir Bruce Williams, Professor John Ward, and Professor Don McNicol. At the Greek end it owes a lot to the late Inspectors General of Antiquities Professors Spyridon Marinatos and Nicolas Yalouris, and to Professor Nicolas Kontoleon.

One of the sad facts related to archaeological fieldwork is that more often than not the objects unearthed are not properly displayed in museums, but put away in storerooms. In this respect the finds from the excavations at Zagora in the late sixties and early seventies received better treatment thanks to the generosity of the late Basil and Elise Goulandris, who had built and donated to the island the Archaeological Museum in Chora.

The excavations at the site proved to be very important, and the great specialist of Greece during the Geometric Period, the late Professor J. N. Coldstream, who visited the site more than once during the excavation seasons commented on Zagora as follows:

> At Zagora, on the south-west coast of Andros, a stone-built Geometric town of 6.4 hectares has been partly explored. Since occupation is virtually limited to the eighth century, the architecture is extremely well preserved, and no other place in the Greek world offers a clearer picture of domestic life during this period (*Geometric Greece, 900-700 B.C.* [2003] 210).

Yet, although this first Australian expedition to Zagora had yielded important results, only part of the Geometric town had been explored. Thirty years later it occurred to me that a resumption of its exploration using up-to-date technology was highly desirable.

The conference ‘Zagora in Context. Settlements and Intercommunal Links in the Geometric Period (900–700 BC)’ was organized with the revival of research at the site in mind. The papers read at the conference aimed at summarizing the knowledge acquired about the Geometric period in the Aegean and beyond as a guide to the renewed exploration of the site.

The Institute is deeply grateful to its Deputy Director, Dr Stavros Paspalas, for the impeccable organization of the conference. It is hoped that its proceedings will be a valuable resource to all those interested in the Mediterranean Early Iron Age, particularly the Aegean, and in early Greek history and archaeology in general.

Alexander Cambitoglou
Director of the Australian Archaeological Institute at Athens
Athens, March 2015

EDITORS' NOTE

The Proceedings are dedicated to the memory of David Ridgway. No one who attended the conference will ever forget the moment when Alexander Cambitoglou opened the first working session on Monday morning with the announcement that David had left us the night before, on his way to his hotel after a joyous gathering with a number of friends and colleagues.

Following the keynote lecture on 'Setting Zagora in Context' by Catherine Morgan on Sunday evening, the two-day conference was subdivided into seven sessions (see Appendix) and closed with Susan Langdon's paper on 'Social Life in the Early Iron Age Cyclades'. Starting the discussion with an assessment of the impact the work carried out at Zagora has had on our vision of the Geometric period before examining, in ever wider circles, other settlements of the Geometric period and their interrelationship within the Aegean and beyond, clearly revealed the importance of the planned resumption of its exploration. It is thus in keeping with the conference's original concept that we agreed to replace the papers in which Lesley Beaumont, Matthew McCallum, and Margaret Miller had outlined the aim of future investigations at Zagora with the report on the first campaign, carried out in September 2012 by a team from the University of Sydney under the direction of Professor Miller and her colleagues.

Two other papers which had not been part of the conference programme have been included in this volume. Both Vicky Vlachou's presentation of the figured pottery from Oropos and Zagora and Barbara Leone's discussion of the links between Euboea and the northern Aegean fit in so neatly that our decision to take them on board surely needs no explanation.

Our thanks go to all contributors and especially to those who submitted their manuscripts on time. We are also grateful to Derek Harrison, Kristen Mann, and Valeria Pratolongo for their assistance in the proof-reading process and, as always, to Camilla Norman for the final production of the volume.

Appendix: the Conference Sessions

1. The Cyclades

Christina A. Televantou, 'Ὑψηλή Άνδρου. Η Γεωμετρική Φάση'
Karl Reber and Photini Zapheiropoulou, 'Plithos on Naxos. An Early Iron Age Cemetery'
Demetrius Schilardi, 'Zagora and Koukounaries of Paros: Two Parallel Cases'

2. Euboea and Oropos

Irene S. Lemos, 'The Missing Dead: Late Geometric Burials at Xeropolis, Lefkandi'
Samuel Verdan, 'What is New in Old Eretria? A (Re)assessment of the Geometric Period and Prospects'
Alexander Mazarakis Ainian, 'The Domestic Space of Zagora in the Light of the Excavations at Oropos'
Jan Paul Crielaard, 'The Iron Age Sanctuary and Settlement at Karystos-Plakari'

3. Crete and Cyprus

Nota Kourou, 'Across the Sea. Cypriots and Levantines en route for the Euboian Gulf'
Donald C. Haggis, 'The Structuring of Urban Space in Archaic Crete: an Example of Settlement Development from the Early Iron Age to Archaic Periods'

4. The northern Aegean

Antonis Kotsonas, 'Zagora in the Cyclades and Methone in Macedonia. Rethinking trade and colonization within the Aegean of the 8th century BC'
Jacques Y. Perreault and Zisi Bonias, 'After Zagora: Andrian Colonization in the Northern Aegean: the Case of Argilos'
Michalis Tiverios, 'Η Άνδρος και οι αποικίες της'

5. Ionia and the central Mediterranean

Michael Kerschner, 'Settlements in Ionia During the 8th and Early 7th Century BC: Expansion into the Landscape'
Jean-Paul Descœudres, 'Orikos—A Euboian Colony in the Adriatic?'
David Ridgway and Francesca Mermati, 'New Thoughts on Pithekoussai and the Aegean'
Maria Costanza Lentini, 'Recent Investigation of the Early Settlement Levels at Sicilian Naxos'

6. Architecture

Matthew McCallum, 'Zagora and its Heurist Database: the Architectural Perspective'
Alexandros P. Gounaris, 'Ζαγορά Άνδρου: Ο θερισμός (Η συμβολή της στην έρευνα και τη μελέτη του δομημένου χώρου της Γεωμετρικής Περιόδου)'
Margaret Miller and Lesley Beaumont, 'Zagora: the Perils and Potential of Archaeological Positivism'

7. Pottery

Stavros A. Paspalas, 'How Coarse Can Fine Wares Be? Some local (?) pottery from Zagora'
Beatrice McLoughlin, 'Kitchen Equipment at Zagora. A comparative analysis of the domestic ceramic assemblages from four unpublished houses'
Jean-Sébastien Gros, 'The Pithoi from the Early Iron Age Settlement at Oropos'
Ian K. Whitbread and Antonia Livieratou, 'Early Iron Age Coarse-ware Pottery in Context. New finds from the settlement of Xeropolis at Lefkandi'

NEW INVESTIGATIONS AT ZAGORA (ANDROS): THE ZAGORA ARCHAEOLOGICAL PROJECT 2012

Lesley A. Beaumont, Margaret C. Miller, and Stavros A. Paspalas,
with contributions by Y. Bassiakos, G. Cantoro , S. Déderix, B. McLoughlin,
N. Papadopoulos, A. Sarris, and A. Wilson

INTRODUCTION[1]

A new phase in the archaeological investigation of the Early Iron Age settlement at Zagora on Andros commenced in October 2012, following a hiatus of some thirty-eight years since the cessation of earlier fieldwork at the site under the direction of A. Cambitoglou.[2] This new work was catalysed by the realization that even in the context of the growing corpus of evidence unearthed at other Early Iron Age sites in the intervening years, Zagora remains the most extensive and best preserved Aegean Early Iron Age settlement known, with some 90% of the site still unexplored. Owing to Zagora's unparalleled potential for broad lateral exposure of a settlement whose finds secure a date of the 9th to 8th centuries BC, renewed fieldwork on the site promises to provide important evidence on the Geometric urban context and so to contribute to the discussion of developments in socio-political and economic complexity in this formative period.

The new fieldwork programme comprises a major collaborative undertaking between the Australian Archaeological Institute at Athens (AAIA), the Department of Archaeology at the University of Sydney, the Archaeological Society at Athens, and the Powerhouse Museum Sydney. It is funded by the Australian Research Council for the three-year period 2012–2014.[3] We are grateful to the Hellenic Ministry of Culture and Sport for granting us permission to work at Zagora and to the KA' Ephorate of Prehistoric and Classical Antiquities of the Greek Archaeological Service for its willingness to oversee and facilitate our field and museum research on Andros.

The earliest systematic archaeological investigation of Zagora was carried out by N. Zapheiropoulos in 1960 (**fig. 1**).[4] He located and initiated excavation of a temple at the centre of the site, which proved to have been constructed in the second quarter of the 6th century BC, following the abandonment *c.*700 BC of the Geometric-period settlement. He also excavated a number of domestic units north-west of the temple and a further two units built against the inner face of the settlement's fortification wall.[5]

[1] Note the following abbreviations in addition to the usual ones:

Guide A. Cambitoglou, Archaeological Museum of Andros. Guide to the Finds from the Excavations of the Geometric Town at Zagora (1981).

Zagora 1 A. Cambitoglou *et al.*, Zagora 1. Excavation of a Geometric Town on the Island of Andros. Excavation Season 1967; Study Season 1968–1969. Australian Academy of the Humanities, Monogr. 2 (1971)

Zagora 2 id. *et al.*, Zagora 2. Excavation of a Geometric Town on the Island of Andros. Excavation Season 1969; Study Season 1969–1970 (1988)

Zagora 3 S. A. Paspalas (ed.), Zagora 3. Excavation of a Geometric Town on the Island of Andros. Excavation Seasons 1971, 1974 (forthcoming).

[2] Excavations at Zagora directed by Alexander Cambitoglou, working under the auspices of the Archaeological Society at Athens, were conducted in 1967, 1969, 1971, and 1974. See Zagora 1–3 and Guide. Finds are housed in the Archaeological Museum of Andros, in Chora.

[3] ARC Discovery Project 120102257. We are also grateful for the sponsorship of Virgin Australia Airlines.

[4] N. Zapheiropoulos, 'Ἄνδρος', ADelt 16, 1960, Chr 248–9.

[5] The term 'domestic unit' is employed throughout this paper to signify a built space for domestic occupation. The term

Between 1967 and 1974 Cambitoglou extended these excavations to uncover further domestic units to the north-west and the south-east of the temple (see **fig. 2** on p. 8). He also excavated parts of the fortification wall, including the gate at its southern end, and investigated a number of rooms built against the west face of the wall. The partial excavation of the site traced its earliest human occupation back to the last quarter of the 10th century BC, and demonstrated that its population and prosperity increased as the years passed until reaching its zenith in the second half of the 8th century, followed *c.*700 BC by the settlement's abandonment due to factors as yet unknown.

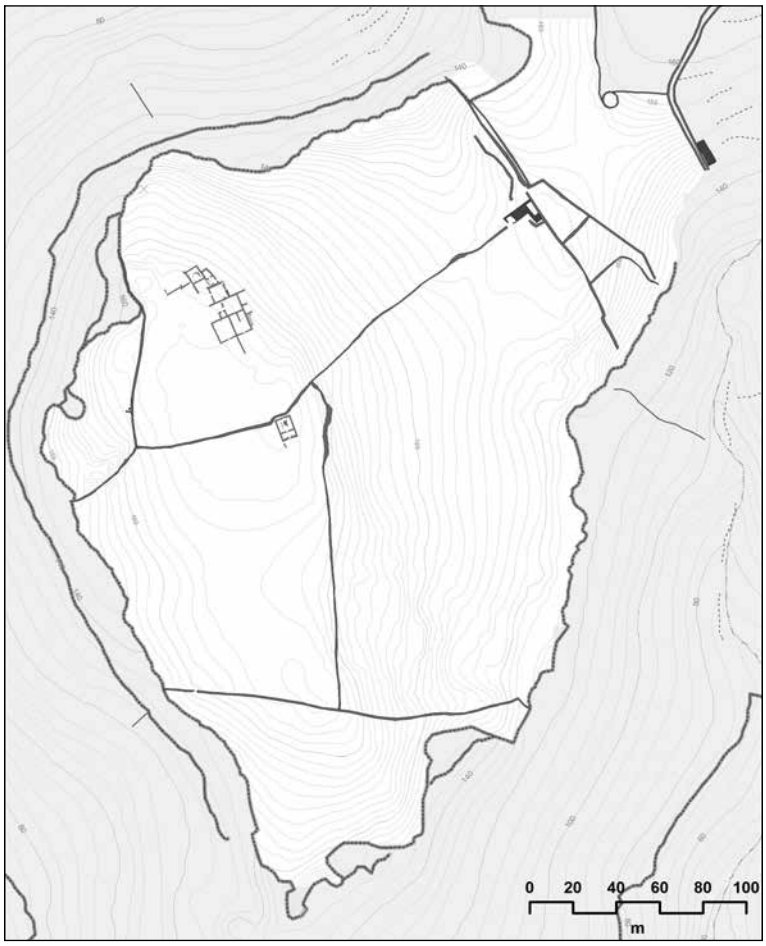


Figure 1. Excavations by N. Zapheiropoulos, 1960.

In resuming fieldwork at the site, the Zagora Archaeological Project seeks to investigate the Early Iron Age settlement from the perspective of sustainability and societal change. Its central aims may be outlined as follows:

1. To understand the character of nucleated settlement in the Early Iron Age by determining as far as possible the whole site plan via the use of a range of non-invasive and invasive evaluative techniques.
2. To explore growth in Early Iron Age economic complexity through evaluation of the range of economic strategies that sustained Zagora during its heyday: industrial, mercantile, domestic, and agricultural.
3. To attempt to explain the abandonment of Zagora *c.*700 BC through consideration of potential stress factors caused by environmental change, natural disaster, or human-induced settlement volatility, or some interplay of these.

An additional goal pertains to method, to the development of the application of digital technologies in archaeology for the recording and manipulation of all field data. By implementing a customized instance of the Heurist database, devised by the Arts e-Research unit of the University of Sydney, and by combining this with GIS applications, we aim to

'house' is avoided since its use requires the delineation of boundaries between separate households and, indeed, the definition of what constituted a household. While these are important debates, they lie beyond the scope of the present paper.

equip ourselves with a powerful tool able to facilitate sophisticated spatial and quantitative analysis of all architectural, artefactual, and environmental data collected.

THE 2012 FIELD SEASON: AN OVERVIEW

The goals of the first field season, conducted over a six-week period from mid-October to late November 2012, were to clarify understanding of the overall urban layout, to contextualize the settlement within its topographical and geomorphological landscape, and to begin investigation of particular loci of potential economic and social significance. To this end, work comprised six major components: geophysical testing of sub-surface remains, geological evaluation of the Zagora promontory, commencement of a new topographical plan of the site, site cleaning and documentation, archaeological surface survey, and excavation of trial trenches. Two other planned components of work, namely aerial photography of the site and satellite imaging analysis of the Zagora hinterland, had to be postponed to a future field season as a result, respectively, of the unavailability of the necessary expert personnel and technical issues.[6]

In keeping with a primary aim of the season, to refine and expand the scope of the base topographical plan of the Zagora archaeological zone, surveying with Total Station was conducted in the flat 'saddle' outside the settlement wall (the area of GP zone 1), W of the west fieldwall, including the doline at H0040 (north); and S of the south fieldwall. The modern features (notably the fieldwalls, a threshing floor, farmhouse, shepherd's hut, site headquarters, and eight spoil heaps of the 1960s and 1970s) that visually dominate were planned. Resection points established at prominent landmarks enable Total Station set-up and use by future excavators across the site despite the complex terrain.

The preliminary report that follows is structured into six sections in order to set out the approaches and outcomes of the 2012 field season.

L. A. Beaumont

THE GEOPHYSICAL CAMPAIGN[7]

Introduction

The geophysical prospection survey was conducted in the period of 16–26 October 2012. The goal was to assist in revealing the settlement plan and so provide guidance for targeted excavation.

[6] Work was directed by Margaret Miller and Lesley Beaumont of the University of Sydney, and Stavros Paspalas of the Australian Archaeological Institute at Athens. Geophysical testing was carried out by a team from the Institute of Mediterranean Studies under the direction of Apostolos Sarris. Yannis Bassiakos of the National Centre for Scientific Research 'Demokritos' conducted geological reconnaissance of the Zagora headland and Ioannis Liritzis of the University of the Aegean took samples for surface luminescence testing. In addition, Richard Anderson undertook an intensive Total Station survey of the Zagora promontory. Site cleaning and documentation, archaeological surface survey, and trial trench excavation were ably and cheerfully executed by a team of volunteer archaeologists recruited largely from the University of Sydney, including Rudolph Alagich, Margaret Dains, Taryn Gooley, Kristen Mann, Jane McMahon, Hannah Morris, Stephanie Snedden, Archondia Thanos, Hugh Thomas, Ivana Vetta, and Steve Vasilakis—to all of whom the three co-directors extend their thanks. They are also grateful to Paul Donnelly and Irma Havlicek of the Powerhouse Museum for live documentation and feeds to the Project website (http://www.powerhousemuseum.com/zagora/about/), to Anne Hooton (archaeological illustrator), Beatrice McLoughlin (finds manager), Bob Miller (photographer), and Andrew Wilson (Arts e-Research, University of Sydney, Heurist database support).

[7] Conducted by A. Sarris, N. Papadopoulos, S. Déderix, and G. Cantoro of the Laboratory of Geophysical-Satellite Remote Sensing & Archaeo-environment at the Institute for Mediterranean Studies (I.M.S.)/Foundation of Research & Technology Hellas (F.O.R.T.H.), Rethymno, Greece, asaris@ret.forthnet.gr.

The investigations focused on various sections of the settlement, inside and outside the fortification wall (**pl. 1: 1**). The geophysical grids were laid out in areas that were accessible with the available instrumentation. To maximize the quality of the results, four methods were applied on the site: magnetic, electrical resistance, electrical conductivity (EM), and ground penetrating radar (GPR). All the techniques emphasized the detailed mapping of the investigated areas (50 cm sampling for magnetic measurements, 1 m for the soil resistance measurements, less than 0.25 x 1 m for the EM survey, and 2.5 cm along the GPR transects separated at 50 cm parallel profiles).

Instrumentation

The Bartington Grad601 - Fluxgate Gradiometer was used for the measurement of the vertical gradient of the local magnetic field, namely the difference of the vertical component of the magnetic field at two different heights from the surface. The instrument is able to read the vertical gradient with an accuracy of 0.1nT/m. The Noggin Plus-Smart Cart (Sensors&Software) GPR with antennas of 250 MHz was also employed. The effective penetration depth of the antennas can reach 3–4 m below the surface, but due to the conductivity of the soil, this was reduced to about 2–3 m. Soil resistance measurements were carried out with the Geoscan Resistivity meter RM15 with a Twin probe configuration of electrodes and a 1-m spacing between the moving electrodes. Finally, the GSSI Profiler EMP-400 electromagnetic induction (EM) meter (EMP-400) was used to measure the in-phase and quadrature components (in ppm) of the induced secondary field for 3 different frequencies (corresponding to different depths), corresponding to the magnetic susceptibility (in mili I.S. units) and the apparent conductivity (in mS/m) of soil correspondingly. In contrast to the rest of the surveys that were grid based (along parallel transects), the EMP-400 was employed using a GPS navigation through a TDS RECON-400 Personal Digital Assistant (PDA).

Discussion of Results

Outside the fortification wall, in area GP1 which lies N of an area of exposed bedrock, all techniques were applied (**pls. 1: 2; 2**). They exhibit a high degree of correlation especially in regions suggesting extensive geophysical features. Notably a long linear anomaly (on **pl. 2d** indicated as 1o) in the south extends for more than 40 m in an almost E/W direction. This anomaly, which is more evident in the deeper GPR horizontal slices (~100–150 cm below the surface), in the soil resistance data, and in the vertical magnetic gradient measurements, seems to run east from about mid-fortification wall towards the modern farmhouse**.** It may be correlated to a stone paved path that connects the ancient settlement with an access path like that which now exists to the NW of the farmhouse or it may be related to a terrace wall used to separate private fields. If we assume that the only entrance to the settlement was that excavated in 1969 at the southern end of the wall, the location of anomaly 1o is less likely to be related to an ancient road: any road from the gate would most likely head towards the NE, along the line of the road-retaining wall M excavated just outside the gate in 1969 and, angling further to the north, the later wall N some 20 m away from the gate.[8] A few stone piles probably originating from older structural remains or residues of the collapsed terrace wall appear further to the SW of the above feature. The other geophysical features that are suggested in the area GP1 are mainly concentrated in the vicinity of the fortifications to the NW and manifested as strong diffused reflectors.

The survey in area GP2, also outside the settlement wall but near the excavation house, suffered from increased levels of noise probably due to the past and recent activities related to

[8] Zagora 2 p. 237 (and p. 64 for discussion). For a detailed plan, see ibid. pl. 3.

the excavations of the site (**pl. 3**)**.** A couple of anomalies to the NW and SE of the excavation house exhibit high resistance values. A rectilinear outline (~4 x 4 m, anomaly 2d on **pl. 3d**) is observable to the SE.

Within the fortification wall, a few more rectangular features are probably correlated to ancient architectural remains in area GP3 (**pl. 3**). Their orientation parallels the line of the fortification wall or shares the alignment of the NE/SW walls of rooms E1 and E2 excavated by Zapheiropoulos in 1960.[9] The same pattern of linear features running in a direction at right angle to or parallel with the fortification walls is observed in area GP4 (**pl. 3**). Two long anomalies extending for more than 13 m with an alignment akin to that of the NE/SW walls of rooms F1 and F2 (excavated in 1969 by the fortification wall)[10] may perhaps give the line of a major road that leads to the centre of the settlement (anomalies 4e and 4f on **pl. 3d**). The feature has a width similar to the main roadway at the settlement gate defined by Wall M noted above.

Area GP5 was located adjacent to and partly over the group of rectilinear dwellings partially excavated over the period 1960–1974 to the NW of the temple, the D-H area (**pl. 4: 1a**). Although the magnetic signals were heavily affected by building construction debris, it was possible to provide a number of suggestions regarding the presence of buildings further to the west and in close proximity to the western section of the recent terrace wall completing the plan of the already excavated domestic units. As we move further to the SW section of GP5, magnetic signals become blurrier, probably due to the construction debris that contains large quantities of pottery fragments, as is suggested by the vicinity of the area to the units H26–H27.[11] Sections of walls or stone pile concentrations were pin-pointed by the GPR signals and the low conductivity values in close correlation to the excavated units H40, H41, and H42.[12]

A clear signature of rectangular architectural remains is suggested in area GP6 mainly from the magnetic measurements (**pl. 4: 1a**). Sections of more than 2 rectilinear spaces can be distinguished in the north of area GP6 (anomalies 6a and 6b). A few GPR reflectors have a good correlation to the particular linear segments of the suggested structures; their NNW/SSE orientation is similar to that of the residential area to the north of the temple. Towards the south of the site a similar clustering of structural remains seems to continue, on both sides of the southern fieldwall, as is suggested by a number of magnetic features in the areas GP7 and GP8. Despite the fuzzy signature of the magnetic signals in area GP8 (**pl. 4: 1b**), a few structural remains are probable. The orientation of the linear anomalies is similar to the features that have been recognized in GP7 and to that of the excavated buildings to the NE (the J sector excavated in 1969, 1971, and1974).

Final Remarks

A number of factors made the detection of the individual architectural units a challenging task: the high density of structural debris, the rubble fill, and the fact that the building material, mainly of schist and marble, is similar to the geological context. In such a context, the value of employing a manifold and complementary geophysical strategy to survey the area of Zagora has been clearly demonstrated.

The results of the geophysical survey concur with the initial observations of Cambitoglou and J. J. Coulton regarding the organization of the settlement (**pl. 5**).[13] Most of the structural units seem to follow a more or less similar orientation, making slight turns in accordance

[9] Ibid. 20.

[10] Ibid. 139–46.

[11] Zagora 1 p. 31.

[12] Zagora 2 pl. 8.

[13] Ibid. 158–61.

with the topography. The whole area of the plateau of the promontory was built over: the geophysical data provide evidence of architectural traces close to the fortification walls (even more than the excavated E1, E2, F1, F2, and F3 units), but also towards the western and southern edges of the plateau (areas GP5, GP7, and GP8). The geophysical data did not pin-point any clear system of roads other than the one suggested in area GP4; it seems that the road network consisted of small passageways among the various housing units that covered the whole area of the plateau.

Extreme low and high values of the magnetic field that could be correlated to 'hot spots' related to workshop areas have been identified in areas GP4 (anomaly 4c), GP5 (anomalies 5u and 5v just to the west of units H46 and H47), and GP8 (anomaly 8g in the vicinity of Q4080, which yielded a significant volume of iron slag on surface). Even though these values are too low to be representative of metallurgical furnaces, some may contain residues of metallurgical processes that are intimated by the geological survey of Yannis Bassiakos and the collection of smithing slags from the site in the past, for which see below.

The integrated results of the past excavations and the recent geophysical survey indicate that Zagora flourished during the Geometric period, attracting a large population that made most efficient use of the space of the settlement in the best possible way to support themselves.

A. Sarris, N. Papadopoulos, S. Déderix, G. Cantoro

GEOLOGICAL EVALUATION

Introduction: the geology of Andros

Andros is the most northerly of the Cycladic islands, situated approximately 10 km SE of Euboea, and about 3 km N of Tenos. It is nearly 40 km long, and its greatest breadth is 16 km. Its surface is for the most part mountainous, with many well watered valleys. The geological basement of the island is mainly constructed by the metamorphic rocks of the so-called Attic-Cycladic massif.[14] The complex consists of a stack of tectonic units which form two nappe piles.[15] The lower nappe formations exhibit multiple metamorphic events and consist of a series of thrust sheets containing pre-Alpine basement, white to grey-blue marble, metavolcanics, and metapelites. The upper nappe, predominating in the NW part of the island, contains various intercalated fragments of ophiolites, Permian dark and yellowish-coloured marbles (partly dolomitic) and high-temperature metamorphic rocks.

Among the dominating tectonic features in the rock formations is a penetrative schistosity associated with isoclinic folding, with axes trending NE/SW. Additionally, younger folds with E/W and NNW/SSE orientation are well documented throughout the island.[16] The tectonic structure shaping the relief of Andros is an extensional fault on the western side of the island

[14] G. Katsikatsos, Γεωλογία της Ελλάδας (1992); M. Brocker–L. Franz, 'Dating metamorphism and tectonic juxtaposition on Andros Island (Cyclades, Greece): results of a Rb-Sr study', Geological Magazine 143(5), 2006, 609–20; P. Mukhin, 'The metamorphosed olistostromes and turbidites of Andros Island, Greece, and their tectonic significance', Geological Magazine 133, 1996, 697–711; D. Rozos *et al.*, 'The impact of landslides on the landscape evolution on the Island of Andros', Scientific Annales, Aristotle University of Thessaloniki, Special Vol. 99, 2010, 491–501; R. Altherr *et al.*, 'Geochronology of high-pressure rocks on Sifnos (Cyclades, Greece)', Contributions to Mineralogy and Petrology 70, 1979, 245–55; M. Schliestedt–R. Altherr–A. Matthews, 'Evolution of the Cycladic crystalline complex: petrology, isotope geochemistry and geochronology', in: H. C. Helgeson (ed.), Chemical Transport in Metasomatic Processes (NATO Advanced Study Institutes Series. Series C) (1987) 389–428.

[15] D. Papanikolaou, 'Contribution to the geology of the Aegean Sea; the island of Andros', Annales Géologiques des Pays Helléniques 29(2), 1978, 477–553.

[16] Rozos *et al.* loc. cit.

that creates a half-graben with asymmetric footwall uplift. The back-tilted block has long, relatively gentle, basins in the eastern part of the island, while the fault scarp is responsible for the very short drainage and steep wall tectonic western coastline.

The objectives of geological reconnaissance at Zagora between 12 and 14 November 2012 were as follows:

• To conduct palaeo-hydrological field observations to assist in the identification of the settlement's water source and to address the question of whether around 700 BC any previously existing water supply may have dried up and was no longer able to support the inhabitants.

• To investigate the impact of the geomorphology on ancient access routes to the settlement from the sea.

• To examine *in situ* several 'cuttings' of the marble bedrock exhibiting geometric shapes (parallel lines, clusters of rhombuses, quadrangles, trapezoids, etc.) as well as many cylindrical or oval/subovate holes of various sizes in the surface of the marble, which constitutes the dominant rock on which the ancient settlement stood; and to determine whether these formations occur naturally or are man-made.

• To observe the currently exposed iron-ore outcrops in the vicinity and to provide an archaeometallurgical assessment of the possibility that such ores were mined for iron production during the main activity period of the settlement (900–700 BC).

Palaeo-hydrological field observations

Walking from the interior of the island to the Zagora peninsula (*c.*160 m asl), one traverses a geological contact separating the schists (NE) from the marbles (SW). The change occurs about 120 m before reaching the fortification wall of the ancient settlement, and renders marble the predominant surface rock on the plateau. In the exposed cliffs of the promontory, facing the sea to the SW, at least five horizontal alternations of marble and schist are revealed, terminating on the top with marble. This creates a scalable rocky profile (the upper part of which is seen in **pl. 6: 1**). It is worth noting that the top marble layer possesses a thickness of more than 15 meters and seems to be the most bulky of all five marble layers, whilst the inter-layering schist bands are rather thicker than the marble ones.

A noticeable feature of the Zagora marble is its property to become karstified, i.e. dissolved over time by atmospheric precipitation and groundwater, which usually have a weak acidic chemical character. Characteristic karstic forms observable in the Zagora area are cylindrical, oval, or conical holes of varying dimensions present in the marble ground surfaces, widening of linear joints (diaclaces), chasms, vertical collapse (dolines), and even caves of various sizes. Two adjacent oval-shaped dolines with vertical walls are present at the Zagora plateau; the larger of them, with a long elliptical axis of *c.*10 m, is seen in **pl. 6: 2** (H0040). It was not possible, unfortunately, to measure the depth of the doline's bottom because it contains natural debris and large rocks.

In terms of water permeability and hydrogeology, the two rock types that build the Zagora area (schist and marble) exhibit thoroughly different properties. Schist is considered to be impermeable and does not allow water to pass through it. By contrast, the natural segmentation of marble due to the extensive existence of joints (particularly if widened as mentioned above), other karst gaps/voids, and even discontinuities caused by the numerous faults, result in water permeability within the marble. Such hydrological behaviour is likely to be exaggerated in the thick upper marble layer of the Zagora peninsula that is exposed to the atmosphere, hence subjecting it to more intense karstification and the presence of dolines. Therefore, the doline illustrated in **pl. 6: 2**, perhaps possessing a depth of 15 m where it would meet impermeable schist, might have once acted as a natural water cistern, receiving not only rainwater but also phreatic/epiphreatic groundwater, the latter percolating through the joints and the karstic gaps of the marble.

This, and potentially other natural cisterns, may have provided the settlement with its water supply, which in turn may explain the initial choice of location for the settlement. Abandonment of the settlement *c.*700 BC may then have occurred if this water source dried up as a result of earthquake, activation of any of the many pre-existing faults causing a break in the formerly watertight doline, or other natural action such as leaking and water loss through the widening of any subsurface karst drain.

Geomorphology and ancient access routes

The geological landscape of the Zagora headland exhibits features of high dynamism. Extensive scree along the south-west face attests to a comparatively recent event. Approach from the sea now is hindered by the fact that the shoreline is punctuated by boulders fallen from above. The ready tendency of the marble cap to split, owing to karstification, results in a constant modification of the geomorphology. Such changes in the landscape affected also the ancient shoreline, and hence, today make it impossible to recover ancient access routes to the settlement from the sea.[17]

Examination of 'cuttings' in the marble bedrock

In the existing published geological studies of Andros, the immeasurable number of joint networks is stressed as a major indicator (along with folding and faults) of the intensive tectonism of the island.[18] Various categories of joints (in large groups and/or networks, including feather joints) have been reported and studied, particularly by D. J. Papanikolaou. A number of intriguing cuttings in the marble bedrock are present on the Zagora peninsula. They have geometric shapes and consist of parallel lines, clusters of rhombuses, quadrangles, trapezoids etc. In most cases I recognized various shapes of natural joints with the additional note that some of these joints have been widened due to the karsting action of the ground- and rainwater, as mentioned above. The same action (karstification) is also responsible for the creation of numerous cylindrical or oval/subovate holes of various sizes and with vertical orientation, opened in the surface of the marble.

One of the joint systems that have affected the top marble band of the Zagora peninsula favours natural rectangular cuttings in the rock, in some cases creating substantial attached rock cubes, which might easily be quarried to supply the building needs of the settlement. This might, for example, be the case near the south-eastern edge of the settlement where the plateau slopes to the nearby ravine. Here some rectangular areas of rock are 'missing' from the marble surface, geomorphologically leaving a large pit with vertical walls (Q2080).

There are, however, a few cuttings that seem to be artificial. For example, a rectangular cutting lies on an outcrop of bedrock outside the settlement wall, *c.*50 m NNW of the gate; its function is obscure and its production date unknowable (**pl. 4: 2**). Just inside the gate, some 20 m ENE, a series of lines accompanied by hollows may be identified as a kind of game board; the first row of hollows is clearly visible, but a second row is possibly also discernible (**pl. 4: 3**). It, too, cannot be dated, but is perhaps paralleled by a stray find of the 1960s/1970s, a piece of schist with rows of hollows incised (**pl. 4: 4**).

Iron-ore outcrops and ironworking

The mineral wealth of Andros is considered important, mostly associated with the Miocene intrusion of acid igneous rocks exposed between Gavrion and Makrotantalon, in the NW part of the island. About ten occurrences with iron-manganese or iron ores are marked in the

[17] Ibid.

[18] G. Marinos, 'Γενική Γεωλογική και Κοιτασματολογική μελέτη της νήσου Άνδρου', ΙΓΕΥ, Γεωλ. Γεωφ. Μελέται III, 1954, 201–26; Papanikolaou loc. cit.

metallogenic map of Greece, most of them situated south of Ayios Petros village and west of Cape Gria.[19] Some of these occurrences were mined for iron-manganese ores before the Second World War, but in modern days the mines are idle. Nonetheless, low-grade iron ore occurrences are apparent in several other areas of the island, for example in the west-facing slopes of the Zagora settlement.

There are four such iron ore outcrops (for locations, see **pl. 7: 4**): the smaller outcrop (no. 1) is located a few metres to north of, and below, the settlement, facing the Apothekes Bay (in the form of limonite/hematite encrustation on the bedrock), while the three larger outcrops (nos. 2–4) occur at a height of *c.*35–40 m in the precipitous SW face of the peninsula, facing the sea. The outcrop illustrated in **pl. 7: 1** (no. 3) is a ferruginous encrustation on the marble, thicker at its lower edge (*c.*1 m) and with a height of *c.*2 m: its main mineralogical component is limonite, with some hematite also present. The outcrop in **pl. 7: 2** (no. 2) is smaller, comprising a mostly hematite filling of thin vertical joints, with a dense iron ore capping at the top of the marble megalith. The outcrop in **pl. 7: 3** (no. 4) is the largest of all three and comprises a ferruginous funnel-form vertical filling, about 8 m long, of a gaping fault (or tectonically generated chasm). The filling material is an admixture of limonite with thumb-sized angular fragments of ankerite, the latter being a Fe- and Ca-carbonate, mostly corresponding to the formula $(Ca, Fe)(CO_3)_2$, but may contain more metallic elements, like Mn and Mg.

The SW iron-ore outcrops are situated above scree slopes and so are exposed by the subsidence that created the scree. Accordingly, they would not have been visible in antiquity as they are now, but comparable iron-ore seams would almost certainly have been available at Zagora in antiquity. However, macroscopic observation suggests that the outcrops are too low grade in iron content to have been exploitable in antiquity. According to archaeometallurgical studies for iron production of the historical period, based on indigenous sources (Laconia, Arcadia, Argolis, Thasos, east Crete, etc.), the iron ores utilized normally contained iron at levels above 60%. The iron content of the Zagora ores very likely lies below that level. One could suppose that through beneficiation, such low-grade ferruginous bodies might provide the required iron content, usable for iron-ore smelting and production of the desirable metal. However, no beneficiation debris or even remains of the metallurgical furnaces needed for the smelting processes have so far been discovered at Zagora. I therefore provisionally conclude that such iron-ore outcrops were not sources of iron during the heyday of the Zagora settlement.

What is certainly attested by the metal slag found at Zagora is *in situ* iron production through the smithing process. Some of the slags, excavated in the 1960s and 1970s and now stored in the Andros Archaeological Museum, are dark grey to black and are characteristically heavy as is the case for most metallurgical slags. The intact pieces mostly have an oval periphery, *c.*12–14 cm long and *c.*4 cm thick. They exhibit a plano-convex or concave-convex shape which is characteristic of the smithing process. Other rather smaller slags show features of vitrification but their weight is not indicative of any serious content of metallic substances. However, beyond these preliminary macroscopic observations, analytical studies, including portable XRF surface examination first and then systematic laboratory investigations (including polished/thin sections preparation, optical microscopy, XRD, SEM/EDX analyses/microanalyses, trace elements determination, metallography and so forth) are now needed in order to retrieve the maximum amount of information from these finds before any conclusions can be drawn.[20] Such analytical results will also clarify whether these slags derived from ores mined in the vicinity of Zagora or came from further afield.

[19] According to Marinos loc. cit., the ores contains more metallic elements and sulphides.

[20] Such a study is now being undertaken by I. Vetta and Y. Bassiakos.

Geological study – Concluding Observations

The immeasurable groups and networks of joints noted everywhere on Andros, directly related with its intense metamorphic and tectonic character, along with the karstifying action (the latter affecting only the marbles), often exhibit an arresting symmetry and intriguing geometric shapes, that can be mistaken for man-made constructions. Yet, some artificial cuttings in the marble can be observed at Zagora. Moreover, some of the joint systems create tri-orthogonal adjustments in space, hence favouring marble natural cutting in rectangular bodies, in certain cases voluminous cubes, which might easily be quarried for use in settlement buildings.

The particular sandwich-type alternating zones of marble and schist apparent at the Zagora peninsula, in correlation with the karstification of the top marble layer comprise conditions allowing the creation of natural waterproof cisterns (dolines), capable of collecting and retaining water. In this dynamic landscape, however, any natural accidental event might be responsible for a consequent drying up of a once water-containing doline.

Low-grade ferruginous bodies are apparent around the Zagora settlement. Whether they constituted ore sources for iron production in the Geometric period remains uncertain. Richer iron-ore outcrops on the island (e.g., at Ayios Petros), might have provided the appropriate iron ore for smelting and production of the spongy-iron (bloom): such activities, as is the case for other iron-producing sites in Greece during antiquity, probably took place close to the mine sites. That the second, equally significant, stage of iron tools/weapons production through smithing certainly took place at Zagora is supported by the occurrence of smithing slags in the settlement.

Y. Bassiakos

HEURIST DIGITAL RECORDING AND DATA MANAGEMENT

In line with the project's commitment to the application of digital technologies to archaeology, the Zagora Archaeological Project implemented an integrated approach to digital field data collection that supported a smooth flow from form creation to database ingestion using Android tablets, the Open Data Kit Collect xForms application and the Heurist eResearch Data Modelling and Management System.[21] Such recording and analytical tools are seen as providing enhanced efficiency and accuracy of field recording and processing. These are important considerations in view of the limitation of field seasons to 6 weeks, as it enables fieldworkers to maximize the work they can conduct in the field without compromising accuracy and thoroughness.

The AAIA has been using Heurist for more than three years to marshal and analyse the digitized records from the 1960s and 1970s investigations.[22] This process has resulted in the development of a sophisticated and flexible data model focused on building relationships

[21] Other members of the Heurist 3 development team are I. Johnson, S. White, S. Hayes, A. Ozmakov, and M. King from Arts e-Research, Faculty of Arts, The University of Sydney. A. Traviglia, Director of the *Beyond the city walls: the landscapes of Aquileia* project, and her team showed great forbearance as the field systems were trialled during their 2012 season. The *BCW* project is funded by the Australian Research Council. S. Ross, A. Sobotkova, P. Crook, B. Ballsun-Stanton, and the participants in the Federated Archaeological Information Management System (FAIMS) Stocktaking Workshop in August 2012 contributed generously to the field-data modelling process. FAIMS is funded by the Australian Government National eResearch Collaboration Tools and Resources (NeCTAR) programme.

[22] The programme of digitizing records was undertaken in conjunction with the preparation for publication of Zagora 3 by S. A. Paspalas, M. McCallum, K. Mann, and especially B. McLoughlin. The Zagora 3 publication project has been the recipient of funding from the Shelby White and Leon Levy Publications Program, Harvard University.

between the various forms of legacy data including text, photographs, and plans to facilitate analysis, interpretation, and publication in both traditional and digital forms.

One of the aims of the digital field-recording process in 2012 was to capture new field data for ingestion into this database so that it would conform to the complex and highly linked data model. In this way the new information can be seamlessly and immediately integrated with the legacy data in keeping with the directorial aim to engage in a programme of fieldwork complementary with rather than independent from that of the past. Another important aim was to ensure that as much as possible the data was collected in digital form to minimize the time between the collection of the data and its availability for review and analysis.

The collection of digital field data has become increasingly widespread and sophisticated over the last decade and several pioneering projects have made significant contributions to the development and implementation of data capture systems often concentrating on one type of data or one technology.[23] In creating the Heurist system, our approach was to develop a light, inexpensive, and flexible means of using readily available robust digital devices to collect any kind of field data and generate an XML output suitable for the database management system already being used.

At Zagora, field data collection was carried out using up to 12 Android tablets running a variety of recording forms based on the xForms application.[24] After initial development of the linked data models in the Heurist database, the required structures were exported as form definitions to the tablets and used to collect the field data. Completed forms were ingested into the Heurist database as fully linked data, with relationships to existing records automatically created and photographs and sketches uploaded to a file store and connected to their parent records by a uniform resource identifier (URI).

The 2012 season generated more than 2000 completed instances of the recording forms with a similar number of linked photographs and sketches. In addition to the reconnaissance, survey and excavation recording, forms were developed to record the taking of samples, site interventions and a variety of other aspects of the fieldwork.

The use of Open Data Kit forms on the tablets enabled the packaged collection of different types of data using any suitable available widgets. The forms could be quickly customized to match different or evolving workflows and still be imported as standard linked data thereby decoupling the workflow from the data model. A significant advantage of this approach is the automation of the mundane aspects of data collection and management thereby allowing effort to focus on observation and interpretation.

Reliance on digital data raises fundamental issues in capture, processing, ingestion, and data modelling. After initial training and some familiarization, the tablets proved to be quick, reliable, and easy to use. There remained some difficulties, especially with screen visibility in brilliant sunshine, but on an often windswept and uncomfortable site the palm-sized tablets had clear advantages over traditional paper recording forms. No digital records were lost or blown away.

[23] Note the important pioneering work at Silchester by the University of Reading and DigIt developed by D. Powlesland, which both used PDAs. Two significant GIS-focused systems are the Integrated Archaeological Database system (IADB) from the York Archaeological Trust and the Intra-Site Information System (IntraSiS) developed by the Archaeological Excavations Department of the Swedish National Heritage Board. There are of course many projects that have made use of mapping grade GPS receivers with asset management software or mobile GIS software such as ESRI ArcPad which provide a robust but expensive solution to field-data capture.

[24] S. White–A. Wilson, 'Androids on Andros: Digital field data collection for the Zagora Archaeological Project using ODK and Heurist', paper to the 41st Computer Applications and Quantitative Methods in Archaeology Conference: Across Space and Time, March 2013, Perth (Australia).

Digital systems also bring to the fore issues of calibration and graceful degradation that are often overlooked in traditional practice. The validity of digital data is reliant on calibration of devices and sensors, so checking and monitoring must be part of any system. Ideally data collection should never be stopped by equipment failure and staged alternatives should be planned for so that any cost is in speed of capture rather than loss of data.

A. Wilson

SITE CLEANING, RECONNAISSANCE, AND DOCUMENTATION

Overview

Intensive site reconnaissance was planned to assess and document the current state of the whole site within the fortification walls, which had been used for pasturage and limited (grain) cropping in the modern period prior to purchase for excavation; and to develop our understanding of the settlement beyond the areas previously excavated, by carefully recording all visible signs of ancient activity in order to clarify aspects of site layout, occupation density, and variation in spatial use before undertaking new excavation. Of the 78,000 m^2 contained within the fortification wall, close investigation could be conducted across a total of approximately 23,000 m^2. The remaining 55,000 m^2 were obscured by dense vegetation, often growing on top of the numerous stone piles that likely represent collapsed ancient structures.

Process

Site cleaning and reconnaissance was systematically conducted across the site in small groups over a period of two weeks in late October and early November, utilizing the grid established in 1967 (see **fig. 1** on p. 2). Topographical planning in 2012 confirmed the accuracy of the site grid and allowed the three surveyors' base points to be recovered.[25] The site grid is oriented to true north and is organized in 100 m^2 squares, identified by letters of the alphabet (A to Q, omitting I and O) and ordered NW to SE, set to include areas just off the headland. Within the 100 m^2 grid, 20 m^2 units are measured by number, counting from the SW corner of each sector. The first digit pair of each grid reference increases to the east while the second digit pair increases to the north.[26]

Observations were recorded on Android tablets, each pre-populated with forms for documenting such elements as the terrain, vegetation, surface finds, and the presence of 'Points of Interest' (see Wilson above for incorporation into Heurist database). A 'Point of Interest' (POI) was defined as any anomaly that potentially provides cultural information, such as diagonally set rows of schist stone indicative of wall collapse, or a suggestive concentration of cultural material, notably slag, pieces of obsidian, and ceramics. Documentary photographs were taken of terrain and POIs, to be compared with photographs taken in the past.

Observations

Clearly visible also in aerial photography, there is a marked difference in the vegetation and soil cover across the site between the northern three-quarters, where prickly oak dominates, and areas where the dominant vegetation is phrygana (west of the NW fieldwall and south

[25] The permanent marks are located at (1) E0000 (Greek grid 576045E / 4180816N, Elevation 162.11 m. asl) and (2) 120 m. to the east, at F2000; and (3) 120 m to the south, at M0080. These provided the base points from which Richard Anderson, aided by Rudolph Alagich, surveyed the 20 m^2 alphanumeric grids utilized in reconnaissance.

[26] The system is outlined in Zagora 1 p. 37; the initial survey and grid creation was the work of N. Konbocholis (Plan I credit).

of the southern fieldwall).[27] As grey marble is the consistent bedrock across the site, simple variation in morphology is not a sufficient explanation. The continuation of ancient walls visible on the surface below the modern fieldwall suggests that the difference in vegetation type does not invite an archaeological explanation. One possibility is variable grazing in modern times; another is differential cropping.

At the southern edge of the headland, the grey marble naturally splits into rectilinear pieces, leaving an exposed area that was initially taken to be a formal stone quarry (Q2080, POI 3; see the comments by Bassiakos above). This pattern may explain why in the southern part of the site, marble is more frequently used as building material than the schist construction that elsewhere predominates. Past study suspected an increase in use of marble in later construction, perhaps when the more accessible schist supply was diminishing.[28] Schist is a superior building stone in thermodynamic quality as well as ease of use.[29]

Along the upper plateau slopes to the north, the marble bedrock visibly splitting into quadrilateral shapes also gives the impression of worked stone. Evidence for maximum utilization of the space on the plateau can be found to the north, in the careful bridging of fissures in the marble bedrock with schist slabs at the very cliff edge. The bedrock 'repair' is visible from the small shelf at the north some 3 m lower and accessed by (enhanced) natural ramps, in the northern ten meters of D6080 (east) and D8080 (cf. D6080, POI 2). Traces of walls on this northern shelf were recorded in the 1970s, indicative of activity even there.[30]

Across the headland, traces of collapsed structures take a range of forms, distinguishable with variable clarity between and within the vegetation:[31] a standing wall, up to four courses, visible within a clump of prickly oak (e.g., E2020, POI 5; M8080, POI 6); a line of schist stones (e.g., L6040, POI 1; M0040, POI 1; P8080, POI 1); a line of schist and marble stones (e.g., D2040, POI 2); rows of angled schist-wall collapse (e.g., L8040, POI 2); collapse with schist and marble (e.g., L8020, POI 5; N2080, POI 2); and possible stone-wall collapse covered by prickly oak (e.g., J6000, POI 2). One terrace wall of marble fieldstone, constructed at the far south of the site (Q0060, POI 1), evidently to provide a ramped access to the steep shelf below the site on the south, was subjected to surface luminescence dating, in order to ascertain whether it might indicate ancient use of the land off the plateau: it was found to be modern.[32]

The density of pottery observable on the surface was highly variable, both numerically and proportionally (**pl. 8: 1**). In general, a greater concentration of surface material was noted at the edges of the site and little was observed along the central NE /SW diagonal of the site. In view of the extensive evidence for architecture all across the plateau, the disparity is best explained as result of differential post-abandonment experience (most notably modern farming but also including the fieldwork of the 1960s and 70s).[33] That the local variability in

[27] Most easily accessible (looking south) in G. Gerster–P. Cartledge, The Sites of Ancient Greece (2012) 125. The differences of vegetation are seen in the more general cover of the pale grey-green phrygana (upper right and lower right on the headland) and the concentrations of darker green of the prickly oak. A similar pattern appears to have pertained in 1967 (Zagora 1 pl. 1).

[28] Pers. com. J. J. Coulton.

[29] Pers. com. D. Koulaxizis.

[30] On the base plan prepared by M. McCallum for Zagora 3, these walls are identified as 499 (west) and 513 (east).

[31] It is aimed to integrate in future seasons the indications of wall collapse on the base plan. J. J. Coulton has explained to the authors that when planning the site in the 1960s and 1970s, he decided to include only those walls that met at a corner, thereby certainly a marker of an interior space.

[32] Surface luminescence testing was conducted by Ioannis Liritzis on samples taken on November 12, 2012. He reports that the testable sample dated 145 ± 15 years BP, signalling that the wall was indeed recent and perhaps constructed to provide access to a simple enhanced natural rock shelter on the spur jutting off to the south west of the plateau.

[33] e.g., L5560, L6060, L6065 (PJC in 1969); P0080 (1969)—no activity in this area appears on the index for 1967 or 1971; no index of 1974 is available. In 2012, nothing was observed on surface at D2040, E0020, E2000, E2020, E4040, E8020, E8060 (by shepherd's hut), F0080 (straddles ancient wall/fieldwall complex), H2040 (almost entirely an excavation dump), H2060, H8020, L2080, Q4080.

surface finds is not necessarily evidence for differential density of occupation is shown by the results of the geophysical survey. Notably, GP 7 revealed clear wall traces below a disturbed top surface with few visible artefacts (in L 6040 and L 8040 north of the south fieldwall). Erosion plays a constant factor in uncovering architecture and finds (and subsequent loss). On the northern slope, for example, the rim of one vessel was observed, possibly still *in situ* on its bench, gradually exposed by rain and wind (D4060 POI 14, rope band pithos inv. 12-09). Erosion of domestic units must be another factor explaining the uneven ceramic distribution. In general, surface pottery was compatible with an 8th-century date (see below, section on finds).

The presence of iron slag and obsidian amongst the surface finds is noteworthy (**pl. 8: 2**). Iron slag was observed in many locations across the settlement, from the NW (D4060, 197 gr.), to the SW (L6000, 270 gr.), with particular concentrations on the central east parts of the site (E4000, 364 gr; E8000, 701 gr.; F0000, 267 gr.; K2060, 312 gr.; M8060, 248 gr., and M8080, 380 gr.).[34] These discoveries, combined with the extensive finds of slag made during the 1967–1974 excavations in the area of the D–H domestic units and the fortification wall, confirm the presence of significant metalworking activities that warrant further investigation. Five fragments of black Melian obsidian, reminiscent of the obsidian blades and cores excavated in the past under Cambitoglou, were also observed on the surface at the extreme north, west, south, and east of the plateau (D4060, M2000, two in N2080, and SU 61 on **pl. 7: 4**). The possibility that pieces of obsidian may have been casually introduced to Zagora from the neighbouring EBA/Neolithic sites rather than being in active use during the lifespan of the site is undermined by its widespread occurrence, including cores, in closed Geometric contexts excavated in the 1960s and 1970s.[35]

Conclusion

Preliminary significant observations pertain to settlement density, ceramic profile, and industrial activities. The evidence suggests that occupation encompassed the whole area between the fortification wall at the NE and the cliff edge to the north, west, south, and east, indicating that by the Late Geometric period the site was densely settled. The ceramic profile, discussed in detail below, parallels well the excavated materials of the 1960s and 1970s; in other words, it concentrates in the 8th century BC. The presence of iron slag and obsidian flakes at various locations on the site testifies to diversity of production.

M. C. Miller

ARCHAEOLOGICAL SURFACE SURVEY

Extramural surface survey was conducted in the zones immediately adjacent to the settlement plateau: the area outside the settlement fortification wall, the slopes around the headland down to the shore of the Phokia Beach to the north, and Melagonas Beach to the south of the site (**pl. 7: 4**). The aim was to investigate, (i) whether any areas of significant ancient activity exist beyond the settlement boundaries, (ii) ancient access routes to the shoreline beneath the settlement, and (iii) whether traces of an ancient water source might be observed at the juncture of marble and schist.

In the 'saddle' (the open terrain between settlement wall and rising hinterland slope), the site's 20 m^2 grid was extended (see **pl. 8: 1**). Elsewhere, in view of the steepness and irregularity of the terrain, survey units ('SU') were topographically determined: plans of

[34] Weights derive from preliminary quantification by I. Vetta.

[35] See C. M. Runnels, 'Appendix: The Flaked Obsidian Artefacts', Zagora 2 pp. 245–9 for cores from the 1969 excavations (#1: inv. 1297; #5: inv. 2740). Also id., 'Flaked-Stone Artifacts in Greece during the Historical Period', JFieldA 9.3, 1982, 365.

the survey units, predetermined on the basis of aerial photography and the contour maps produced by the Greek Army's Geographical Service, were loaded into Android tablets for easy reference and uniform record-keeping practices. GPS readings were taken with the tablets at the start and end of transects walked within each survey unit. Such topographical precision was valuable in the context of steep and inhospitable terrain with limited landmarks. Typically, a Survey Unit occupied a full terrace width, allowing 2–4 transects per unit, at roughly 2–4 m apart, depending on the topography. Diagnostic material was collected and POIs noted.

Of the 512,000 m^2 constituting the approved survey zone, only 193,000 m^2 were actually surveyable. The remaining 319,000 m^2 were inaccessible as a result of slope gradient and rock fall. More archaeological survey was possible along the headland to the shore of the larger northern (Phokia) beach; the narrower and more precipitous southern ravine yielded little, despite the report of a wall by the shore.[36] Ceramic and other finds in general were few, but a significant volume was observed on the shelves immediately below the settlement plateau. These presumably had eroded down from the settlement area (e.g., the obsidian at SU61, for which see **pl. 7: 4**).

The extramural transect survey detected little evidence of ancient exploitation of the currently accessible slopes below the plateau. In view of the clear evidence for geological instability observed by Bassiakos, the absence of evidence for ancient maritime, industrial, or agricultural activities can in no way be taken as indication of evidence of absence. Indeed, a major landslide in the recent past has rendered much of the SW slope inaccessible.

M. C. Miller

TRIAL TRENCH EXCAVATION

During the last two weeks of the 2012 field season, limited excavation work was undertaken within the boundaries of the ancient settlement. The rationale behind opening trial trenches was to familiarize ourselves firsthand with the site's stratigraphy in preparation for a planned full excavation season in 2013 (See Trenches 1–3 on **pl. 5**). With the results of the geophysical testing campaign not yet available, our choice of trial excavation areas was governed by the preliminary results produced by our programme of site cleaning, reconnaissance, and documentation.[37]

In turning our attention to parts of the site untouched by earlier work, we had mapped a number of partially exposed ancient walls and had recorded the distribution density of ceramics and slag. Accordingly, grid squares M4060 and M6060, located in the south-east quadrant of the site, had been identified as a locus where high sherd density, combined with adjacent visible ancient wall remains and the presence of slag, suggested an area of highly focused human activity (**pl. 8**). Trench 1 was, therefore, laid out here. Further to the NE, grid square F2000 was chosen as the location for a second trial excavation area. Strategically positioned directly to the west of and on the same level as the ancient entrance through the fortification wall and devoid of visible ancient architectural remains, F2000 presented itself as an ideal candidate for the possible siting of an ancient open communal space and/or access route and, while the sherd density distribution here was low, the wider area possessed an intriguingly high slag count (**pl. 8: 2**).

[36] Zagora 1 p. 8 mentions a wall 'projecting from a bank of earth at a distance of approximately 3m. above the south end of the beach. This wall is likely to be contemporary with the settlement since its width and construction resemble those of the walls excavated on the plateau. Furthermore, the soil on either side is relatively rich in pottery sherds, which are on the whole rare in the two bays.'

[37] The excavation of Trenches 1–3 was supervised by Ivana Vetta and Kristen Mann.

Trench 1

Trench 1 measured 5 x 5 m and straddled grid squares M4060 and M6060 (**pl. 5**). Its east edge was formed by exposed ancient wall 508, oriented N/S and built largely of schist slabs with some marble blocks.[38] Owing to the natural terrain in this area, which slopes downwards from west to east, soil cover was much deeper west of the wall where an extensive stone pile indicated the presence of a collapsed structure, now colonized by the growth of prickly oak. Removal of this vegetation and of the loose stone tumble surrounding the roots and leaf debris soon revealed the wall 864 return at the north-east corner of the trench. This wall return runs WSW for some 3 m, at which point it appears to abut and be continued by wall 888 which extends to the west edge of Trench 1.

Immediately beneath the topsoil a well preserved bench (894) running along the south side of wall 888, and preserved at the same height, was uncovered complete with pot emplacement containing fragments of a single fine-ware vessel (see below, inv. 12-96)**.** A bench (893) was also partially exposed to the south, running along the west side of wall 508**.** Based on the findings of the earlier Zagora excavations, it seems likely that the presence of these benches indicates an internal space furnished with storage installations. South of walls 888 and 864, and west of wall 508, collapsed ancient wall debris extended across the remainder of Trench 1. This sealed deposit was left untouched until excavations resume in 2013 (**pl. 9: 1**).

Trenches 2 and 3 (**pl. 5**)

Trench 2 measured 5 x 5 m and was located in the south-west of grid square F2000 and approximately 25 m to the SW of the ancient gate in the fortification wall, in order to examine the ancient topography and use of space inside the entrance to the settlement. The trench straddled the line of one of the modern terrace walls running NE to SW in this area. The reason for the construction of the modern terrace wall became clear when we uncovered natural bedrock dramatically sloping downwards from NW to SE.

At this point the excavation area was extended directly to the east by the opening of Trench 3. Its southern edge continued 5 m to the east along the southern edge of grid square F2000 and extended 2 m to the north. While the bedrock here continued to slope towards the south-east, it was overlain with a deeper soil fill. A sondage at the east end of the trench revealed a thick occupation deposit, most of which had to be left intact until the resumption of excavation in 2013. Some limited investigation was made of the upper part of the deposit, which yielded mostly fine-wares, some burnished sherds dated by context to the Middle Geometric, some bone, and a fragmentary shaped and pierced stone (see below, inv. 12-17).[39] In contrast to other finds made in Trenches 2 and 3, these artefacts were characterized by sharp breaks, suggesting a single episode of deposition.

L. A. Beaumont

POTTERY AND OTHER FINDS

Ceramics

The ceramics from the 2012 field season can be divided into two categories: surface finds and material excavated in the three trial trenches.

[38] Note that the system of wall-numbering developed by M. McCallum in preparation for the publication of Zagora 3 is maintained in the current fieldwork.

[39] Burnished coarse-ware: inv. 12-103, 12-104; pierced stone inv. 12-117. The earliest fine-ware, inv. 12-101, is commented on below.

The fine-ware pottery from the surface is exceptionally fragmentary and abraded. In the majority of cases any painted decoration has worn off completely, and so have in many instances the sherds' outer surfaces. Subsequently the fine-wares were principally documented according to fabric colour and degree of fineness, i.e. fine, semi-fine, and gritty. Most of the fragments fall into the beige, orange, or pink categories. At this stage of analysis it is likely that most of these are either Euboean or Attic. The fine-wares from each area were divided into their appropriate categories of fineness and thereafter fabric colour. Each fragment was recorded as deriving from a specific shape, if apparent, or class of shapes ('skyphos' or 'drinking vessel') and what part of the vessel it represented (e.g., 'rim,' 'handle circular in section,' 'strap handle,' 'ring base'). Body fragments were identified, where feasible, as either deriving from an open or closed shape if a more specific identification was not possible. The thickness of every fragment was recorded. Finally, a Minimum Number of Individuals (MNI) was approximated for each colour category within each area. A similar recording system was applied to the pottery excavated from Trenches 1, 2, and 3.

The few fine-wares identifiable on the basis of their decoration that were collected date at the earliest to the MG I period and into LG. Only one shoulder fragment of a closed vessel, inv. 12-68 (M8040), may belong to a PG-derived tradition given that it bears an outlined cross-hatched triangle, though, given the known range of pottery styles from the site, it is best identified as SPG (**fig. 2**).[40] Inv. 12-99 (H2040) must derive from the lower body of a large amphora, in all likelihood Attic; it finds, with its double axe positioned between multiple vertical lines (all above a series of horizontal lines), its proper place among vessels dated from MG I and to LG Ia (**fig. 3**).[41] The neck fragment inv. 12-38 (F0060), again probably from an Attic amphora, with its main field decorated with stacked horizontal zigzags, is also probably MG (**fig. 4**). The amphora neck fragment inv. 12-32 (F0040),with the remains of a crossed circle floating in the field, is LG (**pl. 9: 2**),[42] as should be the shoulder fragment of a closed vessel inv. 12-74 (D6060) that carries angled swastikas and a cross-hatched diamond(?) within a lattice (**fig. 5**).[43]

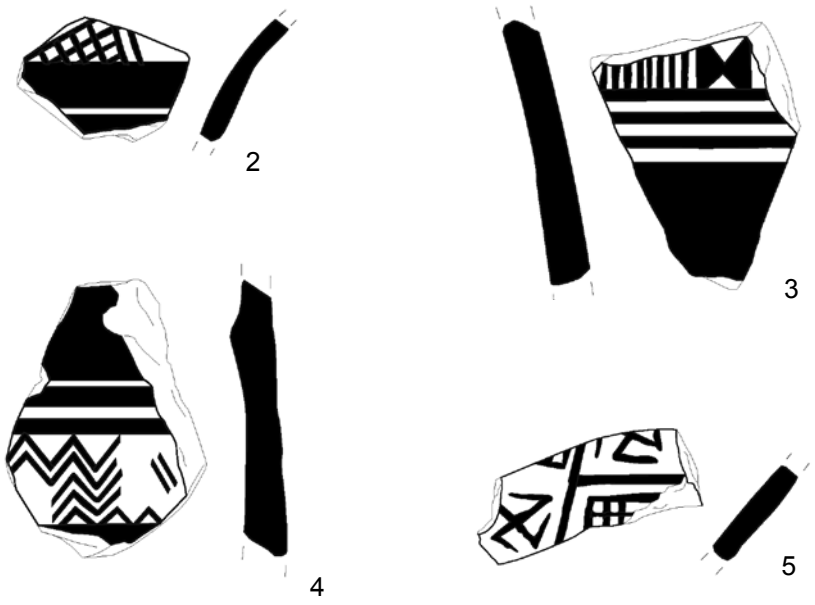
One distinctive category of ceramics collected is comprised of transport amphora fragments of a readily 'oatmeal' or 'porridge' fabric that are usually assigned a Corinthian

[40] For a correlation of SPG divisions with the Attic chronological sequence (EG and MG), see the helpful tables S. Verdan *et al*., Eretria XX. Céramique géométrique d'Erétrie (2008) 135 no. 2, and M. Iacovou (ed.), Cyprus and the Aegean in the Early Iron Age. The Legacy of Nicolas Coldstream (2012) 23. For outlined cross-hatched triangles from various areas: I. S. Lemos, The Protogeometric Aegean: the archaeology of the late eleventh and tenth centuries BC (2002) 13 pl. 20: 2; pp. 17, 20 pl. 40: 2–3; pp. 22–3 pls. 58: 5 and 59: 3. For non-outlined examples placed close to one another on the shoulder of an EG lekythos from Naxos, see N. Kourou, Ανασκαφές Νάξου. Το Νότιο Νεκροταφείο της Νάξου κατά τη Γεωμετρική Περίοδο (1999) 15 no. 27 fig. 12 pl. 26 AK27. For a similar scheme on a lekythos from Tsikalario on Naxos dated as MG, see X. Charalambidou, 'Κεραμικά ευρήματα από τη νεκρόπολη του Τσικαλαριού στη Νάξο. Παρατηρήσεις σχετικά με το ταφικό περιβάλλον και τη χρήση των ευρημάτων', Archaiognosia 16, 2010–2012, 162–3 fig. 12. For an outlined cross-hatched triangle on the shoulder of an oinochoe excavated from a grave dated to the 9th century on Siphnos, see Z. D. Papadopoulou, Σιφνίων Άστυ. Φιλολογικές, αρχαιολογικές και τοπογραφικές μαρτυρίες για την αρχαία πόλη της Σιφνού (2002) 11 fig. 10; for a SPG III example from Lefkandi, M. R. Popham–L. H. Sackett–P. G. Themelis (eds.), Lefkandi I. The Iron Age Settlement. The Cemeteries (1979) 178 no. 1 pl. 177; 321. Note that outlined cross-hatched triangles are not totally unknown in LG fabrics: J. Bingen, 'Les établissements géométriques et la nécropole', in: H. F. Mussche *et al*., Thorikos IV (1969) 97 no. TC66.211 fig. 102; CVA Schloss Fasanerie 2 (Germany 16) pl. 56: 5; CVA New Zealand 1 pl. 5: 3–4; CVA Heidelberg 3 (Germany 27) pl. 107: 1; P. Themelis, 'Ἀνάβυσσος', ADelt 29 (1973–74) B'1 Chr (1979) 109 pl. 85β.

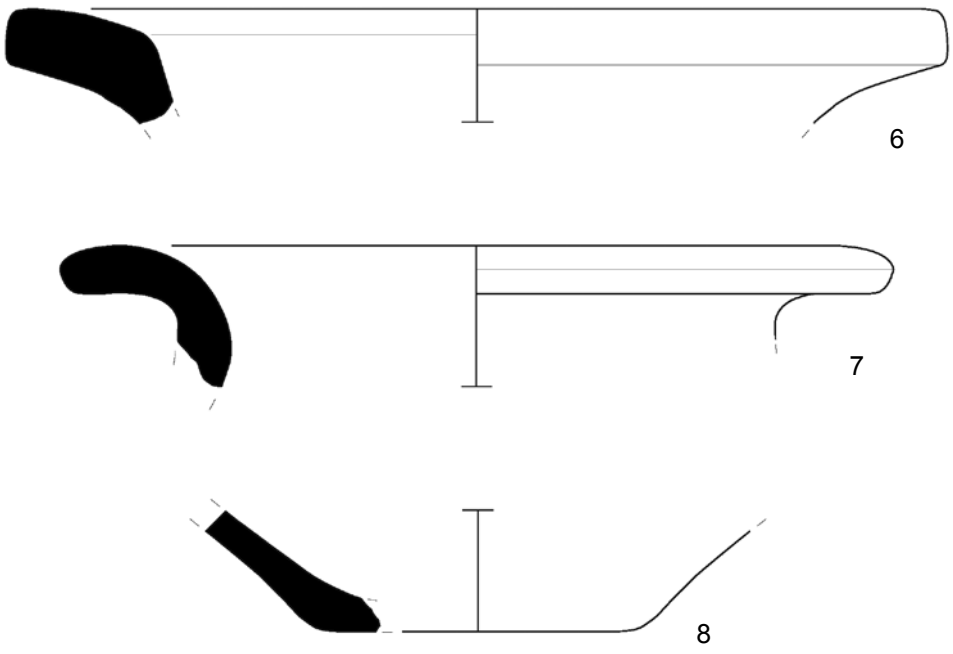
[41] A. Mazarakis Ainian–A. Alexandridou, 'The "Sacred House" of the Academy Revisited', in: A. Mazarakis Ainian (ed.), The "Dark Ages" Revisited. Acts of an International Symposium in Memory of William D. E. Coulson, Univ. of Thessaly, Volos, 14–17 June 2007 (2011) vol. I 169 with fn. 20 fig. 15.

[42] e.g., Verdan *et al*. op. cit. 122 no.110 pl. 29; Ph. Zapheiropoulou, Πάρος (2009) 67 fig. 106.

[43] Generally, cp. CVA Munich 3 (Germany 9) pls. 109 (Attic hydria, advanced LG), 114 (Attic pitcher, mid-8th century); CVA Mainz 1 (Germany 15) pl. 5 (Attic hydria, LG).



Figures 2–5. Fine-ware pottery: inv. 12-68, shoulder fr. of closed vessel, probably SPG; inv. 12-99, Attic amphora body fr; inv. 12-38, ?Attic amphora neck fr; inv. 12-74, LG closed vessel shoulder fr. 1:2.



Figures 6–8. Transport amphorae: inv. 12-64, rim fr; inv. 12-01, rim fr; inv. 12-24, base fr. 1:2.

origin, though A. W. Johnston's warning that a similar fabric was known in various regions of the Mediterranean should be noted.[44] The number of pieces that belong to this category visible on the surface is noteworthy. The larger fragments collected at Zagora do find good morphological parallels among the early examples of Corinthian type A amphorae. The rim of one such vessel has already been published from an LG I context at the site.[45] Inv. 12-64 (J6080) with its flaring horizontal rim can be compared with it as can an example from Corinth dated 'pre-700' (**fig. 6**).[46] Further examples from Corinth with similar rims are dated from MG II contexts and into LG and EPC.[47] The rim inv. 12-01 (M2000) of the same fabric is well paralleled by those of Corinthian amphorae datable to early LG (**fig. 7**).[48] The simple base fragment inv. 12-24 (J8020) finds parallels from Corinth among contemporary material (**fig. 8**).[49]

Terracotta horse figurine

A horse figurine (inv. 12-04) was picked up near the south-eastern edge of the plateau in M6020 (**pl. 9: 3**)**.** It lacks its head, its upper neck, lower legs, a good part of its rump, as well as its tail. If it ever bore any painted decoration it has lost it, though its relatively rough fabric suggests that it may never have been painted. Its identification as a horse is secure given that it preserves part of its lower mane. The figurine is characterized by a tubular body, with a straight back, pronounced shoulders, and a strongly forward-leaning neck. The body widens towards the now lost rump. Its fabric is considerably coarser than many other Early Iron Age figurines from other sites, and it may be profitably compared, macroscopically, to that of some of Zagora's pithoi (for which see below). On this point it matches the tubular body of an animal figurine, possibly a horse, found near the gate of the fortification wall in 1969, though the latter piece bears incised decoration on its back.[50] Inv. 12-04 does not preserve any indication to suggest that it was not free standing.

Such horse figurines (as distinct to chariot groups or pyxis-lid handles) are known from a good number of Early Iron Age sites, mainly sanctuaries but also from some funerary contexts and dumps, and they continue into the 7th century. In the last half of the 8th, and especially the last quarter, their appearance in the archaeological record increases significantly. The fragmentary nature of inv. 12-04 renders any attempt at a close dating hazardous. Of the many known horse figures many are painted either solidly or with some patterning, and increasingly with simple bands towards the late 8th century.[51] Generally similar horse figurines are known from a number of sites, including Athens[52] and other sites in Attica, such as Marathon and the sanctuary of Artemis Tauropolos at Loutsa,[53]

[44] 'Pottery from Archaic Building Q at Kommos', Hesperia 62, 1993, 370.

[45] Zagora 2 p. 186 no. 1394 pl. 170c.

[46] C. K. Williams, 'A Survey of Pottery from Corinth from 730 to 600 B.C.', ASAtene 59 (n.s. 43), 1981 (1983) 150 fig. 64; 155 no. 64.

[47] MG II: C. A. Pfaff, 'A Geometric Well at Corinth: Well 1981-6', Hesperia 57, 1988, 30 no. 70 and C-57-204 fig. 22. LG/EPC: id., 'The Early Iron Age Pottery from the Sanctuary of Demeter and Kore at Corinth', Hesperia 68, 1999, 105 no. 127.

[48] Pfaff art. cit. (1988) 30 C-72-162 fig. 22.

[49] Ibid. 29–30.

[50] Zagora 2 p. 227 pl. 269a–c.

[51] For recent surveys of such pieces, see: M. Xagorari, Untersuchungen zu frühgriechischen Grabsitten (1996) esp. 29 and 55; P. Muhly, The Sanctuary of Hermes and Aphrodite at Syme Viannou, IV: animal images of clay (2008) 13–6.

[52] B. Vierneisel-Schlörb, Kerameikos XV. Die figürlichen Terrakotten, I. Spätmykenisch bis späthellenistisch (1997) 164; J. K. Papadopoulos, Ceramicus Redivivus. The Early Iron Age Potters' Field in the Area of the Classical Athenian Agora. Hesperia Suppl. 31 (2003) 180–2 figs. 2: 113, 115–6 (second half of the 7th century).

[53] Marathon: A. Mazarakis Ainian, 'A Necropolis of the Geometric Period at Marathon. The Context', in id. (ed.) op. cit. (n. 41) II 704 fig. 8. Loutsa: K. Kalogeropoulos, 'Die Entwicklung des attischen Artemis-Kultes anhand der Funde des Heiligtums der Artemis Tauropolos in Halai Araphenides (Loutsa)', in: H. Lohmann–T. Mattern (eds.), Attika. Archäologie einer „zentralen" Kulturlandschaft. Akten der internationalen Tagung vom 18.–20. Mai 2007 in Marburg (2010) 174 pl. 43: 2.

Oropos,[54] Eretria,[55] Naxos,[56] the sanctuary at Ayios Andreas at Kastro on Siphnos,[57] Delos,[58] and further afield at the Samian Heraion.[59] Inv. 12-04 may be compared on the basis of its projecting neck, which starkly contrasts with the strongly vertical necks of many other horses, to: a painted horse from the Athenian Kerameikos dated to the end of the 8th century;[60] a horse (probably from a chariot group) from a Late Geometric burial from Merenda;[61] two 'Geometric' horses from Delos;[62] another from a grave in the Athenian Agora;[63] and one with a context date of the beginning of the 7th century from the Samian Heraion.[64] However, it should be noted that the feature of a projecting neck is not a certain indicator of a late date, as examples dated to the 740s are known from the Athenian Kerameikos.[65]

Owing to their nature the dating of such figures is largely based on their find context and, where present, on their decorative scheme. As inv. 12-04 is an undecorated—and fragmentary—surface find, it is best to recognize that it cannot be assigned to a closely defined period, although the date range of the late 8th century into the 7th may not be too far off the mark given the parallels offered here.

Post-abandonment ceramics

Among the many Early Iron Age pottery finds, some surface material offers us a view into later activities in the region not previously attested. A coarse handle fragment, inv. 12-82 (F4040), probably from a transport amphora, is very likely Late Roman in date, while an uninventoried spirally grooved body fragment from K2060 also belongs to the Late Roman period. These finds supplement those of the 4th and 5th centuries AD made by Ch. Televantou at Ayios Athanasios slightly north of the hill of Palaiopyrgos north-east of Zagora near Pitrophos,[66] while Roman-period finds have been reported even closer to Zagora from Pantoukia near Stavropeda.[67] These finds evince agricultural exploitation of the wider central western area of Andros in Late Antiquity.

[54] M. Arjona Pérez, 'Figurines and Boat Models from the Early Iron Age Settlement at Oropos', in: A. Mazarakis Ainian (ed.), Oropos and Euboea in the Early Iron Age. Acts of an International Round Table, University of Thessaly, June 18–20, 2004 (2007) 320–2 figs. 1–6.

[55] B. Blandin, Eretria XVII. Les pratiques funéraires d'époque géométrique à Erétrie. Espaces des vivants, demeures des morts (2007) 116–7 (with fn. 663 for a listing of horse figurines elsewhere from the site).

[56] Kourou op. cit. (n. 38) 25 no. 58; p. 81 pl. 46.

[57] Ch. A. Televantou, Siphnos. Acropolis at Aghios Andreas (2008) 101 fig. 155.

[58] A. Laumonier, Délos XXIII. Les figurines de terre cuite (1956) 43–4 nos. 11–7 pl. 1 (identified as belonging to the 'géométrique' category).

[59] V. Jarosch, Samos XVIII. Samische Tonfiguren des 10. bis 7. Jahrhunderts v. Chr. aus dem Heraion von Samos (1994) 22–5. From a funerary context on Samos: M. Viglake-Sophianou, 'Γεωμετρική Νεκρόπολη Αρχαίας Σάμου', in: N. Ch. Stampolides –A. Yiannakoure (eds.), Το Αιγαίο στην Πρώιμη Εποχή του Σιδήρου. Πρακτικά του Διεθνούς Συμποσίου. Ρόδος, 1–4 Νοεμβρίου 2002 (2004) 191 fig. 6 right-most figurine.

[60] Vierneisel-Schlörb op. cit. (n. 50) 167 no. 527 pl. 92.

[61] M. Xagorari-Gleissner, Die geometrische Nekropole von Merenda. Die Funde aus der Grabung von I. Papadimitriou 1960–1961 (2005) 25 and 88–9 no. 248 fig. 36a pl. 29b.

[62] Laumonier op. cit. 43–4 nos. 11, 13 pl. 1.

[63] R. S. Young, Late Geometric Graves and a Seventh Century Well in the Agora. Hesperia Suppl. 2 (1939) 63 no. XII 18 fig. 40 (= J. N. Coldstream, Greek Geometric Pottery [2008^2] 84, LG IIb).

[64] Jarosch op. cit. 121 no. 334 pl. 26. See, too, the fragmentary figure with an apparently slightly more upright neck from the sanctuary of Poseidon on Kalaureia that has been assigned to the transition between the Late Geometric and the Archaic period: B. Wells–A. Penttinen–M.-F. Billot, 'Investigations in the Sanctuary of Poseidon on Kalaureia, 1997–2001', OpAth 28, 2003, 48–9 no. 39 fig. 22. It may be noted that beyond Andros' wider region late 8th-century horse figurines with forward projecting necks are also known, for example, from Kombothekra in Elis: U. Sinn, 'Das Heiligtum der Artemis Limnatis bei Kombothekra', AM 96, 1981, 67 nos. 7–8 pl. 8: 5, 7; p. 68 no. 41 pl. 8: 3.

[65] K. Kübler, Kerameikos V, 1. Die Nekropole des 10. bis 8. Jahrhunderts (1954) pl. 143 nos. 1312–13.

[66] Ch. Televantou, 'Άνδρος. Ιερά της Γεωμετρικής και Αρχαϊκής Εποχής', in: D. I. Kyrtatas *et al*. (eds.), ΕΫΑΝΔΡΟΣ. Τόμος εις μνήμην Δημητρίου Ι. Πολέμη (2009) 79–80 fn. 5.

[67] Ch. Televantou, Άνδρος. Τα Μνημεία και το Αρχαιολογικό Μουσείο (1996) 53.

Moreover, around the shepherd's hut (as well as on its roof) a number of sherds were collected that are early modern and later in date, as they were in a number of other points within the area of the ancient site (C6000, D0000, M4000).

EXCAVATED CERAMICS

A very small amount of pottery was retrieved from the limited excavation that was undertaken towards the end of the 2012 season. Here we may note, given its find spot, inv. 12-96, the upper body fragment of a fine, but undecorated, open vessel with a distinctively in-turned rim which thickens towards the lip (**fig. 9**). It was found sitting in the emplacement of bench 894, which must have been originally intended to accommodate a much larger vessel. A general similarity of form may be seen between it and LG II kantharoi from Eretria, but the later are finer (and larger and, of course, painted) while their lip is slightly out-turned.[68] Inv. 12-96 currently stands alone.

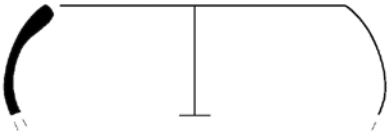


Figure 9. Inv. 12-96, bowl from Trench 1, bench 894. 1:2.

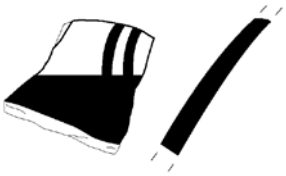


Figure 10. Inv. 12-101, closed-vessel shoulder fr., with concentric semi-circles (SPG). 1:2.

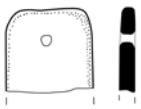


Figure 11. Inv. 12-117, pierced stone from Trench 3. 1:2.

Arguably the earliest identifiable fragment found during the 2012 season is inv. 12-101, excavated from the lower levels reached in Trench 3. This shoulder fragment of a closed vessel, probably an amphora, carries part of a set of concentric semicircles based on a horizontal—a decorative scheme previously documented at Zagora (**fig. 10**).[69] The fragment 12-101 may be profitably compared to LPG and SPG vessels with this scheme best known from Lefkandi.[70] The Early Iron Age date established by the ceramics from Trench 3 is in no way contested by the shaped and pierced stone fragment 12-117 (**fig. 11**) that may be compared to objects identified elsewhere as whetstones.[71]

S. A. Paspalas

PITHOI

The three categories of large storage jars (rope-band, relief-band, and applied-relief pithoi) known from the previous excavations were well represented; fragments of the local thick-

[68] Verdan *et al*. op. cit. (n. 38) 122 no. 100 pl. 25; p. 124 nos. 143–4 pl. 35; p. 125 no. 232 pl. 51.

[69] Guide 103 no. 347 fig. 60.

[70] e.g., Popham–Sackett–Themelis (eds.) op. cit. (n. 38) 30 pl. 14 no.62 (LPG); p. 45 pl. 24 nos. 587–9 (SPG); p. 50 pl. 29A middle fourth row (SPG).

[71] See fn. 37 above. For parallels, see, e.g., J. Boardman, Greek Emporio. Excavations in Chios 1952–1955 (1967) 236 nos. 527–8 fig. 159; M. Andronikos, Βεργίνα Ι. Τό νεκροταφεῖο τῶν Τύμβων (1969) no. Φβ pl. 106; Ch. Koukoule-Chrysanthake, Προϊστορική Θάσος. Τα νεκροταφεία του οικισμού Καστρί (1992) 593 Type 2 pl. 354: 3–4; J. N. Coldstream–H. W. Catling (eds.), Knossos North Cemetery. Early Greek Tombs (1996) 279 T.295.f9 fig. 186 pl. 304; I. Kilian-Dirlmeier, Kleinfunde aus dem Athena Itonia-Heiligtum bei Philia (Thessalien) (2002) 173 nos. 3033–38 pl. 176. For larger pieces of similar form not certainly whetstones, see S. Gimatzides, Die Stadt Sindos. Eine Siedlung von der späten Bronze- bis zur klassischen Zeit am Thermaischen Golf in Makedonien (2010) 299–300 pl. 107 nos. 779–80.

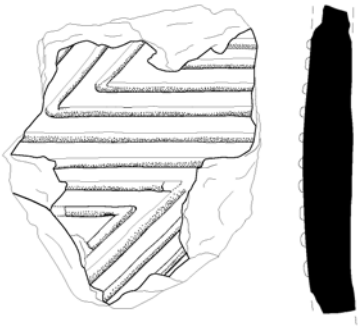


Figure 12. Inv. 12-84, applied-relief pithos fr. 1:3.

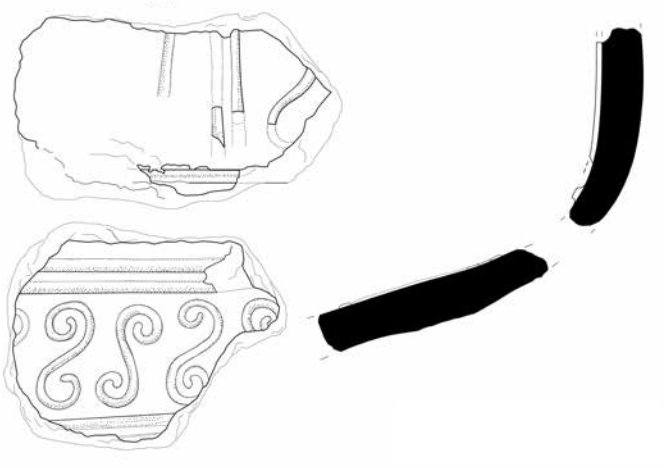


Figure 13. Inv. 12-15 and 12-16, two non-joining applied-relief pithos frr. 1:3.

walled relief-band pithos type predominate.[72] The applied-relief type was also present across the site, though in much smaller numbers. Notable amongst the preserved decorated fragments is inv. 12-84 (from SU84 Transect 3; see **pl. 7: 4**), preserving a continuous step pattern, a decorative scheme known from MG levels of the settlement (**fig. 12**).[73]

Decorated applied-relief fragments dated stylistically to the early 7th century were recovered from the southernmost area of the site, an area separated from the main area of the settlement by a modern fieldwall predating excavation at the site. Fragment inv. 12-17 (from Q0060) preserves part of an applied figure with incised detail in the form of zigzags. Although the piece is too small to allow identification of the figure type, the use of zigzags without the subdivision of a horizontal or vertical line is very uncommon for hairstyles or any other detail.[74] The closest parallels include the rendering of the hair of the dancers on the Tenos Dance pithos and that of the central figures on the Tenos Birth pithos.[75] This fragment therefore underscores the known strong affinities between the applied-relief pithos potting traditions of Zagora and Xombourgo.[76]

Two non-joining fragments of the shoulder and neck of a linear-relief pithos, inv. 12-15+12-16 (from M0020 and P8060) preserve a frieze of opposing vertical Ss on the shoulder, and a border of vertical running spirals or Ss within the neck panel (**fig. 13**).[77]

[72] B. McLoughlin, 'The pithos makers at Zagora: ceramic technology and function in an agricultural settlement context', in: Mazarakis Ainian (ed.) op. cit. (n. 41) II 913–28.

[73] Inv. 1374 from H22 Floor 5: Zagora 2 p. 182 pl. 226b; McLoughlin art. cit. 914 fig. 4.

[74] Incised or impressed opposing diagonals are most commonly used to render Daedalic hairstyles on figured scenes, particularly on the Trojan horse pithoi from Mykonos and Tenos, and the Tenos Potnia fragment: E. Simantoni-Bournia, La céramique grecque à reliefs. Ateliers insulaires du VIII^{e} au VI^{e} siècle avant J.-C. (2004) pls. 47–8 nos. 115–7; pl. 51 nos. 126–7. From the temple deposits at Zagora inv. 1231 preserves the use of opposing diagonals for the hairstyle, as well as for the fringe of an unidentified object: Zagora 2 pl. 267a.

[75] Simantoni-Bournia op. cit. pls. 36–7 nos. 92–4 and pl. 40 no. 98 respectively. For more freeform zigzag detail, see the hair of Ariadne on the Merenda pithos: E. Simantoni-Bournia, 'Minotaur. The acclimatization of a Cretan hybrid in the Cyclades', in: W.-D. Niemeier–O. Pilz–I. Kaiser (eds.), Kreta in der geometrischen und archaischen Zeit. Akten des Internationalen Kolloquiums am Deutschen Archäologischen Institut, Abteilung Athen, 27.–29. Januar 2006 (2013) 383–94 fig. 3; and the fabric worn by Medusa on Louvre CA 795: Simantoni-Bournia op. cit. (n. 72) pl. 46 no. 113; K. Schefold, Frühgriechische Sagenbilder (1964) pl. 15b.

[76] McLoughlin art. cit. 914.

[77] A quantity of undecorated body fragments of the same fabric were also recovered from this area, which may well belong to the same vessel, increasing the likelihood that the fragments have not washed down from elsewhere at the site.

Horizontal and vertical juxtaposition of linear decoration on the neck panel is a feature of the Naxian applied-relief pithos tradition, rather than those from Tenos. It is a compositional feature shared with the later Rhodian corpus where it is not rendered by hand in high relief, but with stamps.[78]

Other notable surface finds included a large pyramidal coarse-ware loomweight and three ground-stone pounders, attesting to a ground-stone industry.[79]

B. McLoughlin

CONCLUSION

The campaign to gain through the application of multiple analytical techniques a holistic overview of the Geometric-period settlement of Zagora within its terrain has proven successful, with information gained from one line of enquiry often finding complementary confirmation from another.

Material excavated in Trenches 1 and 3 corroborates earlier findings of a settlement whose maximum population extent was reached sometime in the second half of the 8th century BC, before abandonment *c*.700 BC. A number of indicators (geophysical survey, site reconnaissance and documentation, extramural survey) attest both to the density and scope of the 8th c. settlement of Zagora. While sub-surface survey in the area outside the settlement walls yielded very little indication of construction, suggesting that the settlement wall indeed marked the end of the urban zone (backed by low levels of surface finds in the extramural survey), by contrast, within the fortification wall, collapsed ancient structures, sub-surface remains and surface artefact counts attest to a high density of population across the whole headland by the Late Geometric period, with some slight spill over to the upper shelf on the north.

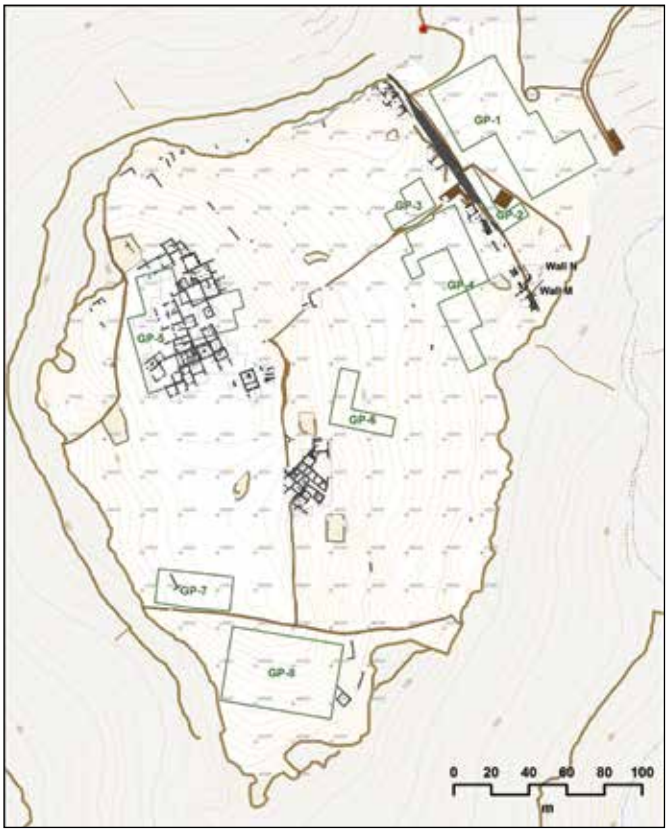
The geological context possibly explains the initial choice of site by the ancient settlers: along the west coast of Andros, only Zagora has a marble cap atop its layers of schist, raising the suggestion that karstification provided a means of securing a water supply. Geological phenomena resulting in drastic changes in Zagora's hydrology may also have been responsible for the abandonment of this large flourishing town *c*.700 BC, and assessment of ancient seismic activity must now consequently be undertaken. The previously unrecognized presence of iron ore on the Zagora promontory also raises the possibility that the site's inhabitants sought to exploit this resource. However, while finds of slag and other metalworking debris confirm without doubt that secondary metalworking, or smithing, activities were conducted here during the Geometric period, further scientific analyses are required to determine whether primary metallurgical production in the form of ore mining and smelting also formed part of the settlement's industrial economy.

Evidence was collected in 2012 for a wide range of ceramic production in local clay, including coarse-ware vessels, weaving implements (inv. 12-190) and the terracotta horse (inv. 12-04). As previously recognized by earlier work conducted on the site, Zagora also had a flourishing agricultural and mercantile economy as evidenced, respectively, by the massive storage capacity exploited by many of the domestic units and by the import of ceramic and other goods manufactured in Euboea, Attica, Corinth, and elsewhere. The pithoi exhibit production links with Tenos and Naxos, attesting to circulation of yet a different kind.

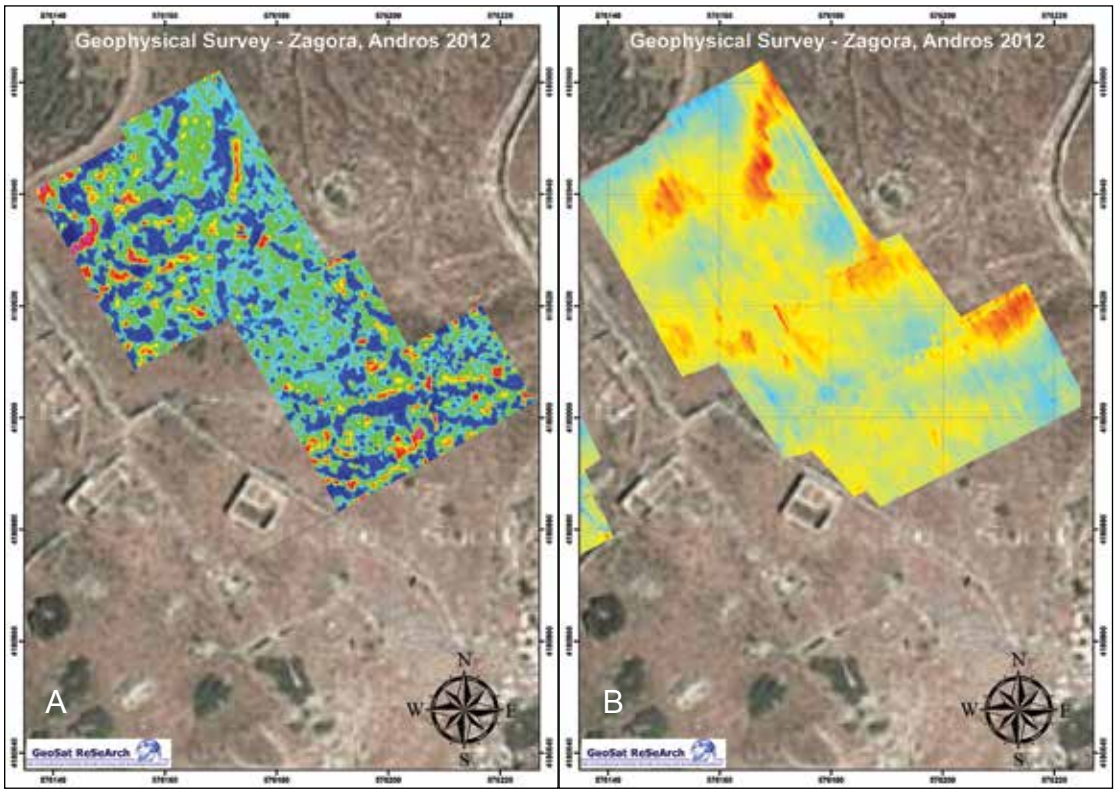
[78] Naxos: Simantoni-Bournia op. cit. pl. 21 no. 41 and pl. 23 no. 45; Rhodes: ibid. pls. 11–5 nos. 25–34.

[79] The loomweight inv. 12-19, of local clay, measures approximately 9.5 x 4.5 cm (from M4000). Three pounders: inv. 12-33 (H8020 POI 1), inv. 12-34 (F2060), inv. 12-35 (Q4080 POI 2).

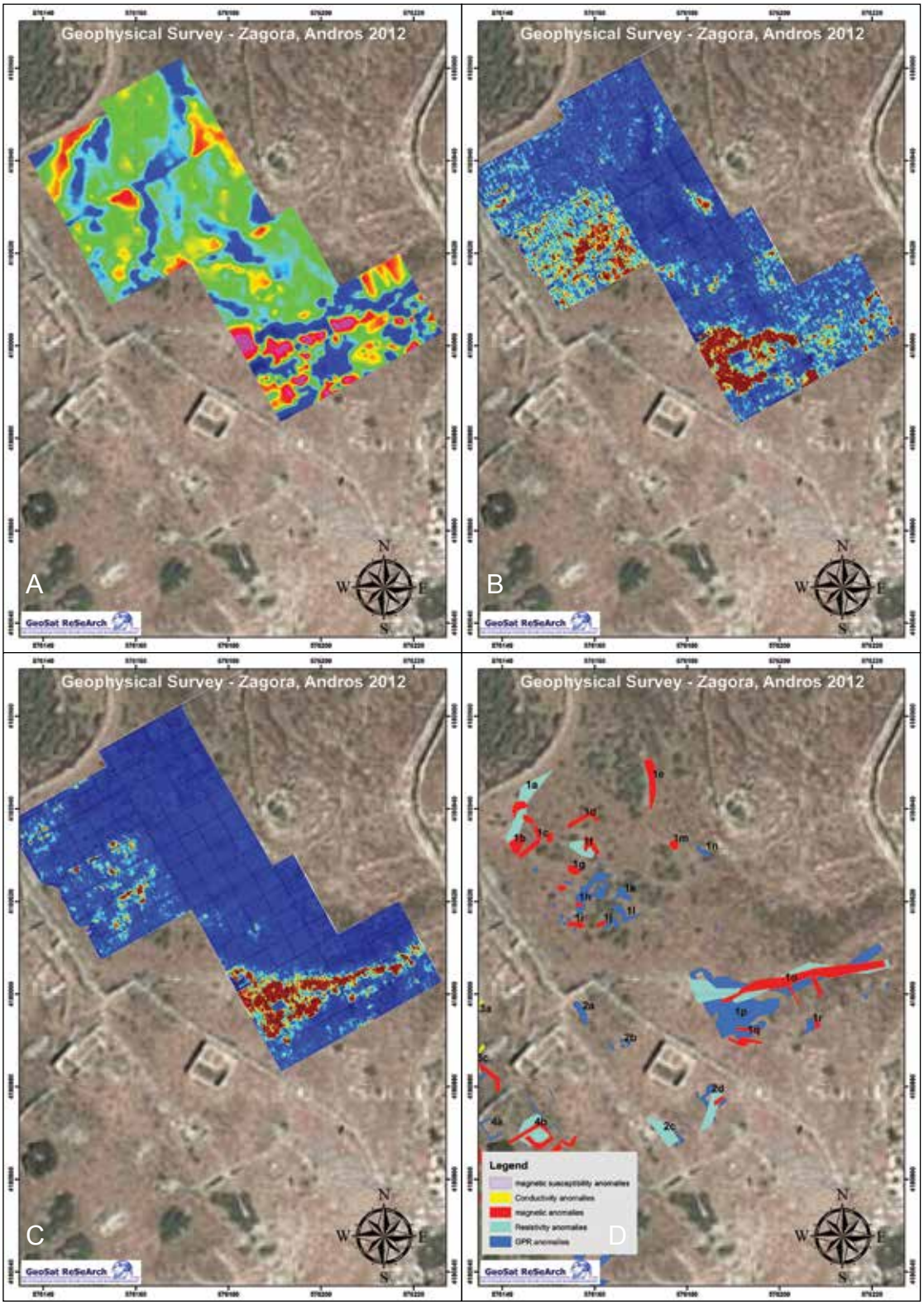
As the work of the Zagora Archaeological Project develops over the course of its current three-year programme, we hope to clarify further the interaction of these various economic activities and to understand their significance for and integration within the socio-political fabric of this flourishing Early Iron Age community.



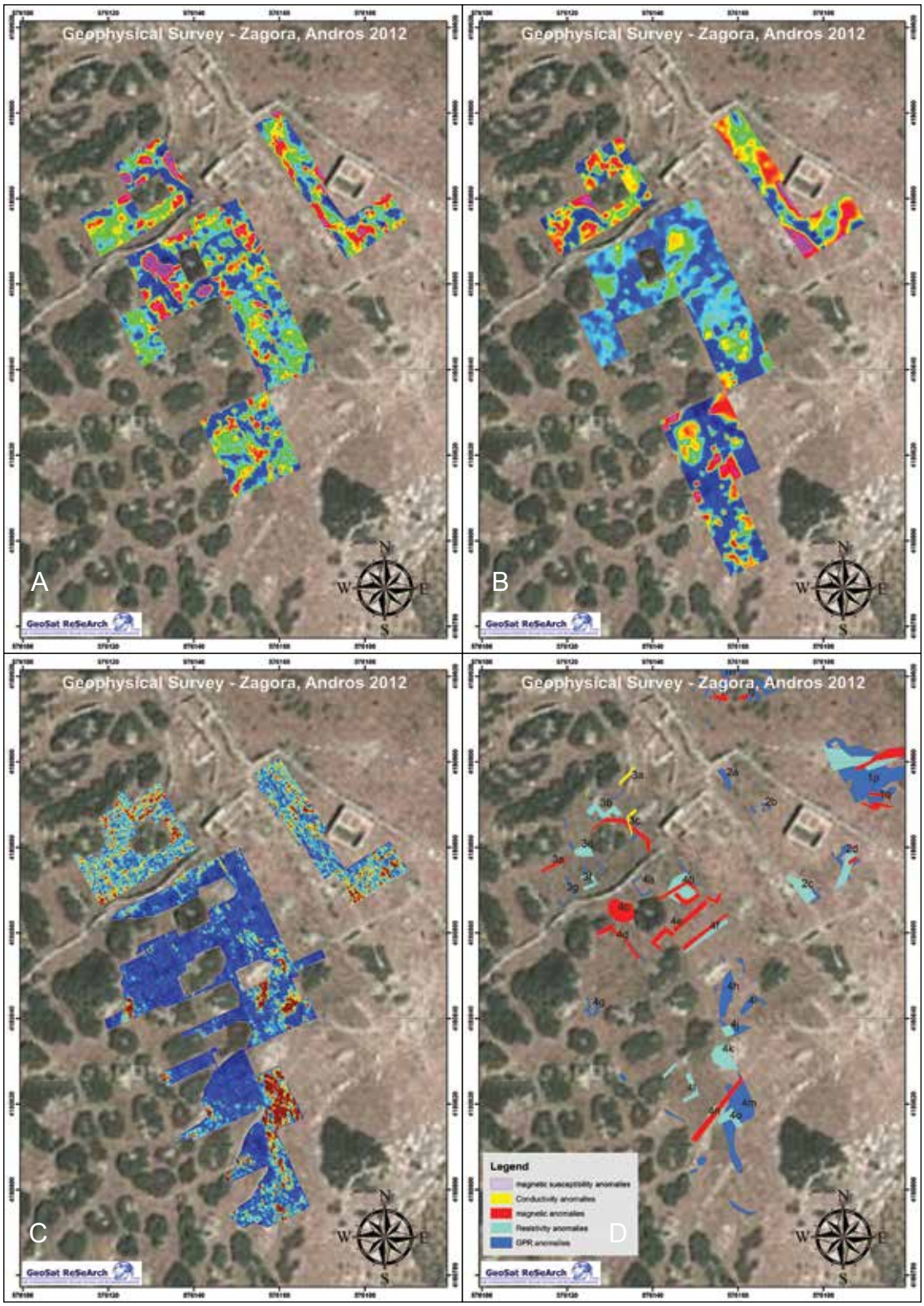
1. ZAP 2012, geophysical survey zones.



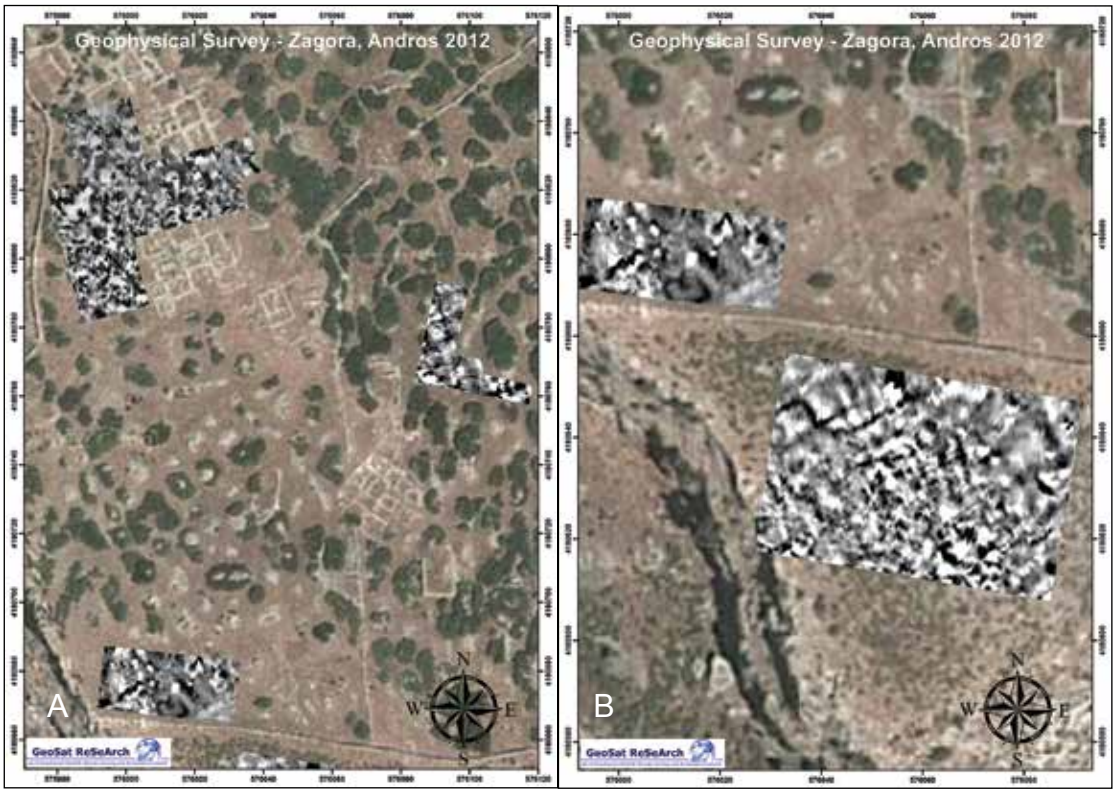
2a–b. Geophysical survey zone GP1 (outside fortification wall), results of the application of the various geophysical techniques in area GP1: a, magnetics; b, soil conductivity.



a–d. Geophysical survey zone GP1 (outside fortification wall), results of the application of the various geophysical techniques in area GP1 (continued): a, soil resistivity; b, GPR 100 cm; c, GPR 150 cm; d, diagrammatic interpretation.



a–d. Geophysical survey zones GP2 (outside fortification wall), GP3, and GP4 (inside settlement). Results of the application of the various geophysical techniques: a, magnetics; b, soil resistivity; c, GPR 100 cm; d, diagrammatic interpretation.

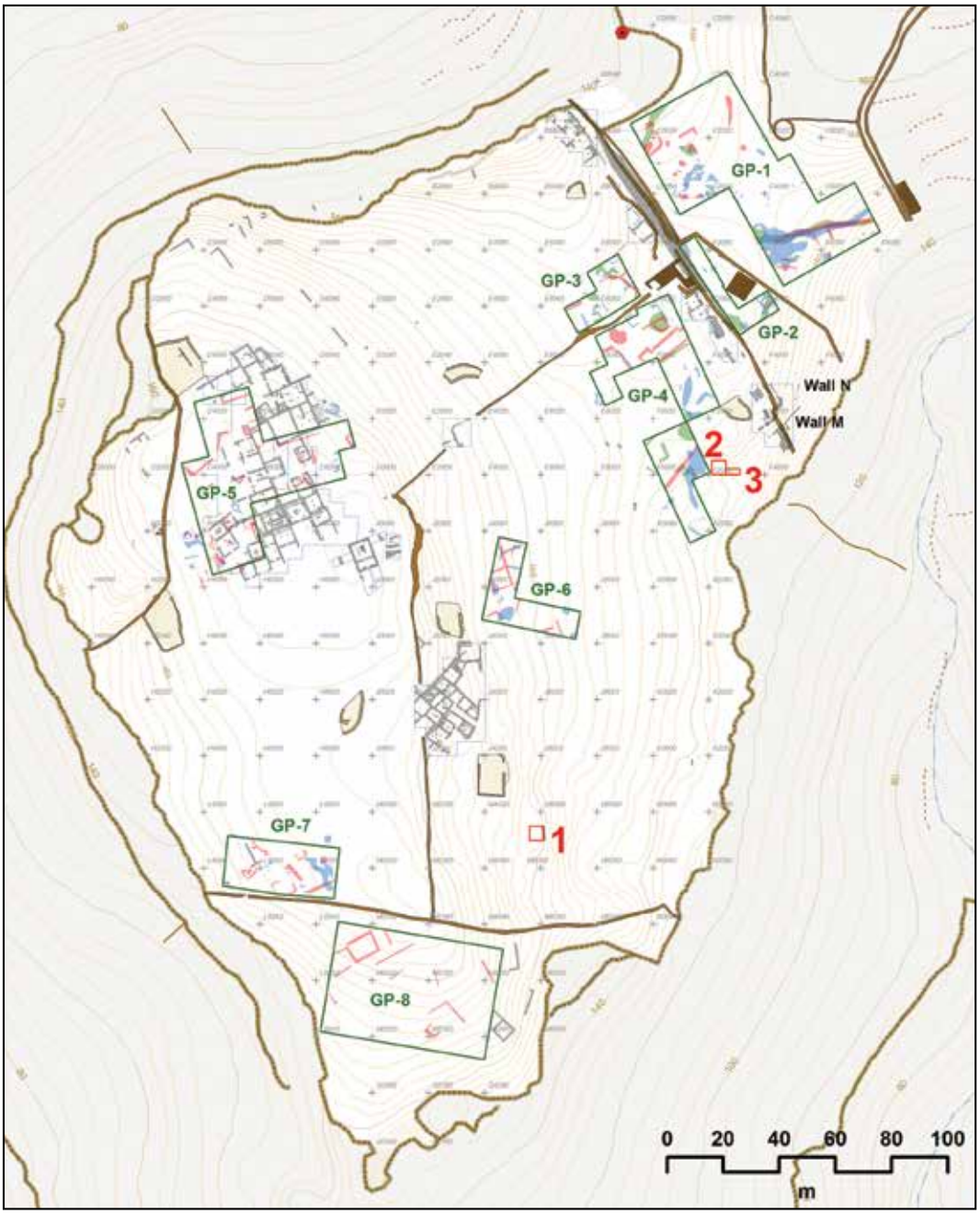


1a–b. Results of the application of the vertical magnetic gradient measurements in areas GP5-GP6-GP7-GP8.

2. A man-made rectangular cutting carved on the blue-grey marble outside the settlement wall.

3. A man-made carving on the marble, lying within the settlement, *c*.20 m. from the gate. A game board?

4. Surface find of the 1960s/1970s, game board cut into schist, with 6 x 12 hollows.



Zagora 2012. Plan with gradient measurements in areas GP5-GP6-GP7-GP8, interpretation of the geophysical anomalies. Location of Trenches 1–3.

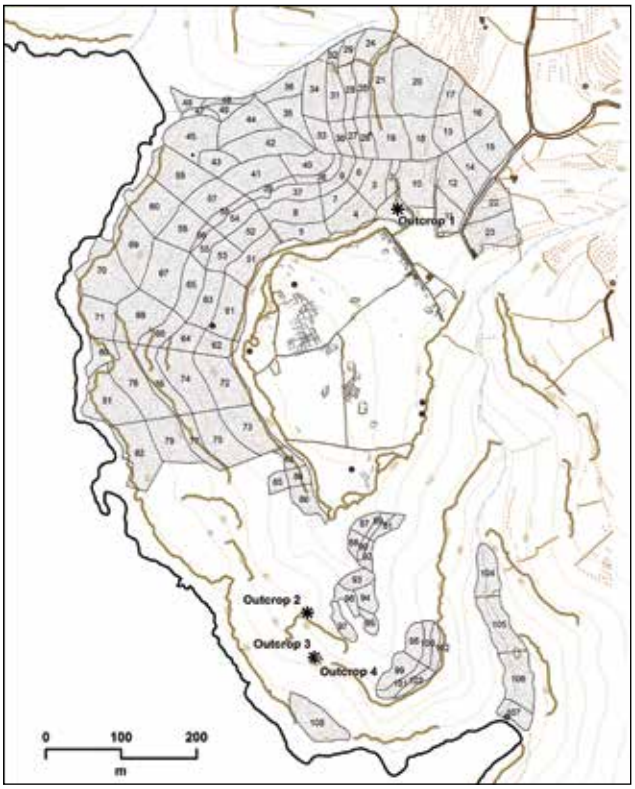
1. Zagora peninsula from the NE, exhibiting a scalable profile at its precipitous NW side facing the sea. Note the alternating successive layers consisting of marble (grey) and schist (dark grey), terminating on top with a thick marble layer on which the settlement sits.

2. A collapse (doline) of unknown depth in the west margin of the settlement (H0040), witness of the intense karstification that has affected the top layered marble.

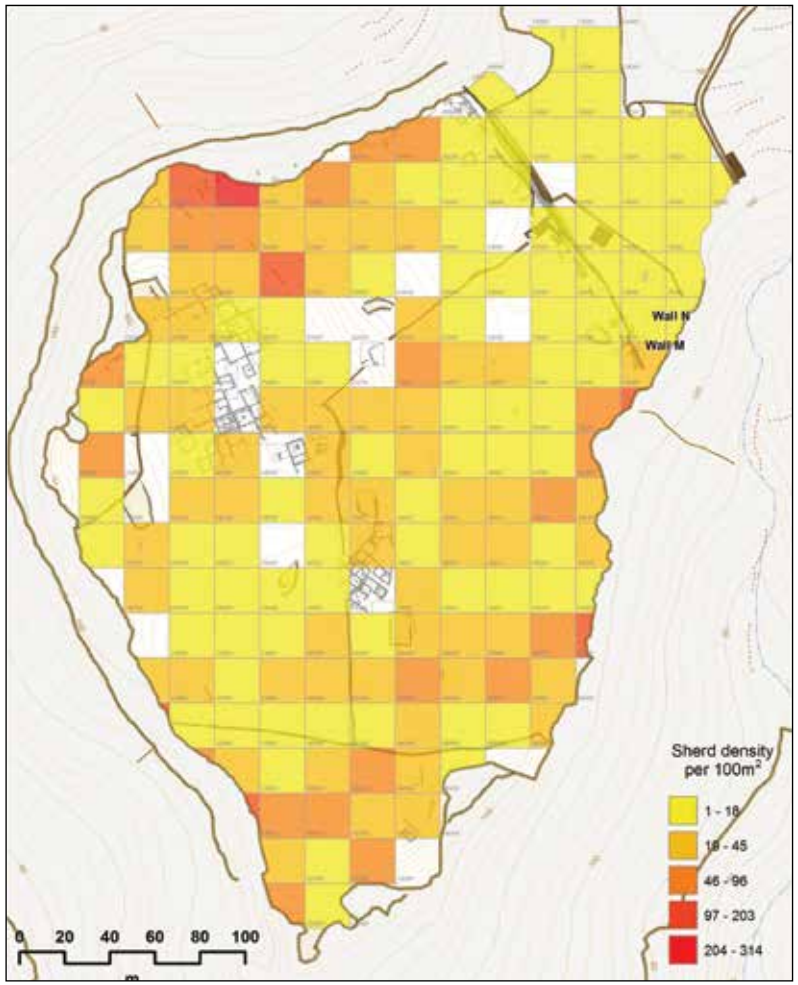
1. One of the three main iron-bearing occurrences on the precipitous SW side of the Zagora peninsula: a thick vertical encrustation on the marble consisting of limonite and hematite (iron-ore outcrop no. 3 on pl. 7:4).

3. Vertical, funnel-form filling of an open fault (or chasm) with limonite and ankerite angular frs. and breccias on the precipitous SW side of the Zagora peninsula (outcrop no. 4 on pl. 7:4).

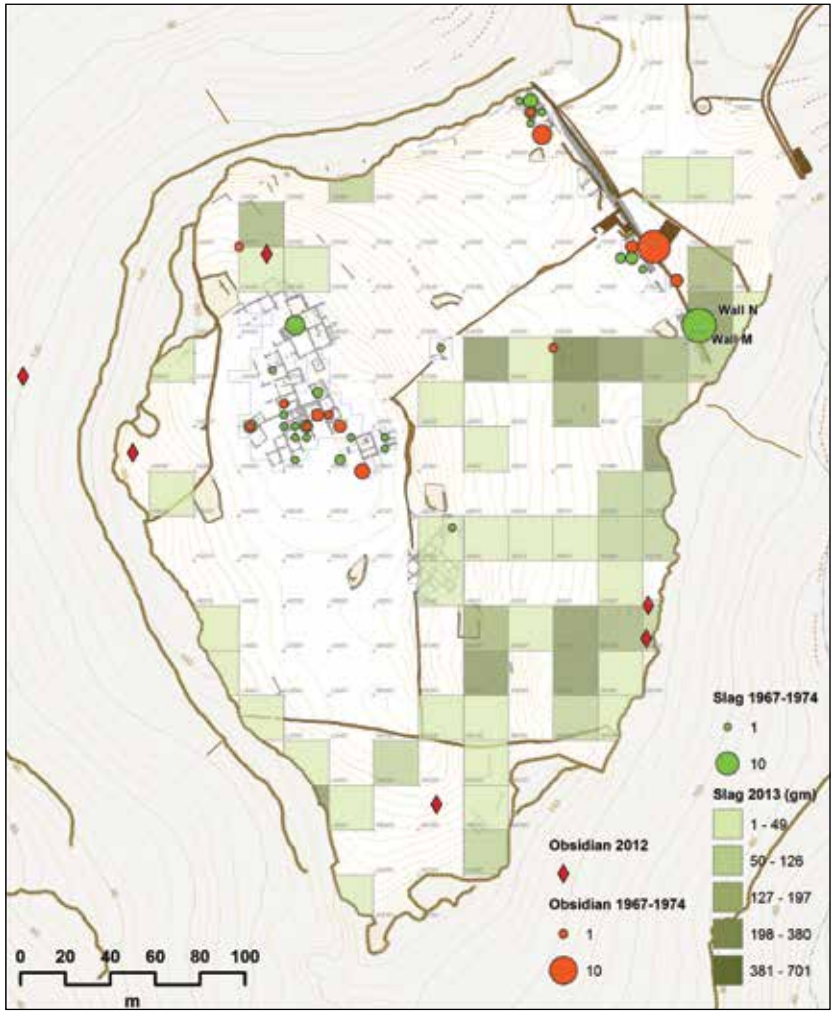
2. Iron-ore filling of vertical joints, consisting mainly of hematite, developed in dense iron ore body at the top (outcrop no. 2 on pl. 7:4).



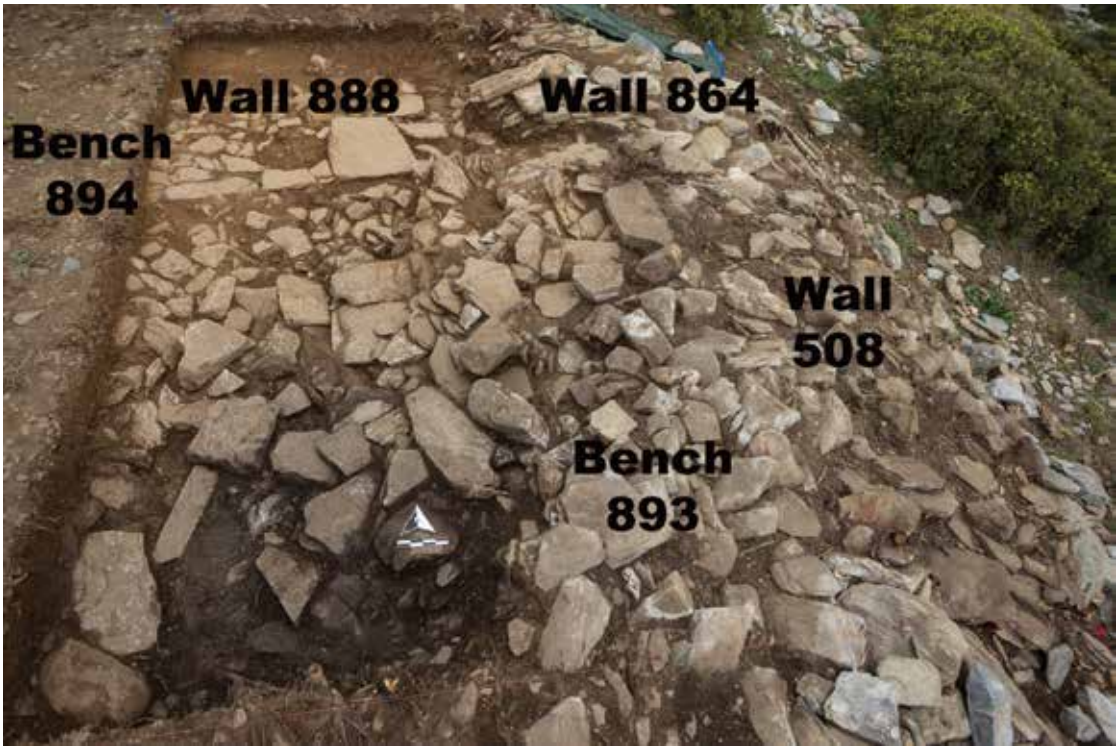
4. Extramural survey, Zagora headland plan. Locations of four iron-ore outcrops (see p. 51) indicated by asterisks.



1. Zagora site reconnaissance. Surface finds: density of ceramic distribution across 20m^2-grid.



2. Zagora site reconnaissance. Surface finds: occurrence of obsidian flakes and distribution of iron slag across 20m^2-grid, with obsidian and slag excavated in the 1960s and 1970s.



1. Trench 1 at end of season. View looking north, with walls (508, 864, 888) and benches (893, 894, whose 'nest' is visible).

2. Inv. 12-32, ?Attic amphora neck fr. 2:3.

3. Inv. 12-04, horse figurine made of local clay. 2:3.

4. Oinochoe inv. M124. 1:2.