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Integrated prospection methods for documenting threatened prehistoric archaeological sites from north-eastern Romania

Andrei Asăndulesei[a], Cristi-Ionuț Nicu[a], Ștefan Balaur[a], Ștefan Caliniuc[a], Mihaela Asăndulesei[a] and Vasile Cotiugă[a]

KEY-WORDS: archaeological prospection, risk management, prehistoric sites, Cucuteni culture, north-eastern Romania

INTRODUCTION AND OBJECTIVES

Available archaeological registries reveal an extremely high density of (not only) prehistoric sites in the north-eastern part of Romania. In this context, our field investigations conducted in several microzones of this area focused on identifying on the ground and accurately charting the sites (Brigand *et al.* 2012; 2014 a; Brigand *et al.* 2014 b) listed in older or newer archaeological registries, but accompanied only by brief and laconic descriptions, or no longer corresponding to current realities. Another aim was to monitor closely the state of these monuments by means of non-invasive techniques (Romanescu *et al.* 2012; Romanescu and Nicu 2014), and to collect as much information as possible on the most threatened ones (Asăndulesei *et al.* 2012; Asăndulesei 2013; 2014a; 2014b; Caliniuc and Nicu 2015). Most of them, particularly the prehistoric ones, either already known or newly identified, were found to be threatened directly by natural or anthropic factors.

The paper focuses on the integrated use of oblique air photography, cartography, topographic survey, 3D laser scanning, caesium magnetometry, electrical resistance, and GPR methods for the investigation and monitoring of the prehistoric sites Costești–Cier and Filiași–Dealul Mare, and makes a case for generalising such practices in archaeological research, particularly in the north-eastern area of Romania. Apart from elements of archaeological interest, the study takes into account the component of landscape evolution with regards to the identification, evaluation and impact of natural and anthropic risks affecting the two sites.

[a] Alexandru Ioan Cuza University of Iași, Iași, Romania

RESEARCH AREA AND CASE STUDIES

The microzone containing the two case-study sites comprises the Bahluieț catchment basin, part of the Lower Jijia and Bahlui plain constituting the southern half of the Moldavian Plain.

The first case-study site is Costești–Cier (Iași County), a site on the upper course of the Bahluieț River (approx. 10 km from the source), well known to the Romanian archaeological community. Previous studies, some carried out during the interwar period, unearthed rich material from the Chalcolithic (Cucuteni A_3, $A–B_2/B_1$ phases), transition to the Bronze Age (Horodiștea-Erbiceni II) and early medieval (8th–9th/10th centuries) habitation levels, as well as two necropolises, one Horodiștea-Erbiceni II and the other medieval (Boghian *et al.* 2013).

The second case study is represented by the archaeological site of Filiași–Dealul Mare (Bălțați commune, Iași County). Located on a promontory that dominates its surroundings, this site yielded abundant evidence of Cucuteni A_3 habitation, in the form of pottery, anthropomorphic plastic art and lithic materials. The settlement was investigated in 1935 by fieldwalking and trial pits carried out by O. Tafrali, V. Manoliu and E. Condurachi.

METHODOLOGY

Work consisted of several successive stages, starting with the existing documentation, during which archaeological registries and specialised works treating on the two sites were consulted. Precise information was ascertained: exact location, limits of the areas of interest, and geomorphological characteristics of the areas occupied. An interdisciplinary approach was employed, based on complementary non-destructive prospecting. The most expeditious and convenient methods (in terms of logistics and financial affordability) were surface research (fieldwalking) — which provided the necessary data for a chronological setting — and air photography (Asăndulesei 2014b). Further input came from geophysical surveys and terrestrial 3D laser scanning, which enlarged the body of available information on the buried vestiges (Romanescu *et al.* 2012; Romanescu and Nicu 2014).

RESULTS AND DISCUSSIONS

Costești–Cier archaeological site

The cartographic analysis of several types of topographic maps and orthorectified imagery at various scales/resolutions and from different time periods highlighted the rapid erosion of this site. At the moment of speaking, more than half of the original site has been destroyed.

The detailed topographic survey augmented by the 3D scan (for the inaccessible sectors of the site) generated a digital elevation model at 0.5 m/pixel resolution, on the basis of which several interpretations were drawn concerning the original size of the site and the landform on which the site is located and its hydrogeomorphological characteristics.

The approximate trajectories of Bahluieț's ancient courses in this area were easily traced. Sometime in the past one of these riverbeds bordered the site along its south-western and southern margins; in another period the stream ran along the northern side, aligned NW–SE. The inhabitants made the most of the latter situation, building a fortification system that took advantage

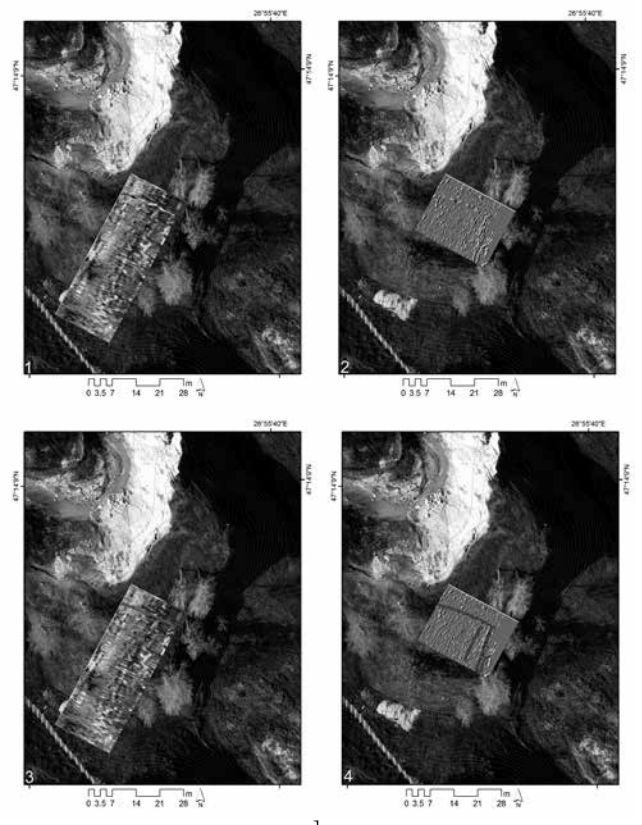

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Fig. 1. GPR interpretation of the archaeological site Costești–Cier

of the ancient riverbed. Moreover, they dug a semicircular defence ditch to protect the entire southern flank of the site. This ditch is observable in both the topographic and GPR surveys, and in the aerial photographs. The advantageous position of the site is also evinced from the steep slopes of the terrain, with values up to 36°.

The analysis of over 30 aerial photographs of the Bahluieț valley revealed several aspects that backed our initiative to prepare an ampler characterisation of the archaeological site at Costești. An analysis of detailed images of the site identified large positive or negative anomalies. Noteworthy is the semicircular defence ditch on the south-western side of the site. Three further linear anomalies were identified in the upper part of the site, two of which formed a right angle, probably stone structures from an old church attested here (Boghian *et al.* 2013).

Georadar surveying was the last non-destructive research method employed at this site. Though the terrain is not ideal for this type of measurements, the results were satisfactory nonetheless. The area was heavily disturbed by tree roots and by sandstone boulders carried by the landslide, visible at the eroded end of the site. Several types of anomalies, of various

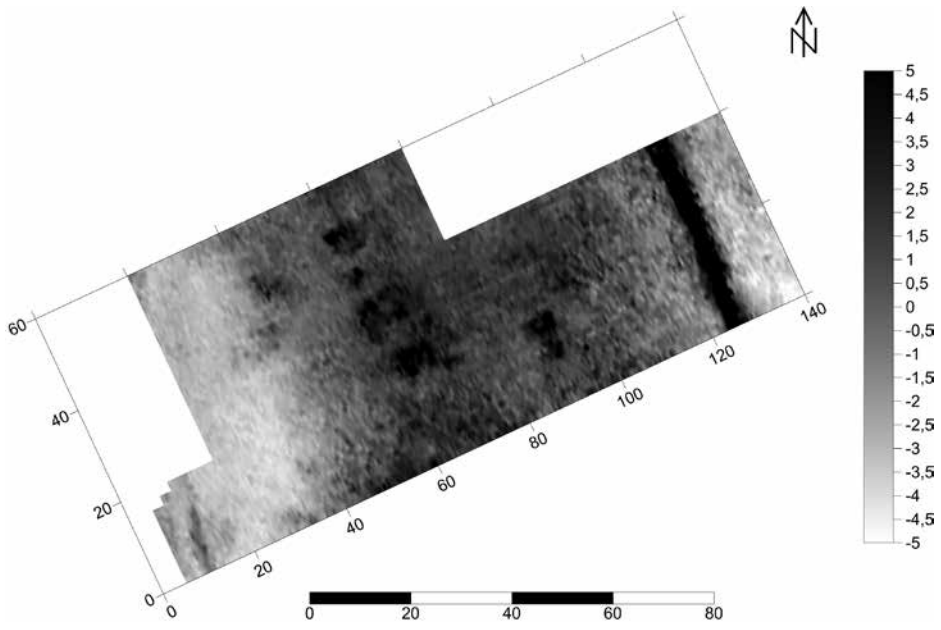

Fig. 2. Resistivity map of the archaeological site of Filiași–Dealul Mare (-5/+5 ohms, white to black)

sizes, were pinpointed after analysing both the vertical GPR profiles and the time slices. The linear or curvilinear anomalies, interpreted conjointly with other results, may be considered archaeologically relevant. The linear structures are probably stone walls and the defence ditch, which should be identified with the marks visible in the aerial images (Fig. 1).

Filiași–Dealul Mare archaeological site

The non-invasive investigation of the second case-study site relied on archaeological topography, aerial photography, soil resistivity measurements, and caesium-vapours magnetometry. The results confirm, on the one hand, the importance of this site, and, on the other, highlight the precarious state in which it is found.

Thus, the Cucutenian settlement Dealul Mare, for which a positive anomaly was identified (a fortification, noteworthy for this period), is threatened by landslides on its northern, eastern and western sides. The site itself has not been affected yet, but immediate intervention is necessary to stop this erosional process from causing more damage. Of greater concern is recent anthropic destruction caused by an open clay quarry inside the perimeters of the site, in the north-eastern corner. The presence of trenches, probably from World War II, fortunately only in the proximity and not crossing the site, contributed to the expansion of the erosion scar.

The soil electrical resistivity measurements revealed the presence of several positive anomalies (Fig. 2), somewhat rectangular, of various sizes. Two linear anomalies with the same polarity can further be observed on the limits of the promontory, connected with a putative fortification system also identified in the air images and magnetometric maps (Fig. 3).

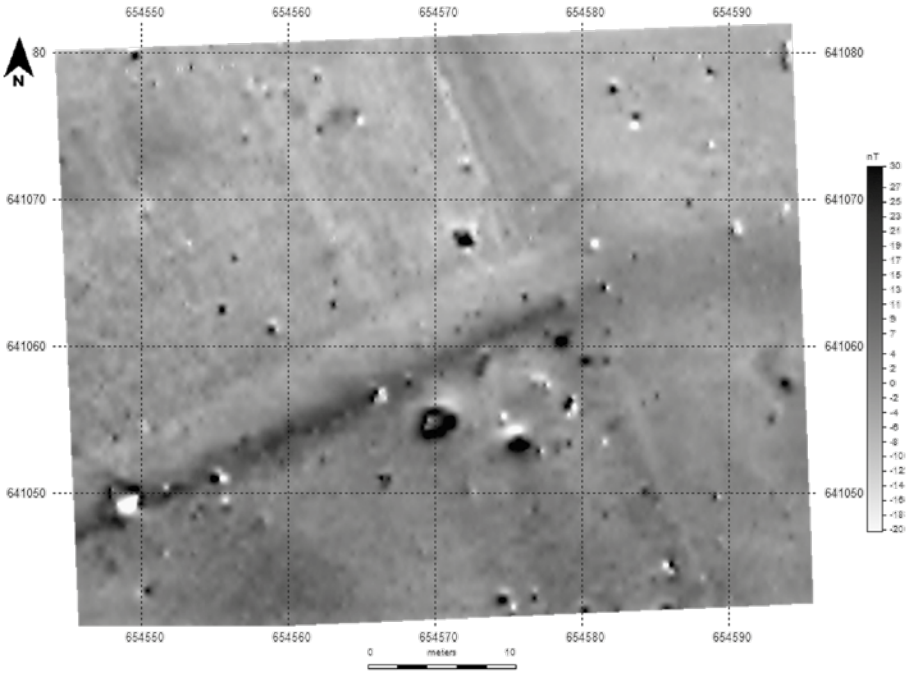

Fig. 3. Magnetic map of the archaeological site of Filiași–Dealul Mare archaeological site (-20/+30 nT, white to black)

CONCLUSIONS

Strict adherence to the methodology imposed at the onset of the research resulted in full achievement of all the set goals, that is, identification and analysis of the archaeological evidence, and assessment of the damage sustained by the sites and the rate of advancement of active hydro-geomorphological processes. The archaeological characteristics identified, foremost regarding planimetry, fortifications and boundaries, will be used to develop coherent plans for mitigating or systematic intervention in the two case-study sites.

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Geophysical survey at Žitný ostrov, Slovakia, in 2012–2013

Mário Bielich[a], Martin Bartík[a] and Elena Blažová[a]

KEY-WORDS: South Slovakia, Žitný ostrov, Arcland Culture 2000, geophysical survey

As part of the Arcland Culture 2000 project focused on mapping of the archaeological landscape of Žitný ostrov, seven archaeological sites were chosen for geophysical research in 2012–13: Dunajská

[a] Institute of Archaeology, Slovak Academy of Sciences, Nitra, Slovakia