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RESEARCHES AT THE MONTE ABATONE NECROPOLIS (CERVETERI)

1. State-of-the-art

The 'Monte Abatone' project was launched by Mauro Cristofani, Marina Martelli and Paola Pelagatti in the early Nineties of the last century. The idea was sparked in the years just preceding by M.A. Rizzo's general reorganisation of the Caeretan materials at the Villa Giulia and Cerveteri depositories, which for the first time provided the chance to consider in concrete terms an overall study of the Caeretan necropolis. Well-known since the nineteenth century – albeit limited to some of the truly outstanding monuments, such as the Campana Tumulus, of the middle-Orientalizing period (see Naso 1996, 35-38, with. ref.), and Torlonia Tumulus (Papi 2010), of the proto-Hellenistic period – the necropolis is located immediately to the South of the ancient city (Cristofani 1991, 13, 67-72 and *ad ind.*) and is actually best-known for the finds from campaigns during the Fifties and Sixties of the last century by the Fondazione Lerici, using what was at the time a revolutionary new geognostic survey system (Lerici 1957; Piro 2016), that could identify the empty spaces of chamber tombs and make it possible to recover their contents. Within a few years, this system led to fundamental discoveries by the Foundation at Cerveteri (not only at Monte Abatone), but also in other major Etruscan centres, like Tarquinia, with extraordinary new finds of painted tombs (Moretti 1966).

The artefacts from Monte Abatone, except for those deposited at the Civiche Raccolte Archeologiche in Milan, made known thanks to the editorial initiative of Milan University (*Milano* 1980 and 1986), remained mostly unpublished. A systematic study of them was consequently considered, despite the difficulties of the lots' being divided among the Banditaccia necropolis, the Museum of Cerveteri and the Museum of Villa Giulia and their respective storerooms, administratively divided owing to the various reforms set in motion by the Ministry for Cultural Heritage. The laborious work of documenting and studying the artefacts – no restoration being possible for many years due to the meagre funds available – has been protracted and can certainly not be deemed complete.

The prosecution of the work has however led to the presentation of numerous scientific articles on several central problems of the necropolis, which today appear less evanescent: reflections on some of the more ancient typologies of tomb ('archaic' or 'semi-constructed'), known at Monte Abatone in the early stages of the research mainly thanks to the so-called

'Taccuini Zapicchi', notebooks of enormous value, kept in the archives of the Soprintendenza, with notes and plans set up by the then-assistant of the Lerici excavations, Cesare Zapicchi (Coen, Gilotta, Micozzi 2014); furthermore, detailed studies on artefacts of the Orientalizing and Archaic period: impasto, brown, red and reddish-brown, from the more 'archaic' types, not lacking in links to tiberine cultures, to the more traditional and apparently predictable presence of *pithoi* and braziers with stamped decoration, all re-contextualised, however, in tomb typologies whose use is clearly not rigidly confined to the old chronological 'phases' established by previous scholars (Coen, Gilotta, Micozzi 2020). Within the same perimeter, other significant new 'details' are recorded, such as peculiar forms in either brown or red impasto, like the *phialai mesomphaloi*, which, apparently with not so close and 'regular' ties to the traditional banqueting sets, now appear to acquire, with their increase in numbers, a not negligible role, of a ritual nature if nothing else.

Much data has also been added to other aspects of the furnishings: from (rare) metal works to imported pottery, from the use and typology of *unguentaria* to the buccheri graffiti, and their connection to the remaining evidence from Caere and southern Etruria, in their functional and ideological contexts. As to the Hellenistic period, the study of black gloss ware, achrome pottery and transport amphorae have started to cast light on the Romanization period and the kind of economic development brought to Caere by the Roman presence, even in such a delicate sector as that of wine containers (Coen, Gilotta, Micozzi 2014, with ref., 2018a, 2018b, 2020; furthermore, Albers *et al.* 2016; Coen 2017a, 2017b, 2018, 2021; *Monte Abatone* 2017; Gilotta 1997, 2013, 2015, 2020; Micozzi 2000, 2016a, 2016b, 2018a, 2018b, 2021; Beck *et al.* 2019-2020). Our research was certainly stimulated by the excellent publication of one of the most outstanding complexes of the necropolis: Tomb 4, published in 2007 by Maria Antonietta Rizzo (Rizzo 2007), witness of the main trends of taste and of the recipients' economic standard of the furnishings at the floruit of the necropolis, twixt Orientalizing and Archaic period (VII-VI cent. BCE), remarkable even when compared with the data of the 'major' Banditaccia necropolis.

With the Italo-German Summer School of 2015-2017 (*Monte Abatone* 2017), the original group consisting of the Università della Campania 'Luigi Vanvitelli' and Università della Tuscia, Viterbo, was joined by the University of Bonn, with M. Bentz, and by the University of Urbino, on the transfer of A. Coen to the latter. Funding from the Deutsche Forschungsgemeinschaft (DFG), from the Dipartimento di Eccellenza and from the numerous VALERE projects launched by the Vanvitelli University, together with the contribution of the University of Viterbo, made it possible, in 2017, to set

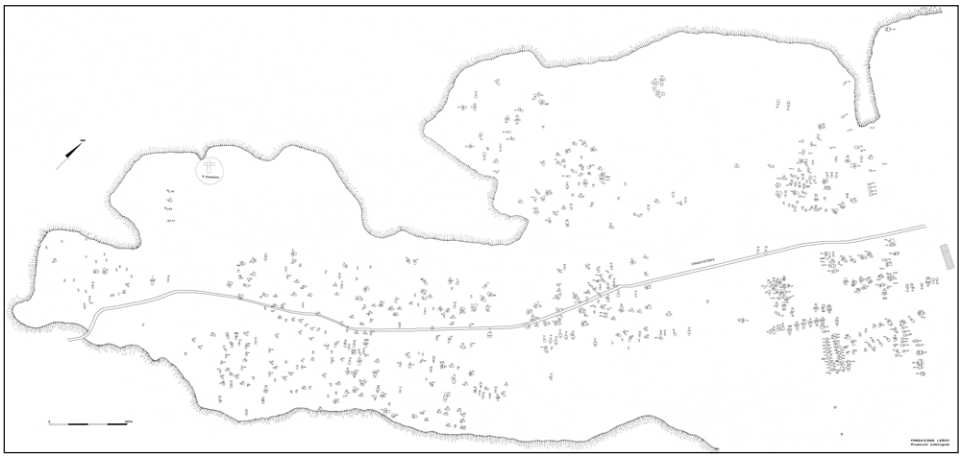

Fig. 1 – Cerveteri, Monte Abatone necropolis. Plan with tombs identified by the Lerici Foundation (courtesy Lerici Foundation, Milan).

up an excavation project, in order to investigate first and foremost the typology of the external structure of newly discovered burials, as well as of those already brought to light by the Fondazione Lerici. Such an excavation could not, of course, aim at an overall control of the Lerici excavations – to which we owe the discovery, let us remember, of as many as 641 tombs – exceeding the possibilities of any Italian, or even foreign, institution, but rather an investigation, if nothing else, of the focal point of the necropolis, the area around the Campana Tumulus, left completely blank on the plan made by the Foundation (Fig. 1), even though it has been the basis of all researches on Monte Abatone published so far. The results of this research will be briefly described below.

The new excavation campaigns (2018-2021) at the Monte Abatone necropolis have thus been launched with the initial aim of clarifying – where possible – the typology of the external structure of tombs brought to light during previous and recent excavations. Particular reference is made to the 'management' of the space around the Campana Tumulus, the dominant monument located at the most visible point of the necropolis, where an analysis of the density of tombs and of the various dimensional and typological modules of the tumuli and burials located close to the principal monument may be fundamental.

F.G., M.B., A.C., M.M.

Right from the start of the works, the approach to the Campana Tumulus area has been accompanied by archive research, firstly at the Rome

headquarter of the Fondazione Lerici, with an examination of relatively complete original images, going back to the time of the Lerici excavations, obtained with the famous sequences of Minox photo shots (Lerici 1960) of the inner spaces of the Monte Abatone tombs and, in some cases, also with the position of the grave furnishings, as for example in the already-mentioned Tomb 4, located moreover very close to the Tumulo Campana.

V.C.

2. Updating the Lerici plan

Parallel to the unfolding of the excavation project, a necessary step was consequently a radical updating of the old plan of Monte Abatone (Fig. 1) produced by the Fondazione Lerici, incomplete – as stated above – and also lacking in any georeferencing. For this reason, the first attempt at 'updating' has involved a topographical survey, studies of cartography and aerial photography (*Monte Abatone* 2017: M. Amadei): 1944 RAF photos (Bradford 1957), to the photographic mosaic of the Monte Abatone plateau using 1930 IGM stills (Tartara 2003, 2018, both with ref.) and finally to photos taken in 1990-1991 by the Regione Lazio and satellite images available on Google.

Furthermore, starting from 2018, L. Lucchetti launched a GIS operating system for the entire Monte Abatone plateau, utilising QGIS software to store and vectorise all the data from the Lerici excavations, as well as from recent excavation campaigns and geophysical explorations carried out on the necropolis by the CNR. At the same time, a report database is being created,

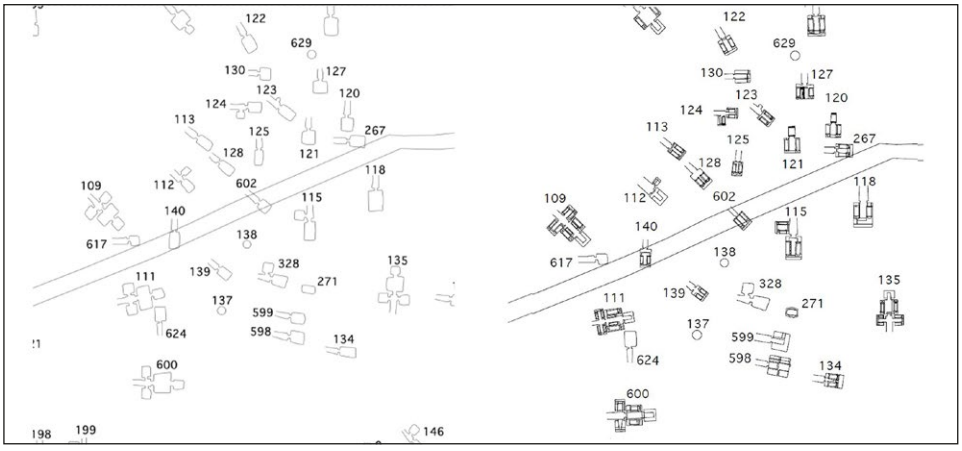

Fig. 2 – Excerpt of the original Lerici plan (left) and of the same (right) with revised layout of the tombs and their inside furnishings (elab. Martina Zinni).

using Filemaker Pro 2018, of all artefacts discovered during the earlier campaigns of the Fondazione Lerici that are still being studied; this database will then be associated on the GIS operating system with the georeferenced plans of the respective tombs of provenance, so as to 'store' all known facts about the necropolis.

L.L.

With this aim in view, AutoCAD 2021 was also utilised to complete the vectorisation of the 641 tombs of the necropolis already excavated by Lerici; this operation was contextually accompanied by a review of the plans, starting from the 'Taccuini Zapicchi' archive sketches mentioned above, of all the tombs brought to light, with a reconstruction (Fig. 2) of their original profile and verification of their internal spaces and furnishings, such as funeral beds, benches, etc.

M.Z.

As a result, at the end of the works, the GIS thus designed should make it possible to consult in sequence the funerary monuments, their revised plans, the related furnishings, and the entire documentation available on both old and recent excavations.

3. Laser scanning, photogrammetry

For the first time, integrated digital survey activities (see, in general, Guidi, Beraldin, Russo 2010; Argenziano 2015; Avella 2015; Bianconi, Filippucci 2019; see also, in general, Garagnani, Gaucci 2020) were carried out both on the Campana Tumulus (Feb. 2021) and on the archaeological excavations around it (September 2019 and September 2021), and subsequently a graphic representation was created in a geo-referenced mesh model, as a first three-dimensional graphic elaboration of the archaeological objects in their natural setting. The survey activities were carried out following well-known scientific protocols on the integration between 3D laser scanner data (Leica BLK360) and multi-temporal GNSS topographic data (Leica GS18T); the scans were acquired with an average resolution of 40,000 points/m^2 and a contextual colour photographic survey was made, with a resolution of 150 Mpx; the GNSS topographic network was created by 60 group control points.

In particular, the Campana Tumulus was captured in 73 scans, and chamber tombs 73, 83, 642, 643, 644, 645, 646 in 36 scans (September 2019); the tombs from 647 to 653 took 133 scans (September 2021). The total cloud-model is about 4.3 billion points, and the Campana Tumulus one is about 1.2 billion points. During the 3D scanning, homologous targets were

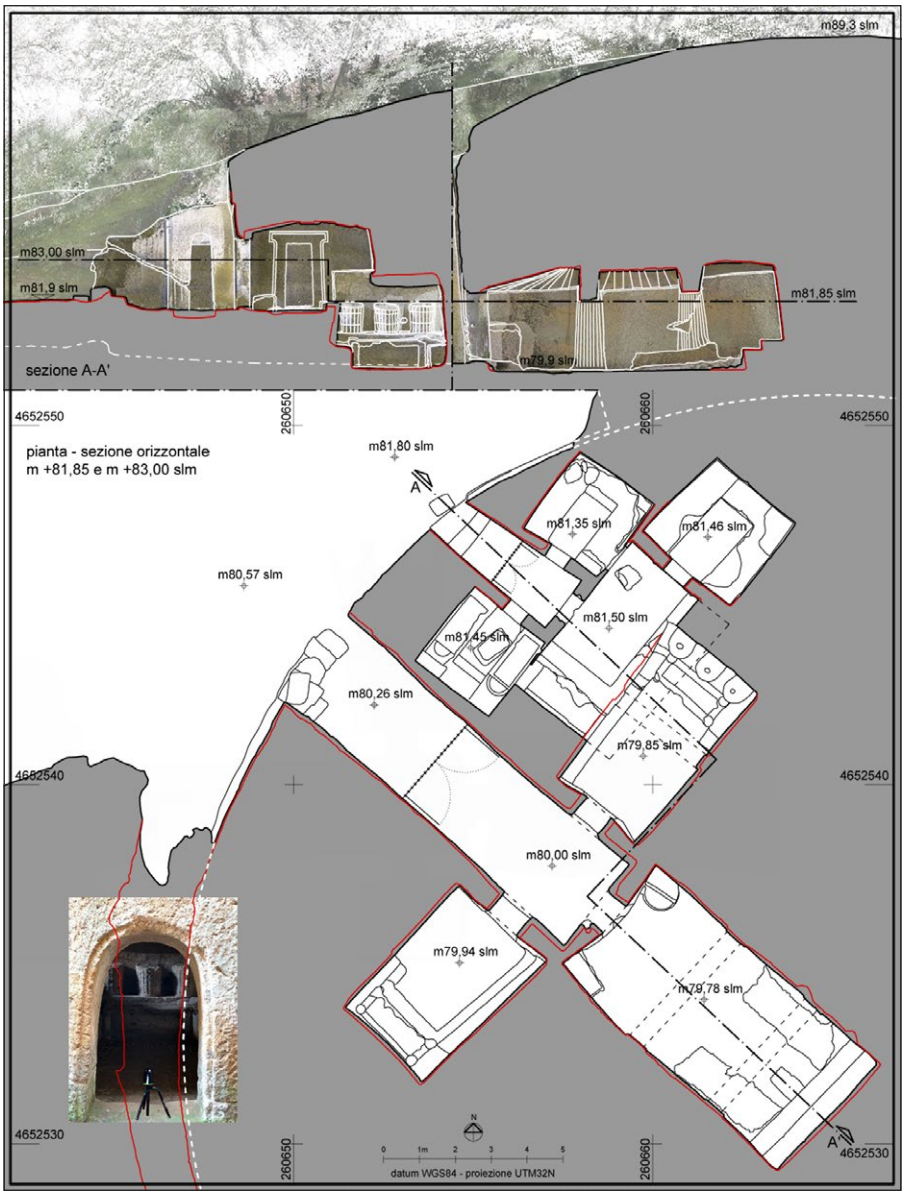

Fig. 3 – Cerveteri, Monte Abatone necropolis. Integrated digital survey of the Campana Tumulus (Febr. 2021). Plan and section are staggered, respectively, to represent the two tombs inside the tumulus. The photorealistic texture in the section is extracted by point cloud model. The red line and short-dashed line concern the edges of the chamber tombs and of the tumulus beyond the section plane (elab. Alessandra Cirafici, Alessandra Avella, Pasquale Argenziano, Teresa Patriziano).

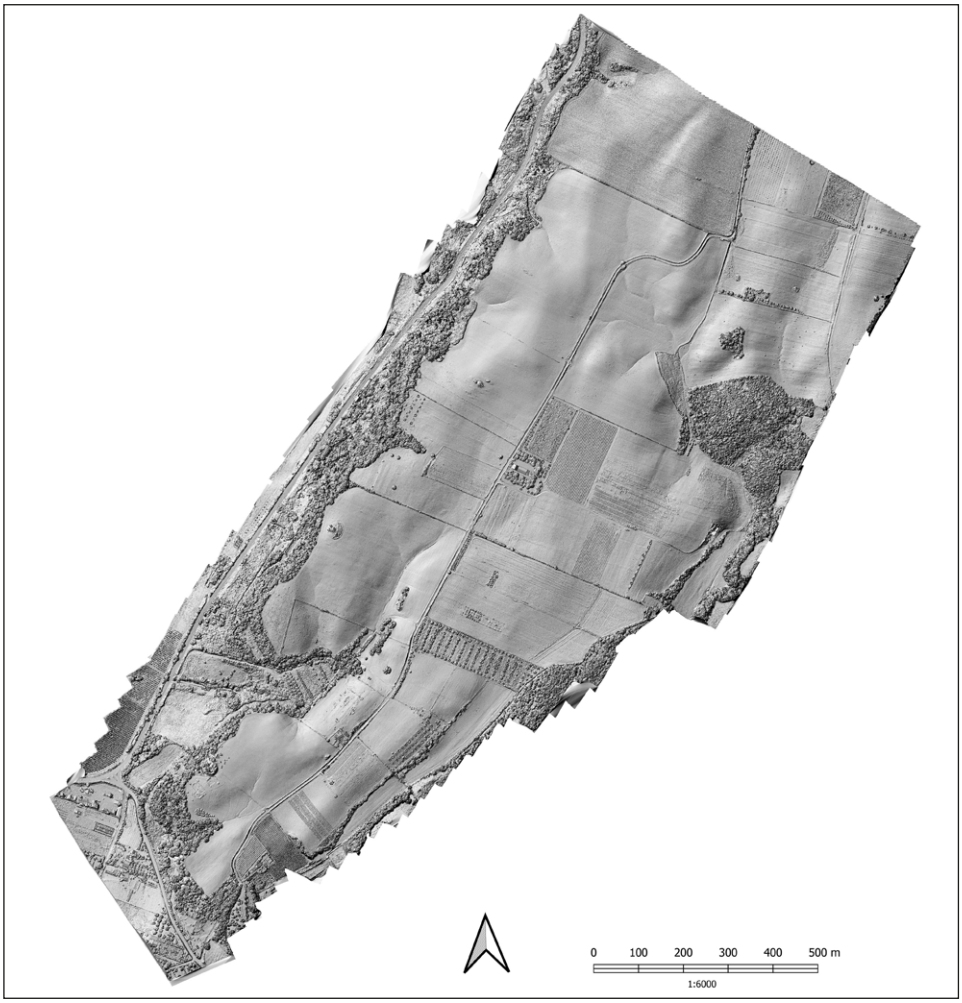

Fig. 4 – Cerveteri, Monte Abatone necropolis. Photogrammetric model of the Monte Abatone plateau (elab. Matthias Lange, Philippe Kluge).

not placed in natural/ archaeological settings, in order to register the point cloud model without artificial elements. The geo-referenced point cloud data was spatially validated by comparison with the official LIDAR Digital Terrain Model (Regione Lazio, 2018, ground resolution: m 1) and with satellite remote sensing data, such as ESA WorldView.

The 3D laser scanning of the Campana Tumulus (Fig. 3) constitutes a novelty in the documentation of the archaeological area and the critical

elaborations resulting and still expected from it are considerable. The survey campaigns carried out about a year apart also led to the acquisition of chamber tombs 73, 83, 642, 646, both *en-plein-air* and buried, with consequent volumetric restitution – point cloud and mesh – of the excavation 'void', a particularly interesting aspect for remote sensing and three-dimensional post-processing evaluations. The meshing modelling was carried out using semi-automatic procedures so that operators could calibrate the degree of detail of the surfaces in relation to the real morphology of the artefact and the density of the point cloud model in the same geometric surroundings.

The 3D modelling of the Campana Tumulus and its surroundings continues with the elaboration of its Information Model according to its specific archaeological characteristics, quite different from those known from existing and project architecture. A further output of the solid model is the restitution of drawings of the excavation areas, also unpublished, through which it has been possible to reconstruct the plano-altimetric relationship of the Campana Tumulus with its immediate natural and archaeological surroundings. The accurate DSM model of the terrain surrounding the Campana Tumulus, including its vegetation cover (elaborated in March 2021), on the other hand, is the fundamental geometric layer against which the next surveys of the archaeological area of Monte Abatone can be systematized, as already experimented in the acquisitions of September 2021.

A.Ci., A.A., P.A., T.P.

The University of Bonn team's contribution to the GIS of the necropolis consisted of a photogrammetric model (Fig. 4) of the entire Monte Abatone plateau (Phantom 4 drone, Agisoft Metashape Pro program; in future a multispectral survey is also foreseen), adding topographical data to both modern and historical aerial photos, as well as geophysical surveys. They also investigated the area to the West and North of the Campana Tumulus including surveys on the borders of the plateau, identifying tombs excavated in the past and in part reburied. These tombs have been included in the plan and, where possible, photogrammetric models have been produced (Fig. 5).

More in detail, the northern area immediately adjacent to the Campana Tumulus was surveyed. A large rectangular altar joined to the tomb was cleaned first, then four chamber tombs built between the VI and III centuries BCE, hence at much later times than the great tumulus. In front of three of these tombs were brought to light terraces for funeral rites, oriented towards the plateau of the ancient city and, in front of one of the chamber tombs, three fossa tombs for children. This whole area has been documented, both

Fig. 5 – Cerveteri, Monte Abatone necropolis. Photogrammetric model of tomb 660 (elab. Matthias Lange, Philippe Kluge).

by laser-scanning (Faro M70 scanner, Autodesk Recap program), and using photogrammetric methods (Nikon D750 device and Agisoft Metashape Pro), to reproduce geographical features and a 3D model of all the area.

M.B., D.B., C.B.
Digital documentation M.L., P.K.

4. Geophysical surveys

The elaboration of the topographical data set provided an opportunity for starting a geophysical prospection, using Magnetic and Ground Penetrating Radar (GPR) methods, with the collaboration of ISPC CNR, in order to verify anomalies already identified by analysis of aerial photos. These geophysical surveys confirmed what was already known and identified new anomalies even where the Lerici plan was blank.

The geophysical surveys were carried out between 2018 and 2021, employing Fluxgate Differential Magnetic and Ground Penetrating Radar. For

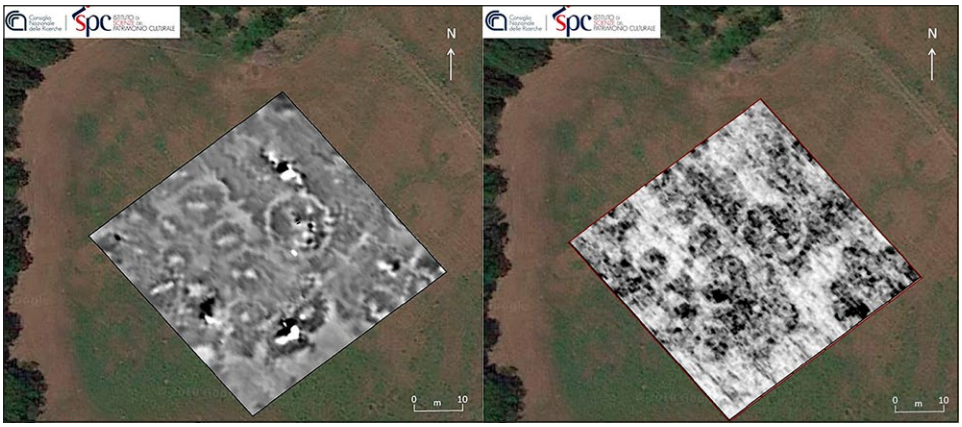

Fig. 6 – Cerveteri, Monte Abatone necropolis, 2018 survey area. Contour map of gradient of Z component of EMF (left). GPR time-slice at the estimated depth of 0.40 m (right) (elab. Salvatore Piro).

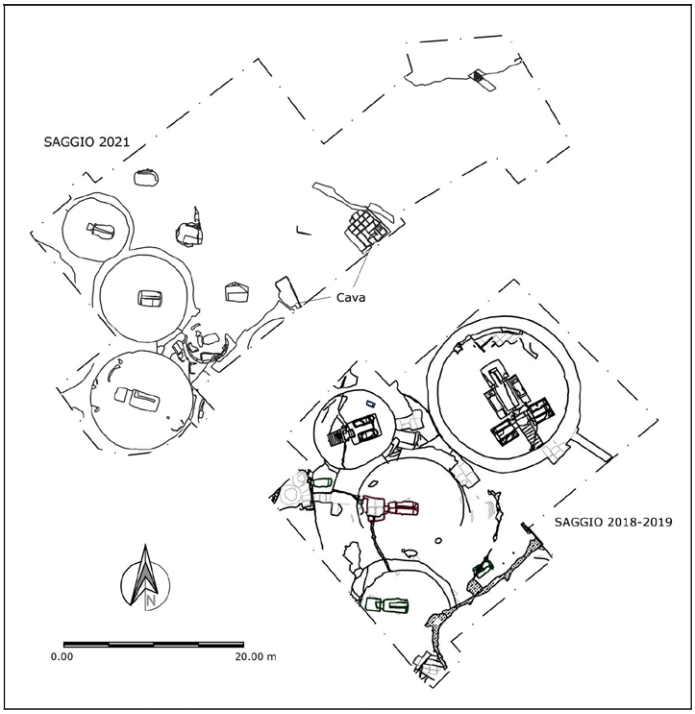

Fig. 7 – Cerveteri, Monte Abatone necropolis, campaigns 2018-2019 and 2021. General plan of the excavations SW of Campana Tumulus (new drawing version Carmelo Rizzo, 2021).

the GPR, the following instruments were adopted: SIR3000 (GSSI) equipped with a 400 MHz antenna, SIR4000 equipped with a dual frequency antenna of 300/800 MHz and a multichannel 3D Radar Continuous system with stepped frequency (Goodman, Piro 2013; Novo *et al.* 2013; Piro *et al.* 2018).

The area of Monte Abatone necropolis, investigated using the magnetic method, was subdivided into several 30×30 m squares. For the measurements, a Fluxgate Gradiometer FM256 (Geoscan Research) was employed, collecting the data using a sampling grid of 0.5×0.5 m. After processing, the results obtained were shown as a contour map of filtered values of the gradient of the vertical component of the Earth Magnetic Field in the range -15 to +15 nT/m (Fig. 6). This figure shows the results obtained in a 60×60 m portion of the area, investigated during the survey of 2018, in which it is possible to recognise a group of graves unmarked on the Lerici plan, opened between the first half and the last decades of the VII century BCE.

During the GPR surveys, the area East of the Campana Tumulus (ca. 3 hectares) was also investigated employing 3D Radar Continuous Stepped Frequency. The sound results obtained in terms of readability using the GPR relate to different depths of soil down to about 2.5 m from ground level (Piro, Malandruccolo 2020). The total surface represented in the GPR images (2D time-slices) exclusively refers to the paths taken by the antenna and is contained within the limits of the areas to be investigated. The project is in progress and further geophysical investigations are planned in the coming months.

S.P.

5. The new excavations: traditional and technological methodologies

The 'system set-up' of these various research methodologies thus permitted in 2018-2019 – as we said above – the opening of an excavation area on the western side of the plateau, South of the Tumulus, georeferenced and recorded on digital IGM cadastral and regional cartography. The georeferenced points were then utilised as the reference basis for a manual archaeological survey, including the whole architecture of Tomb 642 (Fig. 8), the drawings of its inner walls and sculpted furnishings, with the support of the topographic station TS06plus and Leica system GPS/GNSS GS18 T LTE&UHF. The hand-drawn plans were then computerized using AutoCAD 2018. Lastly, the excavation documentation was completed by a survey using laser scanner Leica BLK360, including all the underground chambers discovered (on the graphic and photographic documentation 'technique', generally speaking, see Montagnetti, Rosati 2019; Giorgi *et al.* 2021).

C.R.

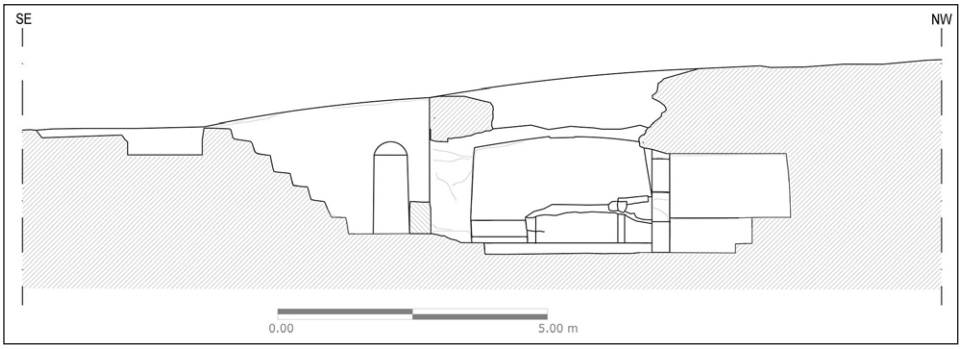

Fig. 8 – Cerveteri, Monte Abatone necropolis. Tomb 642. Section (elab. Carmelo Rizzo).

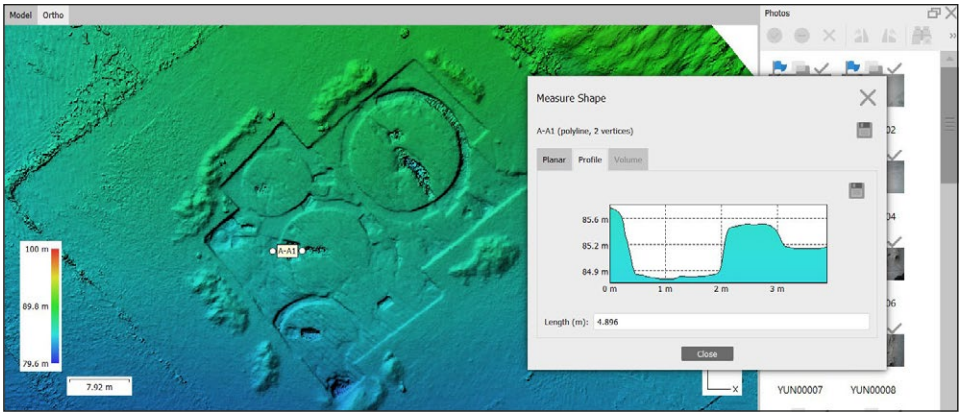

Fig. 9 – Cerveteri, Monte Abatone necropolis, excavations 2018-2019. DEM being processed with Agisoft Metashape (elab. Luca Lucchetti).

In parallel, it was decided to use the photogrammetric technique, both from the ground and from a drone, for the graphic documentation of all the excavation steps, in relation to the stratigraphic units, the tomb structures and the entire test area. The aim was to provide a metrically precise base to be inserted in a GIS environment, here too QGIS (the 3.18 version, and PyArchInit plug-in: see Mandolesi, Cocca 2013, 2016), specific for archaeological excavation activities (Fig. 9). The same operating system was used to associate the vectorised graphic documentation and data sheets (SAS, US, USM) of the campaigns.

L.L.

Fig. 10 – Orthophoto of the excavations 2018-2019 and 2021 (Luca Lucchetti, graphic processing Carmelo Rizzo).

6. Results and perspectives

In the area surveyed, some of the tombs already excavated by the Fondazione Lerici were brought to light again, albeit located differently from the references of the Lerici plan, thanks to the georeferencing of the excavation area and of the Campana Tumulus itself, and other new tumuli and fossa tombs were identified. It was possible to excavate and make a complete structural survey of the new ones, thus leading, in a decidedly restricted space, to a reconstruction of the profile of what appears to be a possible 'family' cluster, active at least between the early Orientalizing and the early/middle Archaic period (Bentz *et al.* 2021).

The excavated tombs are of fossa, semi-constructed, single-chamber types, plus one similar to the C2 Prayon (Figs. 7, 10), all documented for the first time at Monte Abatone by thorough and scientifically reliable surveys.

They appear to be organised not very differently from what R. Linington (1980, 20) observes regarding the Laghetto necropolis where, among the more ancient semi-constructed tombs, during the VII century BCE small underground chamber tombs with tumulus are found, as well as fossa tombs, often destined for child burials. Only when the space between the older tombs became full, did 'new' Tomb 642 with its South-East entrance interrupt the continuity of orientation found in all the contiguous tombs of earlier periods.

M.B., A.C., F.G., M.M., D.B., F.B., V.C., F.Ga., L.L., C.R.

During the 2021 campaign, again based on historical aerial and satellite photos and integrated geophysical surveys, a trial excavation was begun (Figs. 7, 10), running from just behind the moat of the Campana Tumulus and covering, on a largely East-West axis, a vast quadrangular area of ca. 1250 sq. m, situated immediately to the South of the great tumulus. In the most eastern part appears a large area of level tuff lacking any archaeological evidence, except for a tuff quarry for the extraction of squared blocks, investigated by the Bonn team. On the other hand, the area further to the West, separated – as one might say – from the eastern side by an 'invisible' straight line of demarcation, accommodated tombs of the 'semi-constructed' type with tumuli of various dimensions (max. diam. m 11 ca.), ordered in two roughly parallel rows and all oriented North-West, with few insignificant exceptions.

This discovery was at once deemed important. Indeed, tombs of the same typology, albeit with numerous variants in their architectural detail and internal 'furnishings' (dimensions, presence/absence of benches, cover pattern, when partly preserved), are found in a single area, certainly designed by some form of 'urban' authority, at a time – beginning with the Early Orientalizing period – that marked a considerable acceleration in the economic growth of the 'city' and its civil-political structure (on the regular layout of the various lots of the necropolis, quite visible moreover in all historical and recent aerial photos, see in particular Tartara 2018, 127-130, 134-136). The aim of the next campaign is a complete survey of the whole space close to the Campana Tumulus – including of course the moat, a fundamental element joining the monument to its surroundings.

F.G., A.C., M.M., V.C., F.Ga., L.L., G.M., C.R.

Lastly, the Italian project ALES (Arte Lavoro e Servizi S.p.A.) to develop and enhance the Cerveteri site aims at an overall reconstruction of the excavation area, starting from photogrammetric surveys and laser scans of the excavation area and the Campana Tumulus, which will include the 3D reconstruction of the funerary monuments investigated, together with vectorised plan and section views, drone and surface photos and 3D models

of some of the finds from inside the tombs. The final aim is to visualize the burials, using virtual reality systems to furnish 'access' and 'visibility', despite the inevitable reburial of the structures at the end of every excavation campaign (Università della Campania 'Luigi Vanvitelli', Università della Tuscia, Viterbo).

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ABSTRACT

The Authors illustrate the 'Monte Abatone Project', focusing on the important necropolis South of the ancient city of Caere. The area in its archaeological and topographical features was not further studied since the geophysical campaigns (1957-1961) by the Lerici Foundation. The main focus is the large area around the Campana Tumulus, previously left unexplored in the large plan by the Lerici Foundation. Excavations in 2018-2021 on the South side of this area led, conversely, to discover a possible 'family' cluster of tombs, dating to at least between the early Orientalizing and the early/middle Archaic period: these tombs were of fossa, semi-constructed, single-chamber and C2 types. Also, further unknown sectors of the necropolis were found not far from this cluster, with a concentration of tombs of the early semi-constructed type (first half of VII cent. BCE), provided with small tumuli, ordered in two approximatively parallel rows and all oriented North-West. This suggests the existence of a planning by some form of 'urban' authority, at a time – beginning with the Early Orientalizing period – that marked a considerable acceleration in the economic growth of the city and its civil-political structure. The area West and North of the Campana Tumulus was also investigated, including surveying the edges of the plateau that led to the identification of tombs (VI-III cent. BCE) excavated in the past and partially backfilled, and terraces for funerary rites which are oriented, like the Tumulus, toward the city plateau. Extensive use of laser scanning and photogrammetry allowed to produce a model of the Monte Abatone plateau, a 3D model of both the Campana Tumulus, never surveyed since the first half of the nineteenth century, and other excavated tombs.