Non-invasive Survey Approaches to Pre-Roman Settlement Centres in Central Adriatic Italy

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Abstract—The paper presents the main methodological approaches and some of the first results of an intensive analysis of a series of pre-Roman settlement centres in Central Adriatic Italy. A new project of integrated non-invasive archaeological prospection of large- to medium-sized settlement sites in the Marche region not only aspires to reveal new evidence about the socio-cultural and socio-economic base of the Iron Age elites, but also challenges earlier approaches of pre-Roman society in this part of the peninsula that looked essentially at evidence from funerary culture. Especially the use of geophysical survey and associated remote sensing is being evaluated and tested, and the first results of the field- and desktop measuring and mapping of large settlements in an area of central Marche hold the promise of a fundamental knowledge shift regarding Piceni culture.

Keywords—Central Adriatic Italy, protohistory, spatial analysis, archaeological prospection, geophysics

I. INTRODUCTION

Our understanding of the internal organization of protohistoric communities in Central-Adriatic Italy is affected by research biases in favour of the elaborate ‘princely’ graves of the Iron Age Piceni population. The well-studied funerary record of this part of Italy indicates the emergence of stratified societies from the Late Bronze Age (ca. 1200-900 BC) onwards, culminating in warrior aristocracies in the Piceni Iron Age (ca. 900-400 BC). The fragmentary and little studied settlement record, however, does not show much evidence of centralization or concentration of power; settlements appear to remain small-scale, non-monumental and dispersed until the Roman conquest in the 3rd century BC. The socio-cultural and socio-economic base of the Iron Age elites remain therefore poorly understood. This paper presents a new research project that aims at bridging the gap between the trends seen in the funerary and settlement record of the Piceni communities. It especially focuses on the study of the sites positioned highest in the settlement hierarchy, which due to their size, landscape position and the quality of their material culture are interpreted as central places in the human landscape of pre-Roman Central-Adriatic Italy.

Broad settlement trends in the Metal Ages are studied by bringing together survey data of different landscape archaeological projects in the river valleys of the Italian region Le Marche. Intensive non-invasive prospection data of selected sites and their surroundings are used for spatial analysis of micro-regions, aiming to unravel social organization through the use of space in Bronze and Iron Age communities (Fig. 1). This paper discusses especially the merits and challenges of an integrated approach of field walking survey, aerial photography, geophysical prospection, and soil studies for the reconstruction of the ‘archaeological continuum’ and its landscape setting in the Potenza Valley (Le Marche, Italy). It builds on a substantial history of interdisciplinary research in this area carried out within the framework of the Potenza Valley Survey project of Ghent University between 2000 and 2015.

Here we present a new phase in the ongoing studies of this river valley between the Adriatic coast and the Apennine inland, in which we focus on protohistoric settlement and land use. Artefact surveys in the Potenza valley and parallel-running river basins in Le Marche indicate that site distributions in this region undergo radical changes in the transition between the Bronze and Iron Ages. However, the dynamics behind these developments and the effects on the socio-political and economic structure of these Metal Age communities remain obscure, as only few pre-Roman settlements in this area have been studied in detail. As a related result, little is known about the detectability of late prehistoric remains by non-invasive techniques, as well as the potential to study long-term processes through the analysis of large-scale prospection data, in these river valleys and the gently rolling hills between them. Our present research therefore puts the spotlight on selected micro-regions with two main objectives: first, to extract more information about changing protohistoric settlement and land use in the long term history of the Potenza Valley, and second, to refine prospection methodologies for ephemeral and non-monumental traces.

Fig. 1. The research area in Central Adriatic Italy. Archaeological sites discussed in the text are indicated in red and labelled in italics.

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II. APPROACH AND METHODOLOGY

We use a multidisciplinary toolkit of high-resolution artefact surveys, geophysical prospection techniques, aerial photography, (micro-)topographical and pedological work to get a better understanding of the occupation of selected case study areas. The integrated use of these techniques allows us to detect both artefactual (utensils, structures) and non-artefactual (field borders, empty areas) aspects of past human behaviour. Moreover, they allow us to look beyond the border of the archaeological ‘site’ and to study how such human activity foci are situated in wider catchments. Pedestrian surveys are conducted at a high resolution (units of 30x30m, walker interval 5m) to be able to document small-scale artefact scatters. In areas of interest the coverage may be increased, or additional 100% coverage samples may be collected. For geophysical prospection we mainly apply magnetic gradiometry and ground penetrating radar (GPR), but other techniques may be used as well. We use a modular GPR system of a Sensors & Software Spidar network consisting of pulseEKKO PRO 500 MHz antennas, towed by an ATV, allowing the coverage of large open areas. Magnetic gradiometry surveys are conducted using a mobile LEA MINI system mounted with four Sensys probes at 0.5m distance. After extensive testing of the effects of different probe lengths, we use two FMG650 probes flanked on both sides by a FMG600 probe (Fig. 2). This light and flexible cart allows us to investigate large open areas but also to access more remote locations and sloping terrain, making it especially useful for the prospection of protohistoric remains. Pedological studies are focused on recording local soils and deposition processes affecting the archaeological record and its detectability by non-invasive prospection techniques. Targeted drillings using a manual Edelman screw auger are conducted to characterize features detected in the geophysical surveys. These studies are supported by micro-topographical mapping through drone imaging.

In the second phase of the project, the datasets collected in the selected case study areas are integrated and spatially analyzed. This part of the research draws on the proposition that space is intrinsic to human activity, and thus that spatial layout of domestic, settlement, and regional situations reflect socially and culturally given norms [1], [2]. Therefore, spatial characteristics of human activity areas can be used to identify societal organization, socio-economic diversification, and socio-political complexity [3], [4]. Spatial patterns are commonly used to this end by archaeologists on landscape and site scale, for instance in analysing burial clusters or regional settlement systems, while functionality of urban areas and large buildings can be investigated through approaches like space syntax [5]. Settlements and their surroundings thus provide the tangible spatial backdrop to social organization at a daily-life, community scale. Settlements do not just consist of huts or houses, but of a wide range of structural parts and activity areas. Their arrangement reflects the internal coherence, interdependence, and communal effort of the people involved. In settlements, characteristics such as site extent, internal plan (structures and infrastructures), differentiation between built and non-built areas, and the presence of specific functional areas (workshops, storage facilities, ritual spaces) can reveal levels of planning and interlinkage. The presence of defensive features such as walls or moats indicates an underlying group identity and inherent distinction from other groups, while their erection requires initiative, planning and organization. The arrangement of the settlement catchment may likewise reveal much about the community’s economic and political structure: separate production zones (workshops, kilns), but also waste disposal, graves, roads, and field systems all reflect levels of organization and cultural norms.

By obtaining more detailed information on the spatial layout of carefully selected known settlement sites and their catchments, and analysing these data in a wider, comparative approach, valuable insight in the social structure of protohistoric communities in Central-Adriatic Italy are obtained. The analysis of intra-site spatial patterns will be done on both qualitative and quantitative basis, using geographical information systems (GIS). This part of the research focuses on settlement structure and lay-out rather than singular buildings or rooms. There are two reasons for this: firstly, the known protohistoric architecture of this region does not allow identification of single room use; secondly, the spatial data from non-invasive prospection datasets will not be detailed enough for spatial syntax or access analysis. Nevertheless, buildings and activity areas can be identified by shape, size and clustering of geophysical features. Such socio-spatial analysis of non-invasive prospection data has been successfully attempted in urban environments [6], but so far not in pre-urban settlements. We argue that this innovative approach yields new insights in the development of social organization in protohistoric communities, and illustrate this below with preliminary observations of three case studies.

III. CASE STUDIES

The main central sites detected and studied here are: Montarice (Porto Recanati) in the lower valley and the hilltop sites of Monte Pitino (San Severino Marche) and Monte Franco (Polenza) in the middle valley. The first results of the project show the potential of these combined methods of ‘protohistoric’ landscape archaeology to achieve major advancement in the understanding of complex pre-Roman archaeological settlement sites and their direct surroundings in Italy.

A. Montarice (Porto Recanati)

This plateau of circa 5 hectares dominates the estuary of river Potenza and controls the entrance to the Potenza Valley.
Although situated on the outskirts of Porto Recanati it has escaped recent expansions of the seaside town, yet its western edge was destroyed during the construction of the A14 motorway. Archaeological traces on the plateau were first discovered through aerial photography, crop marks revealing a large number of buildings, other settlement features and especially the traces of large defensive structures which accentuate the natural defences of the site [7]. Further detail of the site’s internal organization was obtained by a magnetic gradiometry survey which not only confirmed the presence of the structures already seen in the aerial photography, but also yielded various other smaller discrete features related to pits and other activity traces (Fig. 3).

Intensive artefact survey on the plateau and its slopes established that the site had a long but not continuous occupation span, with the most intense periods of use in the Middle and Recent Bronze Age, the Late Iron Age, and the Middle Ages. In a palimpsest situation like this, it is not possible to assign single magnetic features to specific occupation phases without further invasive work such as coring, test pitting, or excavation, but the surface artefact distribution provides clues to changing occupation preferences.

The artefact distribution suggests that Bronze Age habitation was concentrated in the western corner of the plateau. We tentatively associate this area with a large curvilinear structure demarcating the densest occupation area. Defensive moats and walls are well-known in pre- and protohistoric settlements in Central-Adriatic Italy, for instance the very deep defensive moat at Chalcolithic Conelle and the double defensive system at Late Bronze Age Monte Croce Guardia, both near present-day Arcevia. The latter system was discovered alongside a series of houses during our recent magnetic gradiometry survey here in September 2018, underlining that such features can well be detected using non-invasive methods in different geological backgrounds: Montarice is part of a fluvialitic conglomerate system, while Monte Croce Guardia is a limestone outcrop with shallow soils. In terms of spatial expressions of social structure, such large features are clear indications of community organization, group effort, and planning, perhaps with certain people taking initiative and coordinating the project. The uniform orientation of the building structures of Montarice and Monte Croce Guardia also suggests clear rules and traditions. However, we see no indications of social differentiation: the structures appear to be similar in size, layout, and spatial arrangement, suggesting that these two Bronze Age sites were inhabited by mostly egalitarian communities in which socio-political roles were expressed primarily at a kinship level.

**B. Monte Pitino (‘Pitino Castello’, San Severino Marche)**

Our work on the Monte Pitino focused on locating and mapping the Piceni settlement associated with an exceptionally rich Orientalizing (7th century BC) necropolis of nearby Monte Penna (Fig. 4). The dominant hilltop of Monte Pitino is characterized by a Medieval castle with an imposing tower on the highest sandstone outcrop, overlooking a large plateau towards the east. The settlement associated with the necropolis was never identified, although unpublished site reports by the local heritage authorities mention that remains of a 6th century Piceni settlement were recorded on the eastern slope of the Pitino summit, outside the castle walls. Our working hypothesis was that the Piceni habitation contemporary to the 7th century Monte Penna necropolis may also be found on the Pitino summit, assuming Iron Age habitation continuity [8]. However, despite our

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Fig. 3. Montarice (Porto Recanati). Left: aerial photo of the settlement plateau from the southwest (photo Frank Vermeulen); right: magnetic gradiometry results, +/-5mT (Eastern Atlas GmbH & CoKG).

Fig. 4. Overview of the Monte Pitino and Monte Penna area (San Severino Marche) on the IGMI 1:10,000 topographical map. The investigated areas in Monte Pitino are outlined in red.
discovery of a large-scale defensive system surrounding the highest plateau, it remains for now difficult to associate this temporally and spatially with the burial site on the adjacent hill.

The large-scale magnetic gradiometry survey on the accessible parts of the hilltop indeed revealed a number of large linear features demarcating the eastern part of the summit, including a double defensive wall, and several areas within (Fig. 5). Yet no single building structures or other archaeologically relevant features were detected. This may largely be attributed to far-reaching levelling of the upper plateau, the signs of which can be seen in the many clearance cairns visible all over the upper part of the hill. Roof tiles in protohistoric, Roman, and Medieval fabrics were found in many of these cairns, indicating the disturbance of the multiphase occupation of the hilltop.

The presence of protohistoric pottery including a milk strainer, flint flake tools, fine ware fragments including black gloss, and the find of a Republican coin reported by one of the field tenants further testify of the long-duration of the Monte Pitino. However, most of these artefacts are occasional observations from disturbed contexts and cannot be securely linked to the features seen in the magnetometry data. The systematic artefact survey of the accessible areas on the hilltop in July 2018 was hampered by the vegetation cover, making it difficult to interpret in terms of finds densities and distribution.

Disregarding the chronological issues, the large linear structures detected by magnetic gradiometry are clear evidence for the spatial organization of the hilltop during phases of intensive occupation. A series of worked blocks in local sandstone were recorded in line with the double linear feature seen in the magnetometry data, indicating that a considerable part of the structure is still buried and preserved. Apart from a large rectangular structure possibly associated with Roman roof tiles in a nearby clearance cairn, no archaeologically relevant traces were recorded at all in the easternmost part of the Pitino hill. The magnetically very quiet areas further east underline the border function of this defensive work just below the break of slope of the highest part of the hill.

C. Monte Franco ('Monte Franco', Pollenza)

Like at Monte Pitino, the poorly understood habitation history of the Monte Franco area contrasts with past and current scientific focus on a nearby Piceni necropolis. The well-known Moi di Pollenza burial cluster, located in the valley bottom near river Potenza, contains graves dating between the 9th and 5th centuries BC. Associated settlement sites were never established, but large-scale extensive artefact survey by Ghent University in the nearby fields in 2001 revealed several occupation areas dating from the Late Bronze Age to the Middle Ages [9]. Our working hypothesis was that the densest multi-period artefact distribution zone, along the eastern foot of the hill, would contain traces of protohistoric habitation and activity contemporary to the burial site.

In the summer of 2018 an intensive artefact survey was conducted in the arable fields east of the Monte Franco, following the survey strategy described above (Fig. 6). This resulted in a high-resolution surface artefact distribution map in which two discrete artefact concentrations were observed: a Roman rural habitation with a large quantity of building material and a remarkably low amount of fine wares, and an Iron Age site with a broad range of artefact classes including fine wares, cooking wares, coarse storage wares, and roof tiles. Artefact studies are still underway, but the latter site was tentatively dated to the 6th century BC. It is located near the south-eastern base of the Monte Franco hill.

The direct surroundings of the Iron Age artefact scatter were subjected to both GPR and magnetic gradiometry surveys, the latter of which was successful in mapping a
series of anthropogenic and natural features. The surface artefact concentration is spatially associated with a group of strong magnetic features aligned along the Montefranco base. The archaeological relevance of several of these was established by a series of manual cores placed inside and outside selected magnetic anomalies. One of these has a more or less rectangular shape; the drillings taken inside this feature revealed anthropogenic layers with charcoal, pottery, and tile fragments.

The surroundings of the artefact scatter and anthropogenic magnetic features display clear signs of spatial arrangements and further human activity. A striking curvilinear feature following the base of a slope was tentatively interpreted as a buried terrace, while clusters of magnetic anomalies were identified as pits and dumps. In the future, the magnetic gradiometry survey will be extended to adjacent fields in order to obtain more information on the site extent and nature of preserved remains.

IV. CONCLUSIONS

The three case studies presented here illustrate how our interdisciplinary non-invasive prospection program reveals new insights on protohistoric settlement and land use in Central-Adriatic Italy. The integration of different prospection datasets offers new possibilities to study the behaviour of past communities in micro-regions, which using spatial theory can be interpreted in terms of social integration and community organization. We argue that this approach offers new perspectives on the poorly understood settlement record of pre-Roman communities in this part of Italy, and that it can be used to bridge the gap between the well-documented funerary record and the patchy evidence for protohistoric habitation, economy, and socio-political dynamics.

In this project we focus on large settlements as centres in the changing human landscape in the centuries before the Roman conquest. The three case studies presented in this paper showcase the contribution of the remote sensing work achieved so far, integrating especially geophysical prospections and aerial surveys with artefact surveys. At the same time, these case studies illustrate the specific challenges posed by landscape formation processes and palimpsest situations to the reconstruction and interpretation of the archaeological evidence, emphasizing the need for stratigraphic information from coring and detailed microtopographical information.

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