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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, and on the German Archaeological Institute's website, <https://www.dainst.org/en/publikationen/publizieren-beim-dai/richtlinien>, with the addition of the following:

ABNGV	Annual Bulletin of the National Gallery of Victoria, Melbourne
ABVic	Art Bulletin of Victoria, Melbourne
Atti I CMGr	Atti del primo Convegno di studi sulla Magna Grecia
BAPD	Beazley Archive Pottery Database
Beazley, ABV	J. D. Beazley, <i>Attic Black-figure Vase-painters</i> (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, <i>Attic Red-figure Vase-painters</i> (2nd ed., 1963)
Beazley, EVP	J. D. Beazley, <i>Etruscan Vase Painting</i> (1947)
Beazley, Paralipomena	J. D. Beazley, <i>Paralipomena. Additions to Attic Black-figure Vase-painters and to Attic Red-figure Vase-painters</i> (1971)
BTCGI	G. Nenci–G. Vallet (eds.), <i>Bibliografia topografica della colonizzazione Greca in Italia</i> , Iff. (1977ff.)
CCEC	Cahiers du Centre d'études chypriotes
DACL	Dictionnaire d'archéologie chrétienne et de liturgie
DOP	Dumbarton Oaks Papers
NEA	Near Eastern Archaeology
OEANE	E. M. Meyers (ed.), <i>The Oxford Encyclopedia of Archaeology in the Near East</i> (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*.

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ZAGORA ARCHAEOLOGICAL PROJECT: THE 2014 FIELD SEASON

M. C. Miller, S. A. Paspalas, L. A. Beaumont, B. M. McLoughlin, A. Wilson
with an Appendix by H. Thomas

A three-year campaign of renewed archaeological fieldwork at the Geometric settlement site of Zagora on the west coast of Andros aimed to expand upon and enhance the important fieldwork conducted under the direction of Nikolaos Zapheiropoulos in 1960 and Alexander Cambitoglou between 1967 and 1974. Following the 2012 season of site reconnaissance, survey, geological and geophysical analysis, and limited excavation, and the 2013 season of excavation and satellite imaging analysis, in 2014 a third six-week field season was conducted between 22 September and 1 November.¹ It was followed by a study season on Andros in 2015. Analysis continues; this overview reports on the excavations and presents some of the preliminary findings.

The great value of the site of Zagora to Greek archaeology and social history lies in its unpretentious character and lack of reoccupation after its abandonment *c.*700 BC. The resumption of fieldwork in 2012 was driven by the need to expand the evidence-base for Zagora's social and economic life and so to contribute to a better understanding of the Early Iron Age. In order to maximize the chances of exposing diversity, the project adopted an excavation strategy of sampling widely across the 7.8 ha site. Seven trenches (4–7, 9–11) were set to enable examination of potentially open spaces as well as areas defined by architecture (pl. 44). A further aspiration was to gain diachronic evidence for the growth and layout of the settlement.

¹ The Zagora Archaeological Project (ZAP) was funded by a Discovery Grant (DP120102257) awarded by the Australian Research Council. The co-directors (L. A. Beaumont, M. C. Miller, and S. A. Paspalas) are grateful to the Centre for Classical and Near Eastern Studies of Australia at the University of Sydney for providing the project's Sydney base and to the Ephor and staff of the 21st Ephorate of Prehistoric and Classical Antiquities under whose aegis the work was conducted.

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M. Roumpou (Residue Analysis), V. de Scarpis, R. Scharenguivel, M. Schugk, M. Sheppard Brennard, A. Smith, S. Snedden, A. Thanos, T. Theodoropoulou (Marine Archaeozoologist), H. Thomas (Trench Supervisor and Aerial Photographer), O. Vanwalleghe, S. Vasilakis, I. Vetta (Trench Supervisor), C. Vincent, D. White, E. Williams, A. Wilson ('Heurist' database support), S. Wrigley, S. Zaid. Unless stated otherwise all photographs are by B. Miller.

For reports of the previous seasons, see L. A. Beaumont–M. C. Miller–S. A. Paspalas, 'New Investigations at Zagora (Andros): the Zagora Archaeological Project 2012', *Meditarch* 25, 2012, 43–66; L. A. Beaumont–B. McLoughlin–M. C. Miller–S. A. Paspalas, 'Zagora Archaeological Project: The 2013 Field Season', *Meditarch* 27, 2014, 115–21. See also: M. C. Miller–L. A. Beaumont–S. A. Paspalas, 'The 'Return' to Zagora: the 2012 Field Season', *Bulletin. The Australian Archaeological Institute at Athens* 9, 2013, 13–17; S. A. Paspalas–L. A. Beaumont–M. C. Miller, 'Zagora Archaeological Project: 2013 Season', *Bulletin. The Australian Archaeological Institute at Athens* 10, 2014, 12–14; S. A. Paspalas–M. C. Miller–L. A. Beaumont, 'Zagora Archaeological Project: 2014 Season', *Bulletin. The Australian Archaeological Institute at Athens* 11, 2015, 12–15. A full analytical discussion of the 2013–2014 seasons combined is forthcoming.

EXCAVATION OF OPEN/COMMUNAL SPACE

The area extending south-westward from the inside of the gate through the fortification wall was initially targeted for investigation as a likely open-air public focal point (see Trench 9 on **pl. 44**). Excavation in the area in 2012 and 2013 (Trenches 2, 3, 8) confirmed that the upper compact surface, similar to the road surfaces excavated in the Gate Area by the Cambitoglou team, was indeed an open space at the end of the site's occupation (**pl. 45: 1**). Below this surface the fill continued to a significant depth.

In 2014, excavation continued with a 3 x 4 m trench (Trench 9) that reached sterile soil at a depth of 2 m below modern ground level.² Excavation confirmed that the deep fill beneath the 'road' surface encountered in 2013 extends across the area excavated in 2014. Within the confines of Trench 9 it was established that the doline first drops to a shelf of bedrock on the western side, stepping down a further 60 cm before reaching the floor of decaying bedrock (**pl. 45: 2**). The fill preserved clear horizontal layers of deposition which were separated by more compact layers comprised of a clayey matrix. It was determined that these sequences are the fill (termed 'F dumps') of a deep doline, a natural cavity roughly 10 m in diameter, the result of marble karstification.

The dump layers produced very rich deposits of ceramic, bone (including a dog tooth and donkey molar), shell, worked obsidian, slag, and stone. The earliest datable material extends back into the 9th century and possibly the late 10th, thereby providing us with some of the earliest finds unearthed at the settlement.³

These Middle Geometric dumps also produced quantities of clay-installation fragments with chaff temper representing two different manufacturing processes (**pl. 45: 3**). One class preserves smoothed flat or curved upper surfaces and exteriors, with pebble and straw impressions on the undersurfaces and uneven firing indicative of having been shaped *in situ* and only fired through use.⁴ The second group is very heavily vitrified with slagged surfaces. The samples shown here (14-218) were recovered from 9.19, the earliest deposit within the doline.⁵ The MG waste dumps found in the interstices between the first and second line of the fortification wall excavated in 1974, similarly produced both types of clay installations. Both in the fortification wall dumps and in the F dumps, the two types occur in separate deposits. Taken together, these clay-installation dumps point to at least two manufacturing processes requiring pyrotechnological activity in the vicinity of the gate in the MG period.

² Adam Carr supervised excavation of Trench 9.

³ For a presentation of this pottery, see B. McLoughlin–S. A. Paspalas, 'Ninth- and Early Eighth-Century Zagora, Andros: Indications of Central Aegean Networks and Engagements', in: *Περὶ τῶν Κυκλάδων νήσων. Το Αρχαιολογικὸ Ἔργο στις Κυκλάδες* (in press).

⁴ Clay-installation fragments of a very similar nature have been recovered in PG–MG deposits from Asine (B. Wells, *Asine* 4: 2–3 [1983] 78, 224–5 cat. nos. 472–4 fig. 169, suggested that it may be a pit lining); Eretria (S. Verdan, *Eretria* 22. *Le sanctuaire d'Apollon à l'époque géométrique* [2013] 142–3 cat. nos. 503–06 pl. 112 [for the dating of pit 197, see pp. 72–4]), and Lefkandi (R. V. Catling–I. S. Lemos, *Lefkandi II.1* [1990] 63–4 pl. 79 cat. nos. 877–81). The examples from Eretria and Lefkandi share in common with the Zagora examples rough undersurfaces suggestive of being created *in situ*, and straw/chaff inclusions. Current speculation on their original function is fraught with difficulty as none have

been found *in situ*. An association with the baking trays, *Backwannen*, from Kastanas (A. Hochstetter, *Kastanas. Ausgrabungen in einem Siedlungshügel der Bronze- und Eisenzeit Makedoniens, 1975–1979. Die handgemachte Keramik, Schichten 19 bis 1* [1984] 164–8) is unlikely, as the northern Greek baking trays are used in conjunction with complex multi-form clay-oven structures that are a hallmark of northern Greek cooking traditions since the Neolithic period: see A. Papefthymiou–A. Pilali–E. Papadopoulou, 'Les installations culinaires dans un village du Bronze Ancien en Grèce du Nord: Archontiko Giannitson', in: C. Mee–J. Renard (eds.), *Cooking up the Past. Food and Culinary Practices in the Neolithic and Early Bronze Age Aegean* (2007) 136–47.

⁵ The form and slagging patterns described by the fragments of 14-218 are very similar to the Bronze Age crucibles from Qantir-Pi-Ramesses, Egypt, associated with copper metallurgy. M. Martinon-Torres–T. Rehren, 'Technical Ceramics', in: B. W. Roberts–C. P. Thornton (eds.), *Archaeometallurgy in Global Perspective* (2014) 114 fig. 6.5.

Towards the middle of the 8th century or slightly thereafter this area ceased to be used as a rubbish dump. The surface that formed over the doline meant that it could be easily traversed.

The presence of the 2 m-deep doline at the same level as the gate, c.20 m away, indicates that prior to the latter part of the 8th century, entrance into the site through the gate must have been made by turning to the right.

EXCAVATION OF ARCHITECTURALLY DEFINED SPACES

In 2014, excavation of domestic units and associated exterior spaces was resumed at four locations across the site: in the north, Trench 5 concentrated on D34, first delineated in 2013.⁶ At the centre, Trench 7 continued excavation of D26, in and below a significant collapse deposit containing decorated relief-pithos sherds recovered in 2013. At south-centre, Trench 4 further probed a room equipped with two benches uncovered in 2013 (M3), while in the area adjacent to it, the new Trench 10 investigated the associated open-air space to the west (M4). In the south, Trench 6 completed excavation of the two-room structure built from marble rubble masonry (M1–M2).

At the north edge of the site, further surface cleaning in the north sector of Trench 5 fully delineated the extent of D34 (see Trench 5 on **pl. 44** and aerial view in **pl. 46: 1**).⁷ Measuring some 11.5 x 9 m and with a single entrance in the south wall, D34 presents one of the largest architecturally defined spaces yet discovered at Zagora. There is as yet no evidence for interior dividing walls as the structure has been only partially excavated; other spaces of similar dimensions at Zagora were divided with internal walls.⁸ To the east, north, and west of D34, abut walls of other rooms. They are visible in recent aerial views, and the north-east corners of the rooms to north and east already appear on the 1974 site plan.⁹

In 2014, along the exterior of the south wall and the threshold of D34, a 2 x 4.7 m sondage was set. Many pithos sherds had been used as packing in crevices in the bedrock to make it level with the threshold. Within D34, excavation was limited to a 4 x 4 m sondage in the south-east quadrant (**pl. 46: 1**). Evidence of roof collapse was found especially along the east side. Here was excavated a concentration of transport and storage vessels, including transport amphorae from at least five different provenances (**pl. 46: 2A–C**: 14-092, 14-173, 14-166). In addition, three ‘proto SOS’ amphora necks (**pl. 46: 2D–F**: 14-175, 14-147, 14-100) may have been used as stands.¹⁰ Fine wares, such as the neck of a large Euboean amphora (**pl. 47: 1C**: 14-051) were also excavated here.¹¹ Below the roof collapse was an array of LG II fine-ware drinking cups (**pl. 47: 1A–B**: 14-057, 14-053) as well as fragments of other vessels.¹² No large pithoi have so far been found in this room; however, the neck of a small neck-handled pithos with fenestrated handles was recovered. It is decorated with incised animal figures set within frames of stamped borders (**pl. 47: 2**: 14-171). The vessel itself belongs to the stylistic

⁶ The nomenclature for built spaces developed by the Cambitoglou team has been retained in the current ZAP fieldwork. The first (alphabetic) element indicates in which 20 x 20 m square of the site grid the space occurs; the second (numeric) element is part of a numeric sequence within the grid square whose order relates to time of identification rather than topographic arrangement.

⁷ Ivana Vetta supervised the continued excavation of Trench 5.

⁸ e.g., D9 and D10-11 for which see A. Cambitoglou *et al.*, *Zagora 1. Excavations of a Geometric Settlement on the Island of Andros, Greece (1971)* 16 plans II–III.

⁹ A. Cambitoglou *et al.*, *Archaeological Museum of Andros*

Guide (1991) 22 fig. 3.

¹⁰ S. Paspalas, ‘Zagora and the wider Aegean’, in: A. Mazarakis Ainian–A. Alexandridou–X. Charalambidou (eds.), *Regional Stories. Towards a New Perception of the Early Greek World. Acts of an International Symposium in Honour of Professor Jan Bouzek. Volos, 18–21 June 2015* (2017) 234–5 fig. 10.

¹¹ *Ibid.* 238. Further on the rare decorative motif on the amphora’s neck, see M. D’Acunto, ‘Euboean Imports in the Geometric Necropolis of Ialysos’, in: V. Vlachou–A. Gadolou (eds.), *ΤΕΡΨΙΣ. Studies in Mediterranean Archaeology in honour of Nota Kourou* (2017) 365–7 figs. 7–8.

¹² Paspalas *art. cit.* 233–4 fig. 8.

and technological class of neck-handled pithoi with relief decoration known from the site.¹³ The incised figures and use of block stamps for the borders have no parallels for the 8th or 7th centuries; the vessel thereby expands the known repertoire of decorative techniques employed within this tradition. Moreover, the incised fragments carry unique incised decoration, featuring a grazing stag, a rampant goat, and two lions with their heads turned back.

Near the highest elevation of the settlement, and in the heart of the D/H houses excavated by Cambitoglou, excavation of room D26 begun in 2013 as Trench 7 continued (see **pls. 44, 48–50**).¹⁴ At the end of the 2013 season, a large quantity of pithos fragments were recovered beneath wall tumble. At the time of excavating, this deposit was thought to represent the upper layers of final occupation. In 2014, it became clear that the pithos smash represents the point at which the building walls finally collapsed, after an extended period of slow decay (**pl. 50: 2–3**). Study of the pithos fragments confirmed that the smash recovered in 2013 represents three pithoi of monumental size, each likely to hold over 700 litres. These include the relief-decorated neck-handled pithos 13-080, for which partial reconstruction has been carried out (**pl. 49**),¹⁵ an undecorated neck-handled pithos with fenestrated handles (13-184), and a piriform pithos without handles, applied relief or relief bands of any kind (13-185).

Beneath the pithos smash and the final wall collapse, 30 schist discs were recovered from the surfaces of roof-fall layers and from the floor surface of the room (**pl. 48**). Such schist discs were probably used as lids for storage jars to protect their contents from pests, evaporation, or oxygenation; or as stands for flat-based storage vessels and necks re-used as pot stands (**pl. 48: 4**). The diameter range of the schist discs is from 4 to 54 cm, the majority falling between 15 and 40 cm in diameter (five of which are *c.*26 cm in diameter). Only two of those recovered are of sufficient size to have been used as lids for the neck-handled pithoi. The interior neck diameter of pithos 14-080 is 46 cm; the largest schist disks 14-130 and 14-017 have diameters of 54 cm and 50 cm respectively. Note that these two disks weighed 10.4 kilos and 8.9 kilos respectively. The final disbursement of schist disks found on top of layers of collapsed roofing clay may explain why no medium or small storage jars or transport amphorae have been recovered from the room. All those that were portable were presumably removed when the inhabitants relocated.

The stratigraphic evidence of the wall construction sequences suggests that in this instance storage pithoi were set into the dirt floor: this contrasts with the more usual practice at Zagora of setting pithoi into curved hollows in the top of raised stone benches. The relative construction sequence of wall abutments is as follows: D26NE was built against the pre-existing back of the north-eastern walls of H37/38 and D18 (built in that sequence); D26SE and the southern return of D26SW were constructed after the emplacement of the pithoi while D26NE was built into the deep natural declivity in the bedrock to function as a retaining wall

¹³ B. McLoughlin, 'The Pithos Makers at Zagora: Ceramic Technology and Function in an Agricultural Settlement Context', in: A. Mazarakis Ainian (ed.), *The 'Dark Ages' Revisited*, II (2011) 913–28. The nomenclature for this typological (and technological) class, hitherto 'Applied Relief Pithos', must be revised to 'Neck-Handled Pithos' to allow the incorporation of both 14-171 and the undecorated neck-handled pithos 14-184 recovered from D26 discussed below. Two other plain neck-handled pithoi with fenestrated handles have thus far been identified while sampling the context pottery material from the 1967–1974 excavations. This suggests that plain versions of this pithos type may be more common than is reflected in previous studies.

¹⁴ Meditarch 2014, 117–18. Mel Melnyczek continued supervision of Trench 7. Though the perimeters of D26 had been delineated and the space labelled by the Cambitoglou team during the wall-top surface clearance of the D and H areas carried out in 1971, the interior space of the room had not been excavated prior to 2013.

¹⁵ Meditarch 2014, 118 nn. 9–10. Thanks to the partial conservation of 13-080 by Wendy Reade in 2015, Anne Hooton was able to reconstruct the profile of the vessel on paper. Its dimensions are as follows: preserved height 117 cm; interior neck diameter 46 cm; maximum diameter 115 cm; estimated capacity >800 litres.

for the back filled soil, after which the pithoi were set in place prior to the final enclosing of the room. This sequence provides the first incontrovertible evidence that the emplacement of storage silos (pithoi) was an integral part of the planning for house construction of the Zagorians.¹⁶

The *terminus post quem* for the construction of the room is provided by the levelling fill within the declivity. From its lowest levels the fill includes fragmentary material dating to LG II. Unit 23, the top layer of the levelling fill over the declivity, extends across the higher bedrock to the south and south-east. The presence of wall stones in / on this level suggests that the floor surface in this area may have been broken up during final collapse, so that the deposit associated with the original surface in the west quadrant of the room may not have been identifiable during excavation. Clay hearth-lining fragments were recovered from the context pottery from Unit 23 and Unit 27 below it (**pl. 51**).¹⁷

In Trench 4 somewhat further to the south, work continued on room M3, a domestic unit with a central hearth and benches built against its east and north walls, entered via a door in its west wall (see **ppls. 52–53**).¹⁸

The central hearth, delineated by stone boundaries (displaced by collapse), was surrounded by four stone post-bases, of which three survive *in situ*. Careful documentation of all the pottery recovered from the lowest levels of final occupation fill (i.e., the deposits from which complete vessels were recovered) allowed us to establish that the floor matrix of the final occupation had been broken up during the building collapse. We are able to confirm that the floor matrix had been disturbed, as there were high percentages of small worn fragments of residual material of both fine- and coarse-ware vessels distributed evenly across the room. Joining fragments of reconstructable vessels found within the uppermost room deposits include fine-ware serving and consumption vessels, and coarse wares restricted to small cooking pots, at least two hydriai and a rope-band pithos.

Removal of the disturbed final occupation levels revealed a clayey surface across the room, associated with the footings of the benches, the hearth stones, and the post bases (i.e., floor 2); the floor matrix is datable to LG II. Continued excavation in the NW quadrant of the room revealed two further surfaces overlying bedrock. The lowest surface ‘floor 3’, which cannot at present be associated with any of the exposed wall footings, is dated by pottery fragments which are MG and SPG in style (e.g., **pl. 53: 2**: 14-200, 14-244, 14-258, 14-593, 14-594). Fragments of clay hearth-lining were also recovered from this deposit, similar to the hearth-lining fragments found in the D26 sub-floor levelling (Inv. 14-674: **pl. 53: 3**).

Full documentation of the wall construction, and the relationship between floor surfaces and wall footings in those areas where the room was excavated below the upper preserved floor, indicate that M3 is part of a larger complex of rooms/defined spaces, that may have been remodelled more than once, from the MG period until the end of the settlement.

Exploration of the open-air space (M4) immediately to the west of M3 commenced with the excavation of Trench 10 (see **ppls. 44, 54**).¹⁹ It was found that the natural topography of the area, sloping downwards from west to east as evidenced by an east/west sondage that

¹⁶ G. London, *Ancient Cookware from the Levant. An Ethnoarchaeological Perspective* (2016) 43 for a modern ethnographic parallel.

¹⁷ The identification of these fragments as clay hearth-lining is based on the rectilinear form, relative size to thinness of the floor, and the carbon black upper surface which does not extend to the vertical edges. The only potential parallel is a fragmentary clay “baking tray” found dumped in an

ash pit in phase 3 levels (Late Archaic period) at Sindos (S. Gimatzides, *Die Stadt Sindos: eine Siedlung von der späten Bronze- bis zur klassischen Zeit am thermäischen Golf in Makedonien* [2010] 70 n. 322 Beil. XVIIIId) but in that instance there is no mention of carbon blackening of the upper surface.

¹⁸ Kristen Mann supervised excavation of Trench 4 (M3).

¹⁹ Antonio Bianco supervised excavation of Trench 10 (M4).

reached bedrock across TR10,²⁰ meant that room M3 had been constructed at a lower level than the adjacent open-air space. The drop in ground level from exterior to interior surface was addressed by the provision of a clay step in the doorway through the west wall of M3. Similarly, the west side of M4 was furnished with a largely rubble wall running north/south that evidently terraced the area to the west; it meets up with an outcrop of bedrock at the south. Between wall and outcrop, deliberate landscaping is seen in the insertion of at least one wide stone step, comprised of a schist slab on a constructed foundation, to provide access to the higher ground to west (**pl. 54: 2**). The finding of a large lump of slag (weighing 634 g) in the collapsed construction of the east bench of M3 in 2013 was echoed by the discovery of ample quantities of slag in the open-air space of M4: at least three of these slags could be identified as smithing hearth bottoms.²¹ As these slag pieces were found in what appears to be tumble from the terrace above to the west rather than in a closed cultural deposit, it is as yet unknown at how great a distance from M3 the smithing activities represented by the slags took place.

The 2014 season saw the complete exposure of the two-room structure (M1, M2) at the south end of the site (see Trench 6 on **pls. 44, 55–56**).²² In contrast to the many agglutinative schist-built domestic structures located further to the north on the site, this apparently free-standing structure is built of marble rubble masonry and partially hewn out of the marble bedrock. The whole structure measures 11 x 6 m and is divided into two roughly equal halves by a cross wall (**pl. 57**). M2, up slope, was the first unit of this two-room structure to be built. On excavation, lenses of clayey roof fall were encountered. These are best evinced by the clayey material overlying the revealed schist disks (visible as found leaning against the wall in **pl. 58**) and transport amphora 14-066 in the south-west corner. A post base was located at the centre of the room. Its builders had levelled the bedrock at its south-eastern end; the natural form of the bedrock was retained along the north-west side of the room (**pls. 55: 2; 59: 1**). Subsequently, M1, excavated in 2013, was constructed to the south-east. This required cutting away the bedrock in the north-west of this room to a level roughly 25 cm below the floor level of M2 (**pl. 60: 3**). It also required terracing at the south-east to account for the drop in ground level. In conjunction with the construction of M1 the original door of M2 in M1's north-western wall was blocked and a new one opened in M2's south-western wall (**pl. 60**). M1 was also equipped with a door in its south-west wall. M1 possessed a central hearth flanked by two stone bases for roof support, and a schist bin. By contrast, in M2 a bench with pot emplacements was constructed of marble rubble along the north-east wall which extended to the existing bedrock in the room's northern corner. Moreover, within the small quantity of finds recovered from this complex, a larger proportion of fine-ware vessels, especially drinking cups, was excavated in M1, while M2 yielded among other things one rope-band pithos, 2 small cooking jugs, and the well-preserved transport amphora 14-066 whose distinctive fabric suggests that it is from the north-eastern Aegean (**pl. 61: 1**).²³

Clear evidence of use of the partially collapsed room in the period after the abandonment of the site emerged from M2: a black-gloss late-fourth-century lamp (inv. 14-176, **pl. 61: 2**) was found on top of the roofing collapse but below the wall collapse. This find suggests that the still standing walls of the structure offered some periodic shelter (at least from the wind) well after the abandonment of the site.

²⁰ Note the sondage stops at c.32 cm from the west wall and entrance of M3.

²¹ These pieces were identified by I. Vetta.

²² Andrew Moore supervised the excavation of Trench 6 for weeks 1–3; Paul Donnelly carried on supervision of fieldwork for weeks 4–6.

²³ For which see Paspalas art. cit. (n. 10) 236–7 fig. 12a–b.

TRENCH 11

Located some 50 m to north-north-west of Trench 9 and some 8 m west of the inner face of the fortification wall, Trench 11 initiated investigation of one of the more level zones of the site (see **pl. 44**).²⁴ Four discrete areas were excavated within its confines (**pl. 62: 1**). Results from the 2012 Geophysical Survey (Zone 4) had already indicated that this flat zone comprised a range of divergent structures, including what appeared to be two parallel walls.²⁵ Excavation revealed elements not hitherto seen at the site: in Area 1 a wide road-like surface running north-east/south-west above a cobble packing adjacent to a wall was crossed by a stone-lined channel, probably intended to guide water flow. At the SW in Area 3 a small three-walled structure (E4) of seeming industrial character was only partially cleared of deep layers of clay-roofing collapse heavily disturbed by wall rubble. All features and finds recovered from this extensive collapse indicate that it was a processing area. Raw clay lining or installation fragments were recovered throughout the lower tumble, knocked out of place (**pl. 62: 2C–D**). A clay-lined schist installation was partially exposed in the north-western corner of the room. Other finds thought to be associated with final use include a small 3-handled storage jar with a relief-rope band on the shoulder, and a schist block remodelled as a mortar or press (**pl. 62: 2**). A small portion of the room was excavated below the wall and roof tumble, exposing an ash layer. None of the clay features recovered from this room show any signs of firing through use. Further investigation as well as testing of samples taken for residue analysis are required before the nature and function of the structure can be determined. Associated pottery finds date its final period of use to LGII (see **pl. 63: 1** for a probably Cycladic fragment: 14-249 and two Euboean pieces: 14-250 and 14-268). Some evidence of MG-date activity in the area was recovered.

GENERAL

Based on discussions and experience from the first two field seasons a fully digital excavation recording system was employed in the 2014 season. The approach to excavation adopted was a modern system of identifying and recording stratigraphic units based on the principles outlined by E. C. Harris.²⁶

Analysis of the workflows from the 2013 season informed the development of a refined suite of recording forms implemented, as previously, in Open Data Kit Collect and used on Android tablets.²⁷ The forms were designed so that the recorded data integrated seamlessly with the existing project database which holds the data from the previous seasons, the ongoing artefact recording, and the digitized records from the 1967–1974 excavations.

The two most important forms were based on the concept of a traditional journal. The primary form was the Unit Journal that stored all the information about each unit being excavated each day. This form had three versions depending on whether the unit

²⁴ Hugh Thomas supervised excavation of the four areas of Trench 11 between bouts of aerial photography and photogrammetry.

²⁵ See *Meditarch* 25, 2012, pl. 3d for diagrammatic interpretation of geophysical survey, especially the area to the south of the modern field wall. Excavation in this area had been avoided in modern times because when the Cambitoglou team first arrived, it was under plough, leading to the expectation that modern agriculture had damaged the archaeological evidence too greatly.

²⁶ *Principles of Archaeological Stratigraphy* (2nd ed., 1989).

²⁷ The forms and database processes were developed by Stephen White, the project programmer and system administrator. For a more detailed technical description of the development and implementation of this type of form, see A. Traviglia–S. White–A. Wilson, ‘Beyond Spreadsheets: Digitising the Archaeological Artefact Inventory Process’, in: F. Giligny *et al.* (eds.), *CAA2014: 21st Century Archaeology: Concepts, Methods and Tools. Proceedings of the 42nd Annual Conference on Computer Applications and Quantitative Methods in Archaeology* (2015) 541–8.

was a deposit, structure, or interface. There was also a Trench Journal that recorded daily information not concerned with individual units such as personnel, changes of extent, and backfill procedures.

To supplement these basic forms there were others designed to be used independently but linked to the unit or trench. These included an Excavation Point of Interest form to record details within an excavated unit, such as a concentration of artefacts or change of colour or texture; a Bucket Count form to record quantification of significant deposits; and a Bag Tally form to document the artefacts and samples recovered each day.

Not all records could be collected on the tablets and not all recording could be digital but the system aimed to include a record of all field recording activities in the database. This was achieved with a group of recording session forms. Total station and dumpy survey sessions were recorded in their own forms, as were (non-tablet) photographic and drawing sessions. Once imported into the database these sessions provided a record to which the collected data could be linked.

In all cases the forms were automatically time-stamped and most information, such as team members or recording device, was drawn from drop-down lists ensuring standardization and reducing the burden of recording repetitive administrative information. Forms also included provision for sketches and photographs created on the tablet. The tablets were provisioned with other resources including reports and records from the earlier excavations.

At the end of each day the data on the tablets went through a two-stage import process. First the completed forms and any attached files were uploaded to the database as an archival record, then the data was automatically processed to create new records within the database structure, not the form structure, and linked to any number of other records already in the database. This process meant that daily and automatically all field and lab records were linked directly to all relevant aspects of five decades of accumulated research.

The imported data was processed again and exported as a web page containing all unit journal entries grouped by trench and unit and sorted by date. To provide an overview of the developing record a 'traffic light' display was devised. This listed each unit and displayed a green dot for attributes recorded and a red dot for those still to be completed. Attributes not appropriate for the unit type were shown in grey.²⁸ This daily update of the complete excavation record was available on all tablets on site.

All significant contexts were sieved, and wet-sieving (flotation) was used for sensitive contexts across the site. In addition to an extensive faunal record, including some marine remains, a notable volume of archaeobotanic remains has emerged. All are currently under study, as are samples for residue analysis that have been taken from selected ceramics and installations.

Fragments of clay-installations were recovered from a range of non-domestic contexts that are, on the basis of present knowledge, concentrated in Areas E and F near the entry gate. They include the TR11 manufacturing area (E4) and the MG waste dump F. Thanks to their recovery, we are also beginning to get a picture of a range of potential economic production activities carried out at the settlement since its founding.

Another particularly noteworthy feature of the 2014 campaign is the significant number of transport amphora fragments recovered from a number of rooms. These include fragments found in the declivity whose excavation started in 2012 (in Trenches 2, 3, 8, and 9). These fragments should date to the first half of the 8th century if not the late 9th as some of the accompanying fine wares do; those from Trench 6 date to the latter part of the 8th. All

²⁸ This feature was devised and implemented by programmer Steven Hayes at the beginning of the field season.

these fragments represent imported vessels and provide important evidence for Zagora's incorporation into a network in which primary produce was exchanged with other centres. The pre-fired markings (pl. 46: 2) on some of the excavated pieces underline the complicated nature of these exchange processes.

At the end of the 2014 fieldwork season, all trenches were lined with geotextile. In the case of trenches 4, 5, 6, 7, 10, and 11, excavated ancient walls were protected by sheathing them with a skin of stones atop a layer of geotextile. All trenches were then backfilled with soil and stone rubble. Furthermore, conservation was undertaken in 2014 (and in 2015) by a team led by Stefania Chlouveraki on significant portions of the architectural remains excavated in the 1960s and 1970s.²⁹

APPENDIX: AERIAL PHOTOGRAPHY AND PHOTOGRAMMETRY

H. Thomas

During the 2014 season, the Zagora Archaeological Project introduced two new photographic recording techniques to complement the digital recording practices already utilised at the site. Drone aerial photography and photogrammetry were used individually and in tandem on both a macro and micro scale to record archaeological features uncovered.

Owing to the extreme weather conditions experienced at the site during previous seasons, it was decided to replace the kite photography system used in 2013 with a custom modified Unmanned Aerial Vehicle (UAV) or drone. This technology would not only allow aerial photography on calm days which previously rendered the kite inoperable, but would also provide a more balanced aerial photographic platform.³⁰ Drone photography was performed with a DJI Phantom 2 Quadcopter carrying either a 12.1mp Canon S110 compact camera on a static mount, which was used for trench photography, or a GoPro Hero 3 on a 90 degree mechanical gimbal used to capture photographs of the landscape and hinterland of the site. The field of view of both cameras was transmitted via a Boschom Wireless Video Transmitter to a monitor on the drone controller, allowing the pilot to precisely frame the photographs.

In total, 3902 photographs of Zagora were captured via the drone, providing a significant contribution to the recording of the site. Photographs primarily focused on trenches during excavation, as well as on important *in-situ* remains. Furthermore, 851 oblique photographs taken from high altitudes were shot using the GoPro camera. These photographs will assist in analysing Zagora's relationship to the sea and to potential trade routes along the western coast of the island.

The season also benefited from both terrestrial and aerial photogrammetry. Photogrammetry involves the creation of highly accurate three-dimensional models from a series of two-dimensional images using the 'Structure From Motion' technique.³¹ This

²⁹ For a report on this conservation programme, see S. Chlouveraki, 'Προληπτική και επεμβατική συντήρηση αρχιτεκτονικών κατάλοιπων στην Ζαγορά 1974–2016', in *op. cit.* (n. 3).

³⁰ H. Thomas, 'Quantitative analysis of two low-cost aerial photography platforms: A case study of the site of Zagora, Andros, Greece', *JFieldA* 2016, 1–11 doi:

10.1080/00934690.2016.1208551.

³¹ N. Snavely–S. M. Seitz–R. Szeliski, 'Photo tourism: Exploring photo collections in 3D.' *ACM Trans. Graph* 25, 2006, 835–46; N. Snavely, *Scene Reconstruction and Visualization from Internet Photo Collections*, PhD Thesis, University of Washington, Seattle (2008); G. Verhoeven, 'Taking computer vision aloft—archaeological three-

technique can reconstruct the geometry of an object through calculating minute directional changes in photographs taken with a significant overlap. Photogrammetry software, like *Agisoft Photoscan*, which was utilised by the project, can then overlay a texture onto this geometry, creating a three-dimensional model that is accurate, often to under 1 cm. Scale is provided to the model through the importation of manual measurements or Total Station data, allowing the photogrammetric software to provide accurate measurements from any two user-defined points.

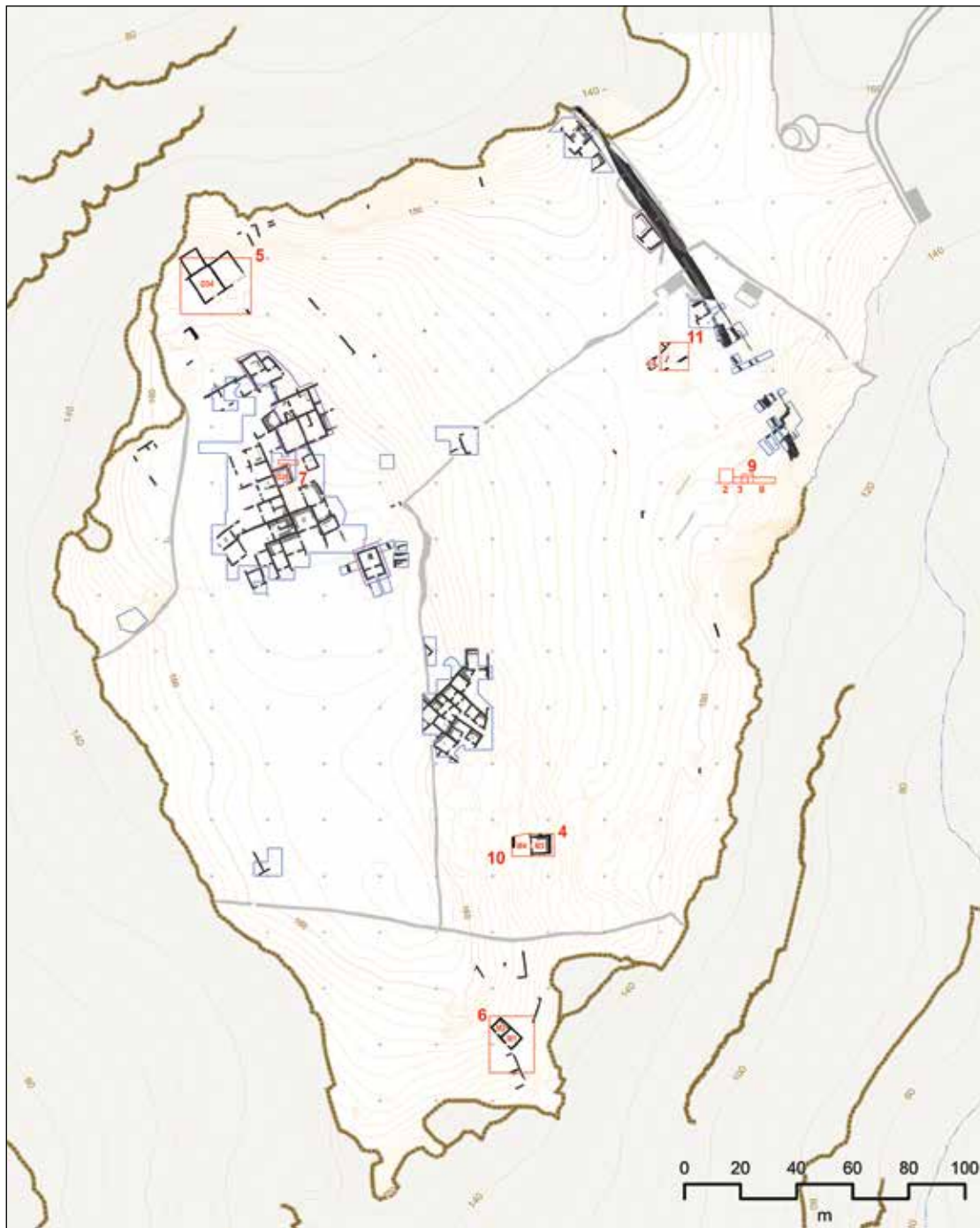
Photogrammetry at Zagora was performed with a 16.1mp Nikon D7000 DSLR. In total, 47 photogrammetry models were produced in the 2014 season, focusing on a variety of subjects including *in-situ* finds, trenches, and extant archaeological remains. Photogrammetry was especially significant in the recording of architectural remains in those trenches destined to be permanently backfilled at the conclusion of the season. These models, along with more traditional recording methods, assisted in digitally preserving these buildings and providing easy access for future analysis of the remains through online 3D modelling portals. A secondary benefit of *Agisoft Photoscan* is that it can produce a series of different outputs that benefit other facets of archaeological recording.³² On several occasions, highly detailed orthophotographs were produced of an area to facilitate the production of more traditional plans.³³ This technique was especially beneficial for Trench 5, where complex areas of wall collapse would have required several days of analogue planning (**pl. 46: 1**). Instead the area was terrestrially photographed and an orthophotograph with millimetre resolution and precision was produced in a matter of hours, allowing the quick creation of a digital plan (**pl. 63: 2**).

Finally, through a combination of drone photography and photogrammetry, a site model was produced of the Zagora peninsula (**pl. 64**). Over the course of several days, transects of the site were flown at an altitude of 30 meters above ground level, with photographs being taken every 4 seconds. Unfortunately, due to worsening weather conditions at the end of the season, only 80% of the site was photographed. However, a sequential series of photographs taken by Kite Aerial Photography in 2013 covered the missing 20%. In total, 2,357 photographs, 274 taken by kite and 2,083 by drone, were processed. The resulting photomosaic has a maximum resolution of per 1.2 cm per pixel, far exceeding that yielded by current commercial satellite imagery.

dimensional reconstructions from aerial photographs with photoscan', *Archaeol. Prospect.* 18, 2011, 67–73; M. A. Fonstad *et al.*, 'Topographic structure from motion: a new development in photogrammetric measurement', *Earth Surface Processes and Landforms* 38, 2013, 421–30.

³² AgiSoft Photoscan User Manual: Professional Edition, Version 1.2 (2016), 19–22. Available at: http://www.agisoft.com/pdf/photoscan-pro_1_2_en.pdf.

³³ J. de Reu *et al.*, 'Orthophoto mapping and digital surface modelling for archaeological excavations: an image-based 3D modelling approach', *Digital Heritage International Congress 1*, 2013, 205–08; H. Thomas–M. A. Kennedy, 'A new methodology for accurate digital planning of archaeological sites without the aid of surveying equipment', *JASc Reports* 2016. doi: <http://dx.doi.org/10.1016/j.jasrep.2016.06.006>.



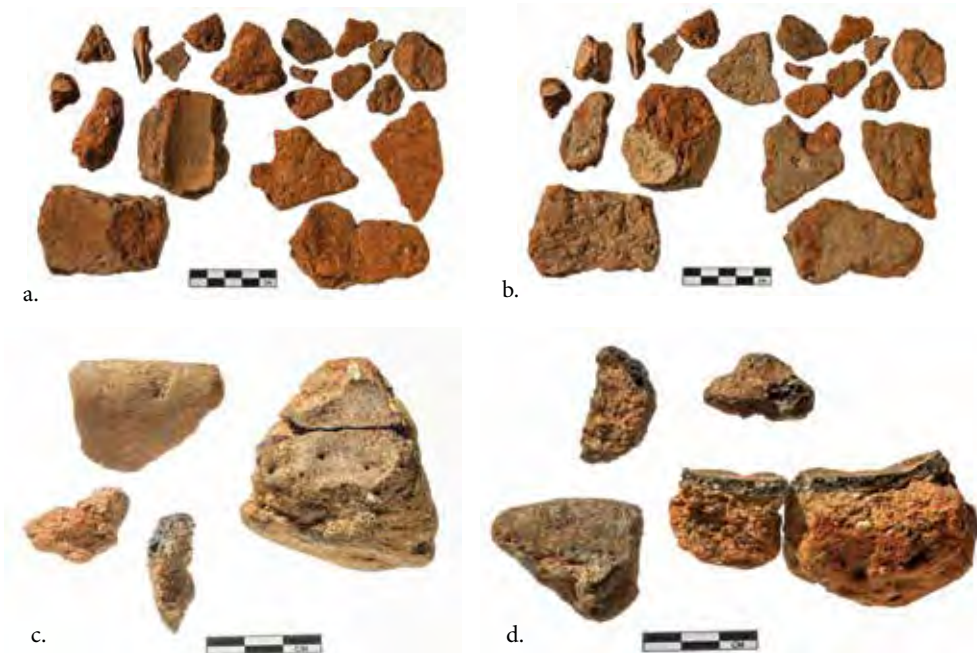
Zagora site plan. The 2012–2014 trench locations are shown in red, 1960 Zapheiropoulos excavations are outlined in purple, and 1967–1974 excavations and clearance areas in blue. Excavated and recorded features are black, modern structures and fences are semi-transparent grey, removed field walls are indicated by dashed outlines. Site contour interval is 0.5 m, off site contour interval is 5 m. Plan uses Hellenic Geodetic Reference System 1987 projection and datum. (Survey data: R. Anderson, J. J. Coulton, M. McCallum, K. Mann, A. Wilson. This plan: A. Wilson.)



1. Trenches 3 and 8 at the end of the 2013 season. View from E (H. Thomas). The eastern boundary of the doline ridge is in the foreground at the boundary of TR8, excavated to the top of the compacted 'road' surface.



2. TR9 excavated to bedrock. Final photograph at end of 2014 season. View from E. The compacted 'road' surface which seals the MG refuse deposits is visible in the baulk at right, marked with a red arrow.



3. a-b) 14-705: clay-installation fragments from Trench 9 unit 10; c-d) 14-218: clay-installation fragments with vitrified or slag covered surfaces.



1. Trench 5 (D34). Aerial view, and associated structures (H. Thomas).



2. Trench 5 (D34). Imported coarse and semi-coarse ware neck-handled amphorae. a) 14-092; b) 14-173, amphora handles with pre-firing marks; c) 14-166; d) 14-175; e) 14-147; f) 14-100.



1. Trench 5 (D34). Fine-wares found *in situ* in clusters on the floor. a) 14-057; b) 14-053; c) 14-051: i. conserved; ii. detail of partially conserved shoulder and neck showing notches in the lower neck for attachment of the upper neck.



2. Trench 5 (D34). 14-171: Fragmentary neck of a small neck-handled pithos with incised figured panels and stamped borders.



1. Apparent clayey surface with two schist disks resting against the walls in the South corner of the room.



2. Uneven clayey deposit with a scatter of schist discs.

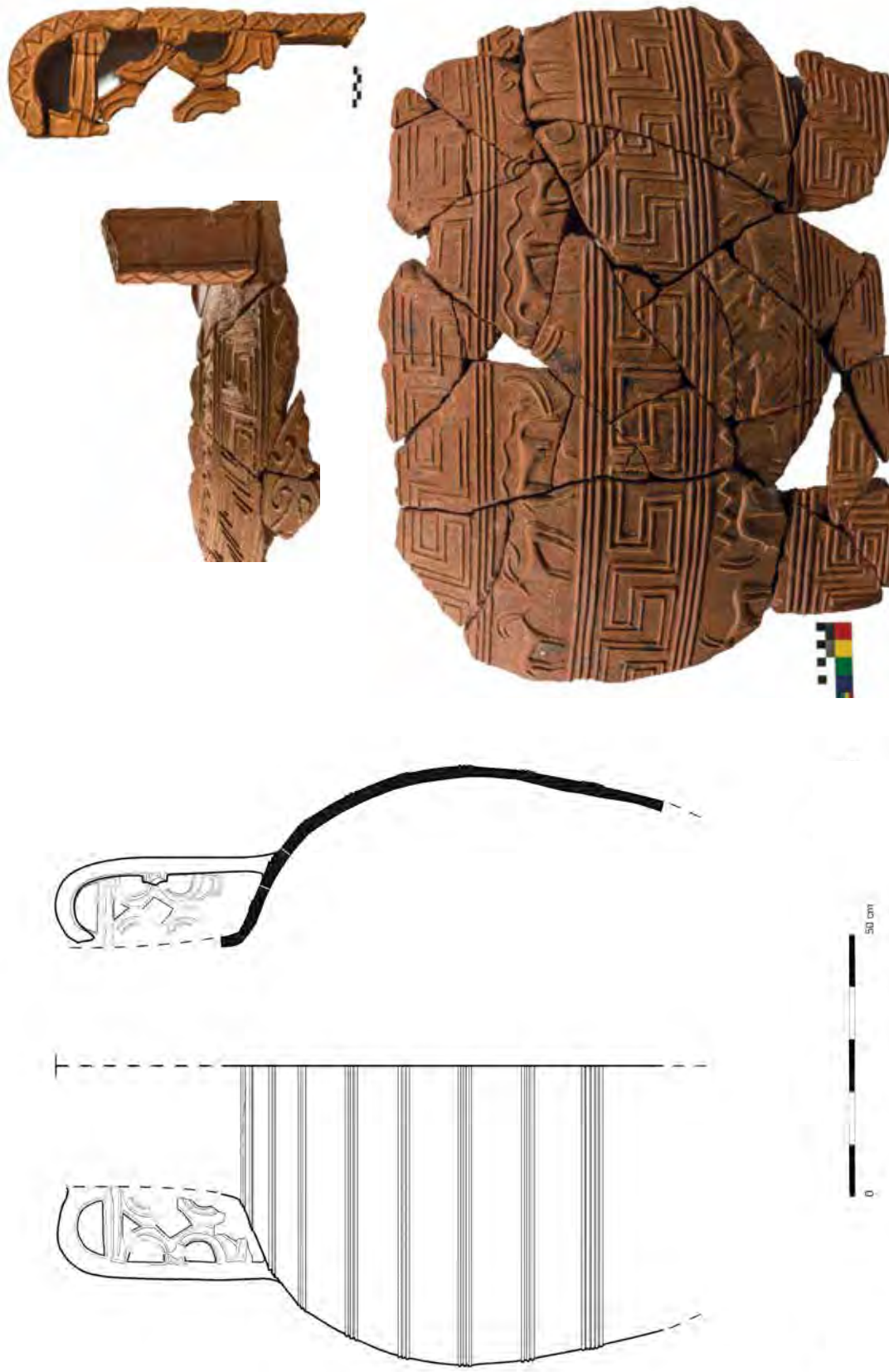


3. Detail of schist disc scatter in south corner of the room, roofing clay bedding clearly visible.

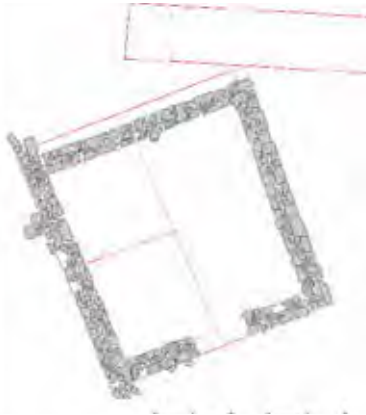


4. Hydria neck re-used as stand, displaced from schist disk support base (14-167 on 14-345 after clearance of roof fall deposit in the W quadrant).

TR7 (D26). Deposition sequence in the south corner of the room: evidence of episodic roof fall collapse, and some use of the room between each collapse.



Trench 7 (D26). 13-080 profile drawing (A. Hooton); details of the shoulder, a fenestrated handle and the shoulder to lower body zones.



2. TR 7 (D26). Clayey surface revealed under the pithos layer removed in 2013.



3. TR7 at the end of season, from SW.



4. TR7 at the end of season, from SE.

1. Trench 7 (D26) Initial construction phase. Stone by stone plan of the walls (A. Wilson); schematic plans of H18-H20 H17 before and after the construction of D26 (K. Mann).



Trench 7 (D26). 14-520. Clay hearth-lining fragments from units 7.23 and 7.26: views of upper surface and underside.



Trench 4 (M3) at the end of the 2014 season. View from N and stone by stone plan (K. Mann).



1. Trench 4 (M3) at end of the 2014 season. NW quadrant with bedrock in the foreground. View from W.



2. Trench 4 (M3). Imported pottery from floor 3 and subfloor matrix. a) 14-244; b) 14-258; c) 14-200; d) 14-594; e) 14-593.



3. Trench 4 (M3). 14-674: Clay hearth-lining fragment from lowest sub-floor matrix. Upper face, underside, and core.



1. Trench 10 (M4). General view at the end of the 2014 season. View from E.



2. Trench 10 (M4). View of constructed wall and step to adjust to change in elevation along west side of open-air space. The stepped entrance into Room M3 is visible to right.



1. Trench 6 (M1 and M2). General view at the end of the 2014 season. View from W.



2. Trench 6 (M2). General view at the end of the 2014 season. View from SW.



1. Trench 6 (M1). General view at the end of the 2014 season. View from NE.



2. Trench 6 (M1). General view at the end of the 2014 season. View from SW.



Trench 6 (M1 and M2). Aerial view of structure as excavated. Oriented to W (H. Thomas).



a.



b.

Trench 6 (M2). South quadrant during excavation, from SW: a) A lower roof fall collapse surface with 14-166 in the right foreground broken *in situ* during the initial building collapse, filled with roofing clay; b) clearance of the lowest roof fall lens, exposing bedrock and body fragments of 14-166 that fell between bedrock and a stone block during the initial collapse phase.



1. M2 looking north. The room has a single roof post, a floor of levelled bedrock, and an entrance down slope in the SE wall, founded on bedrock. During its construction the cutting into the natural slope anticipated the presence of a bench that could utilize the bedrock along the NW wall opposite the doorway.



2. M1 looking north. The room, built after M2, has an entrance on the SW wall, two roof posts, an earthen floor, a central hearth, and a bin in the eastern corner. The original doorway of M2 to the north was sealed and a new doorway for M2 opened in the SW wall.



3. M2 (after the alteration of entry), looking north: crudely modelled bedrock, central roof post, bench constructed along the NE wall, and Lesbian transport amphora inv 14-066 recovered from the southern corner.

Tentative reconstructions of building phases for rooms M1-M2 (A. Wilson).



1. General view from NE.

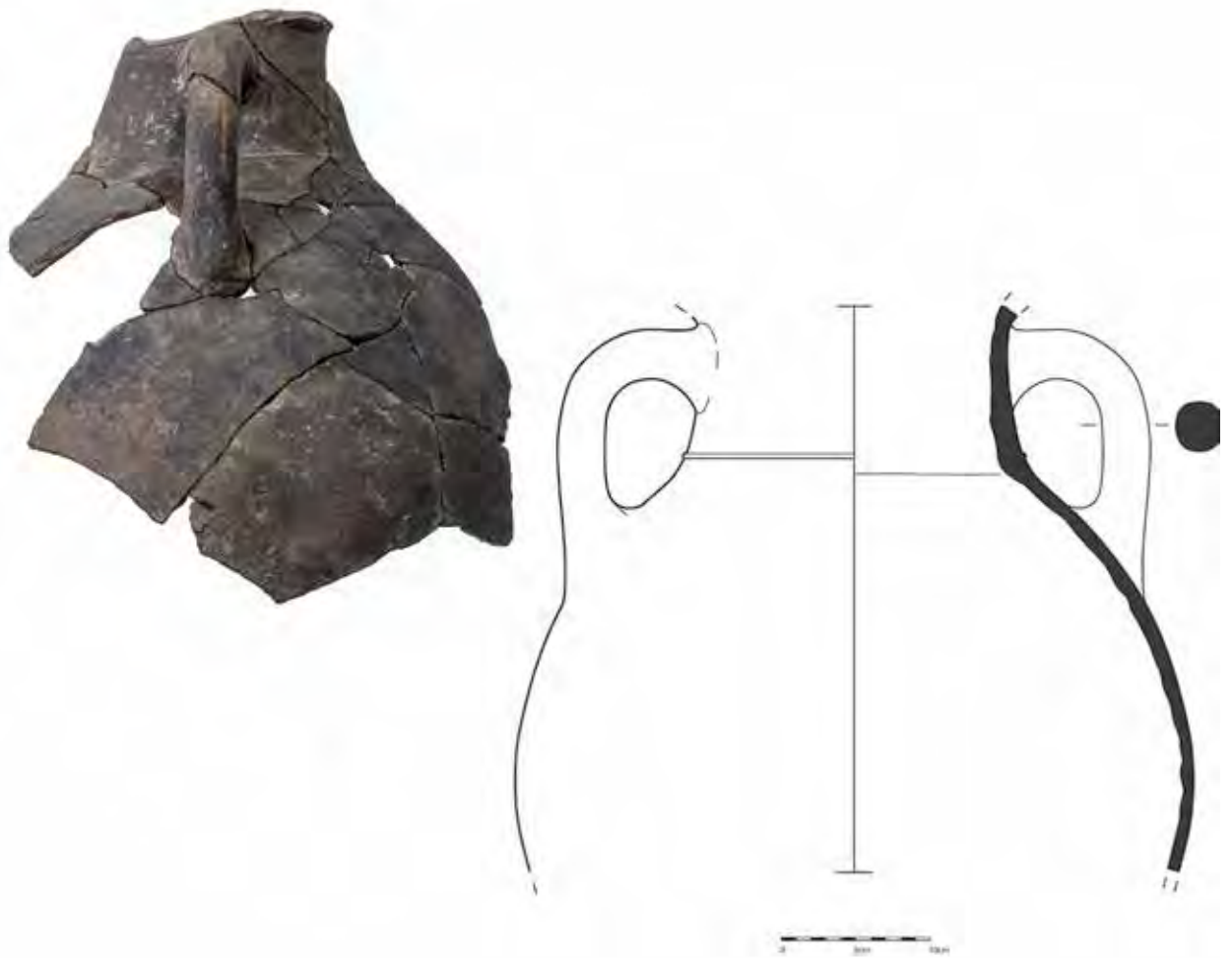


2. Detail of the stone fill of the former doorway in M2. View from NW.



3. Detail of the stone fill of the former doorway in M1. View from SE.

Trench 6 (M1 and M2). Views of the spine wall between M1 and M2 at end of season.



1. Trench 6 (M2). Transport amphora found broken *in situ* in the S corner of M2. 14-066 (drawing A. Hooton).



2. Trench 6 (M2). Lamp found in the upper wall tumble / collapse in the E quadrant of M2. 14-176.



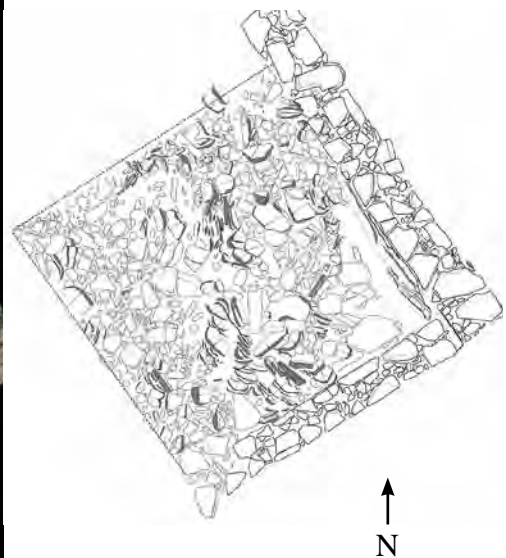
1. Trench 11. Aerial view at end of 2014 season: the four excavated areas. (H. Thomas).



2. Manufacturing equipment and unfired clay installation fragments from TR11 Area 3: a) 14-744, worked schist block shaped as a mortar or press; b) 14-463, small 3 handled storage jar set into the floor; c) 14-574, concentration of clay feature fragments found in SW of room; d) 14-575, concentration of clay feature fragments found in NE of room.



1. Trench 11 Area 3 (E4). LG II ceramics from the lower building collapse: a) 14-249; b) 14-250; c) 14-268.



2. Left: orthophotograph of Trench 5 wall collapse. Right: Plan produced from orthophotograph. 1:100 (H. Thomas).



Photomosaic of Zagora (H. Thomas).