



Contents

Editorial	2
Chairman's Piece <i>by</i> Włodek Rączkowski	4
Participated in AATS in Kostolac and lived to tell <i>by</i> Miroslav Birclin	8
Group photos from the training schools at Kostolac, Serbia and Velling, Denmark	11
Aerial Archaeology Training School, Denmark, 2-8 July 2011 <i>by</i> Lis Helles Olesen, Pete Horne, Chris Musson	12
A flying tablet PC: developments in digital flying maps for aerial survey at RCAHMS <i>by</i> Kevin H.J. Macleod and Dave C. Cowley	15
Calibrating GeoPortal Maps and Orthophotos <i>by</i> Irwin Scollar	20
Problems of reconnaissance of the karst landscape – an example of the northern sub-Velebit littoral, Croatia <i>by</i> Vedrana Glavaš	24
News from New Zealand <i>by</i> Kevin Jones	30
Flying in a Rainy Spring: Romanian Surveys in 2011 <i>by</i> Irina Oberländer-Târnoveanu and Carmen Bem	33
Cropmarks 2011 in Poland – is there a need for further discussion? <i>by</i> Włodek Rączkowski (with an Editor's note)	37 42
Happy Lands Enclosure at Wiggold, Ampney Crucis, Gloucestershire <i>by</i> Bob Bewley and Tim Darvill	43
Comments on flying, observations and photographs, 2011 <i>by</i> Numerous Authors	44
Air Photo Services is 21 <i>by</i> Rog Palmer and Chris Cox	50
The English Landscapes and Identities Project <i>press release from</i> Lucy Palmer	51
Information, summer workshop	52
High-flyers of tomorrow: teaching young archaeologists <i>by</i> Tara-Jane Sutcliffe	53
Cropmarks	55
Book (etc) of interest?	56
Caroline Ingle and Helen Saunders. <i>Aerial Archaeology in Essex: the role of the National Mapping Programme in interpreting the landscape.</i>	
Toby Driver. Seen from the air – the story of Wales.	
Dave Cowley and Colin Martin. Coastal Command: surveying Scotland's maritime superhighway.	
Martyn Barber. Flying, pigs and Stonehenge.	
Alastair Oswald and Matt Oakey. Putting the prehistory of the North Pennines on the map.	
Crop evapotranspiration - Guidelines for computing crop water requirements	
AARG: general information, membership, addresses, student bursaries	57
PS – CUCAP reopens	58

Problems of reconnaissance of the karst landscape – an example of the northern sub-Velebit littoral, Croatia

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1. Introduction

The Velebit mountain range in Croatia spreads along the Adriatic Sea for 145 km between the Vratnik mountain pass above Senj in the north-west to the Zrmanja River in the south-east (Figure 1). The width of this mountain range varies from 10 to 30 km, with an average of 14 km. Velebit is one of the most impressive karst landscapes in the world. With its numerous peaks, karst valleys and mountain-ridges consisting mostly of limestone it creates an image of a unique area in which each micro-region exhibits particular similarities and incredible differences. Velebit is a Dinaric mountain which, at present attracts mostly hikers, speleologists and various adventurers, but only rarely archaeologists. It is difficult to understand why, although its present low population and harsh climate suggest two reasons and some researchers maintain that this region was not attractive enough in the past for everyday living. However, intensive life on the mountain has been testified by many archaeological remains.

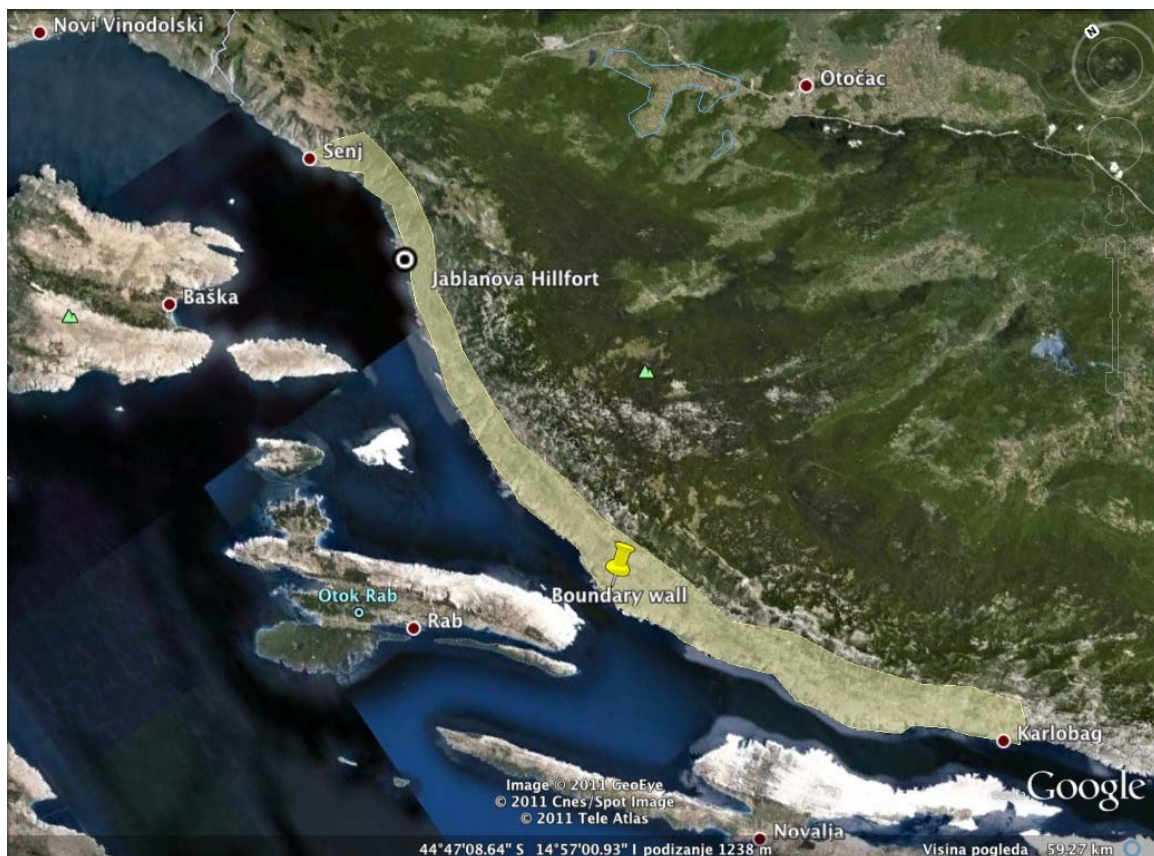


Figure 1. Northern sub-Velebit littoral. Source: Google Earth.

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Until recently, few researchers were engaged in the research of Velebit. However the author of this article belongs to the smaller group of present-day researchers. The author is also writing a PhD thesis on the theme of Romanization of autochthonous *civitates* in the region of northern and central Velebit. Since the Romanization process in this research is observed mostly from the spatial archaeology aspect, all recorded sites and the entire region need to be re-examined and analyzed in a modern way. Aerial photography and its analysis may help achieve this but, apart from the beginnings of such research by Darja Grosman in Dalmatia, these methods have not been applied in the region of the northern sub-Velebit littoral, nor elsewhere in Croatia

2. Problems of field survey

In this brief review I will describe my reconnaissance of the north sub-Velebit littoral and highlight some problems that I have encountered in the process. Field survey in this region is far from easy presenting thereby a true challenge. As stated earlier, Velebit is a karst mountain with an almost completely bare coastal front, the only vegetation being low shrubs and macchia which make passing through certain areas quite difficult. Extremely strong north-eastern wind (bora), which is characteristic of the sub-Velebit channel and which blows for most of the year, often prevents reconnaissance. Furthermore summer is marked by great heat and droughts. Such climatic conditions were one of the reasons for the spread of transhumance into this area which was active on Velebit until the 1950s. For centuries the population spent summer months on the mountain in search of better-quality grass, pastures and water while relying solely on mountain resources for their own survival. Even today, it is quite difficult to pinpoint several favourable weeks for reconnaissance – at least regarding the meteorological conditions.

The second problem is terrain configuration which considerably slows down the survey of this area. The coastal part of Velebit is bare, rocky and full of natural holes and fissures. Greenery is rare so that, in certain areas, the landscape resembles the Moon's surface. Difficulties arise when archaeological sites are situated off the present-day hiking trails. Off-road walking is extremely difficult requiring a lot of hiking experience in the karst terrain and good conditions. If the wind is strong, field survey of such areas is impossible because one cannot fight the wind and keep balance when walking on fissured limestone. In such cases reconnaissance is aimed at karst plateaus or the peak mountain zone. In addition some locations cannot be approached in certain seasons due to vegetation. Low shrubs and macchia represent vegetational cover characteristic of the coastal slope of Velebit. For instance, if a site is surrounded by such vegetation it can be analyzed only in winter, of course if other conditions are also favourable. This region cannot be surveyed in one period of the year, but throughout the seasons. Therefore it is necessary to have a carefully made plan, and to be ready to start a field survey at any moment.

Research of Velebit is aggravated by the fact that this region has been poorly explored, and only scanty information is known. There are many research aims, of which the first task is to inspect all the known sites and to locate and map them in space. They have been identified during previous cartographic analyses but the precise coordinates of most sites are not given in the literature. In the earlier publications spatial descriptions were usually used most of which are no longer recognizable in the field: e.g. 'south of the telephone pole', '20 m north of the road leading towards the village', etc. Sometimes this presents a problem in locating the sites. In such cases Google Earth can be helpful but not always. Furthermore, the

resolution on Google Earth is low, and aerial photos are usually not available. In Croatia, orthophotographs were made for certain state institutions but their high cost and my limited financial means sometimes prevent their use.

The second aim of the research, which is conducted intensively and which will last for years, is a study of locations on which an archaeological site has not been recorded but where some other factors (toponym, terrain configuration) indicate its possible existence. In that case, first Google Earth images are examined in search of archaeological structures as well as any orthophotos which we have. Then the field survey is carried out and locations recognized as potential sites from aerial photos are examined as well as the entire surrounding area in quest of all structures which do not have characteristics of more recent building. If a new site is found, its precise location is recorded and all the necessary documentation is made. Newly-discovered and previously known sites are introduced into a GIS for more detailed analysis.

Written sources about Velebit are also meager. In an isolated region such as Velebit, oral tradition plays an important role in any field survey. In talks with the sparse local population I often heard legends about the “buried treasure”, “pot of gold”, “Turkish cemetery” and “Greek well”. Interviews with local shepherds and peasants are a part of this research, and legends related to a certain location regularly indicate an archaeological site. However the problem is that presently there are few reliable story-tellers as only few people still live on the mountain. In such situations every interview with a story-teller must be recorded, documented, and the information needs to be verified.

Since Velebit is a mountain which (fortunately) has few roads, many of which are not negotiable by car, it often happens (if meteorological conditions are ideal) that a few days are lost in a futile search for a site. Therefore lengthy, sometimes several-days-long walking is necessary. A lot of time and energy is lost in coping with the terrain which makes patience the key to success in such situations. After several years of continuous reconnaissance I still have a feeling that I have not moved from the start. Therefore new methods to “search” for sites seem necessary in order to accelerate this process. This is inevitably aerial archaeology although any features identified must be visited in the field to determine, if possible, the chronology of each site.

3. Research possibilities

On the coastal side of northern Velebit there are no agricultural activities at present since suitable land is almost completely absent. Although along the sub-Velebit littoral there are two characteristic plateaus with karst fields which used to be pastures for the cattle, this is no longer the case. The population has gone, as well as cattle-breeding and soil tillage. Once meager, but still usable, fields are overgrown with macchia, and erosion, helped by the influence of atmospheric agents, made the soil disappear in the karst fissures. What is presently visible is bare karst. The bora, which blows for most of the year in the sub-Velebit channel, also acts to remove cultural layers. Due to the strength of the bora, northern sides of any sites without vegetation are almost completely lacking a cultural layer. That is one of the main reasons why the hill-fort sites are completely bare and without sediment.

That is why, despite the fact that there is a great number of sites on the coastal slope of Velebit, it would be pointless to excavate some of these because the cultural layers are almost or completely missing.

However the situation is different at certain sites and we can create two categories of hill-forts based on their state of preservation. The first group is the smaller and consists of hill-forts which probably functioned as central settlements of Iron Age and later communities. They stand out in the landscape, and regularly contain a cultural layer which, if excavated, would provide an insight into the stratigraphy of the site although depth and survival are likely to be poor. However, all, or most, of these sites have a high level of erosion which is why preservation of the layers is questionable.

The second group of hill-forts is more numerous and consists of sites at which cultural layers are totally lacking because weathering has completely removed the soil leaving only karst and the defensive walls. Such settlements, perhaps used seasonally, functioned as residential units of a smaller group of people, dependent on a larger nearby centre.



Figure 2: Eastern wall of the Jablanova hill-fort in the vicinity of Sv. Juraj (St. George).

Let us consider the site of Jablanova (Figure 2) in the vicinity of Sveti Juraj. Here we can suggest there was a paired system consisting of a great plateau, which was used for dwelling, and a prominent hill nearby, used for controlling the wider area. It is not possible to conduct classical archaeological excavations of the entire site which would offer an insight into stratigraphy. Rare pottery sherds which were not removed by erosion, can be dated to the Iron Age. Nothing more can be said about this site. On the once-inhabited plateau there are architectural remains as well as terraces formed by filling the fissures with smaller undressed limestone rocks. There is no cultural layer. The only thing that determines this location with certainty as a site is a wall in which some pottery sherds were found. It is evident that the archaeological research with the aim of determining stratigraphy of the site cannot be carried out. In such cases we can apply spatial analysis, mapping, conservation and presentation of the site. Considering the great number of sites in a similar condition, procedures of conservation and presentation of the site will probably have to wait for a while.



Figure 3. Remains of the boundary wall *inter Ortoplinos et Parentinos*. View from north-east.



Figure 4. Remains of the boundary wall, which extends in the NE-SW direction, are significantly easier to notice from the air (orthophoto) than during field survey. North is to the top. Source: ARKOD.

4. What is visible on the aerial photos?

Classical field survey in the Velebit region results in quite limited conclusions about the sites. If we focus research towards reviewing each separate site in the context of the entire landscape from the bird's eye view, we can get a wider perception of the space, and better understanding of certain phenomena and human activities in space.

Practical applications of aerial photography, as a research method, are still poorly developed in Croatia. One of the reasons might be insufficient knowledge among archaeologists about the possibilities and cost-effectiveness of aerial photos although the price of orthophotos in Croatia is still reasonably high. On the photos that are in my possession, it is not always possible to distinguish a dry stone wall of the hill-fort from the rest of the surrounding karst. Crop marks are rare in this area due to lack of surfaces covered with vegetation. That means that aerial photographs might be obtained regardless of crop growth throughout the year, if the meteorological conditions are favourable. However there are situations when a site can be noticed on the basis of growth of macchia and low shrubs. The boundary wall in which Dolabella's boundary inscription was found *in situ* is clearly-visible on the ground and from the air (Figure 3, 4). This inscription represents a boundary between *Ortoplinos et Becos*, two *civitates*, which extends 2,5 km in the NE-SW direction from sea towards the Velebit mountain. Macchia grows in the areas around the boundary dry stone wall but not upon it. Even an experienced eye will have difficulties in distinguishing this wall from the hundreds of recent dry stone walls which are almost identical regarding their building technique. On Google Earth the wall is barely visible, and it would probably remain unnoticed without previous knowledge of its position. Lower altitude aerial photos would definitely give a better view of the entire situation enabling easier location and interpretation of the site. Therefore I believe it is necessary to make aerial photos of the explored area.

5. Conclusion

Survey of the sub-Velebit littoral includes ground reconnaissance in difficult conditions, under extreme meteorological circumstances, in a landscape where only an experienced researcher can notice certain archaeological remains. Some stone structures may be noticed easier if photographed from an aircraft. This will enable better comprehension of the sites in their topographical and landscape context. Until such purpose-made aerial photographs are obtained, we are forced to use Google Earth and orthophotos which do not provide sufficient information.

Research on Velebit offers answers to questions asking why and how this region was inhabited, what the way of life was like and why certain locations were chosen instead of others. Velebit can only be understood if we spend more time on this mountain. Only field survey of this region, which seems absolutely unsuitable for life at present, can help us in understanding the previous living, which is necessary for all other analyses.

However analysis of photographs taken of Velebit from the bird's eye view would enable much faster, more efficient and more economic realization of reconnaissance on the mainland as well as better understanding of the sites' distribution and the entire region.

Impetus for writing this article was participation of the author in the Aerial Archaeology Training School in Kostolac in Serbia and a conversation with Rog Palmer to whom I tried to explain problems I had encountered in the reconnaissance of the karst landscape. Thereby I became aware of the potential of aerial archaeology and various possibilities which might facilitate field survey of this region.