

# Features, Sites and Settlement Areas in the View of Air Survey (Bohemia, 1992-2003)

*Martin Gojda*

## **Abstract**

The paper brings an attempt to summarise the most important data concerning the interpretation of the macula features and the classification of maculae sites as a result of a 12-year air-survey campaign in the lowlands of Bohemia (western half of the Czech Republic). A system for the description of settlement areas identified and documented during the "Prehistoric Settlement Patterns in Bohemia" project has been proposed comprising a set of attributes and specifications useful for the description of maculae crop mark areas. The paper also deals with the problem of long-term continuity of various types of past activities to the evidence on how the function and meaning of these zones changed during prehistory from residential to funeral and/or ritual.

## **Résumé**

Cet article tente de donner un aperçu des données principales concernant l'interprétation des sites à taches maculaires, découverts par photographie aérienne dans le courant des 12 dernières années en basse Bohême (la moitié occidentale de la république tchèque. Ces sites ont été répertoriés dans le projet «Structures d'habitats préhistoriques en Bohême». Il est proposé d'utiliser un set d'attributs et de spécifications utiles pour la description des traces phytologiques maculaires. Cet article s'attaque également au problème de la continuité en longue durée de différents types d'activité humaine dans le passé et tente de comprendre comment la fonction et la signification de ces sites ont changé de sites résidentiels à des sites funéraires et/ou rituels.

Mail address of the author: [gojda@arup.cas.cz](mailto:gojda@arup.cas.cz)

## 1 | Introduction

Lowlands, the landscape of large flat valleys of the middle and lower courses of major rivers, in prehistory and early history the most frequently occupied type of natural environment provide a wide range of archaeological evidence in terms of buried settlements and features. It is, however, the extensive application of non-destructive methods of field research which has currently displayed that in this environment – from archaeological perspective supposedly known in detail - there remain a great number of unidentified sites and monuments. These methods enriched the state of archaeological records to a significant extent, both in terms of quantity and quality. The first-rate method of aerial research contributed to this shift, and a complementary role was played by geophysical measurements and surface survey.

The core part of the paper brings an attempt at the classification of the types of features which, in the course of the last decade (most of all during the Prehistoric Settlement Patterns in Bohemia – PSPB project, 1997-2002; Gojda ed. 2004) were identified and recorded.










In terms of settlement activity we can formally classify archaeological features (structures) into three types:

- Small areas (points, spots, dots) - maculae (such as pits, sunken-floored houses, graves, i.e. sunken features, and also post-hole constructions, or above-ground features);
- Lines (ditches, fencing, palisades) delimiting some area/space. These are:
  - enclosures (such as ring-ditched burials, rondels/henges, buildings with peripheral foundation trench, military camps/forts; commonly they include features of the (a) group);
  - enclosing features (ditches/ramparts/walls/palisades which enclose an area just in a part of its perimeter; the rest of the area is usually protected by natural morphology of the terrain);
  - linear systems (such as fields).
- Lines, i.e. features which do not limit, but which intersect, or as the case may be, connect single parts of settlement areas. They do not have a direct relation to another feature, i.e. they are not an integral part of it (such as roads, pathways, territorial boundaries). The majority of prehistoric settlement components, i.e. archaeological complexes (features) have the character of small areas. We can use this division when classifying crop marks.

During aerial reconnaissance over the selected territory within the PSPB project two groups of crop marks were identified. The majority of them (roughly two thirds of the identified sites with components) represent the so-called maculae. Their presence is frequently evidenced on sites in which also linear features (moats, enclosures, paths etc.) occur.

## 2 | Macula features

As mentioned above, the most common component of the archaeological landscape identified during aerial research of the main settlement zone in prehistoric Bohemia is the macula, a feature that yields crop marks (or soilmarks) across its entire area, such as a sunken-featured building, pit, grave, post hole, etc. Items of this type are distinguished by a different size, from round pits (as identified for example in above-ground floor plans) up to destroyed and filled-in quarries and clay pits. It is this very type of an archaeological feature that can most easily be confused with those that are not of ancient human origin (marks in fields forming clusters which are the results of current fertilisation or of local occurrence of weeds on the otherwise homogeneous surface of the fields of fully-grown cereal crops). The correct identification of these features is to

|            |  |  |  |  |  |
|------------|--|--|--|--|--|
| MACULA (M) |  M.1.1. |  M.1.2.1. |  M.1.2.2. |  M.2.   |  |
| I-III.     |  I.     |  II.1.    |  II.2.    |  III.1. |  III.2. |

**Figure 1:** The classification of maculae features as identified by air survey in Bohemia between 1992 – 2002 (based on the PSPB project)

a certain extent dependent on the experience of the observer, who should take notice not just of whether identified features have a geometric form, but also what are their mutual relationship and the total character of the locality (their placing in the landscape from the view of the morphology of the terrain) like. The basic characteristics of the macula features are displayed in figure 1.

## 3 | Classification of maculae crop mark sites



**Figure 2:** Ledčice 2 (distr. Mělník). Large concentration of maculae crop marks



**Figure 3:** Straškov 1 (distr. Litoměřice). Large concentration of maculae crop marks

A particular problem is how to work with areas the components of which comprise maculae, which appear both singly and in concentrations with numbers running into the dozens and hundreds of features (figs. 2 and 3). In the area of interest to the PSPB project the great majority were classified either as pits (the more precise functional determination of which is unascertainable from photographs in most cases; fig. 1a:



**Figure 4:** Horní Počaply 1 (distr. Mělník). A group of crop marked sunken-floored houses (Grubenhäuser)



**Figure 5:** Radim 2 (distr. Kolín). Regular setting of maculae features of similar form, size and orientation indicates the existence of a cemetery site



**Figure 6:** Ctiněves 2 (distr. Litoměřice). Regular spatial distribution of large macula features - sunken-floored houses (placed in the cluster of pits) indicates their contemporaneity

M.1.1), dwellings (fig. 1a: M.1.2.1, M.1.2.2; fig. 4) or graves. Numerous, variously extensive lines of rectangular maculae of the same size and orientation, mutually respecting one another and showing evidence of functional and temporal concordance are easily interpretable – these are regular cemeteries, for which it is possible to state a likely age due to prior knowledge of burial practices of particular prehistoric cultures (size of cemetery, grave orientation, clustering of burials in groups, etc., fig. 5).

In the classification of settlement areas (or residential components) formed by this type of feature, however, there are several problems. Above all there is the question of the description of clusters with a large number of features. In only a few cases is it possible to identify at first sight macula features which from the point of view of spatial distribution form a plan and which are therefore likely to be contemporaneous (fig. 1a: II.2; fig. 6), and which are the structural elements of a single feature, e.g. the post holes of above-ground buildings (fig. 1a: II.2; fig. 7). In the main only irregularly spaced points/spots are recorded, the form and size of which reflects their basic function, but not their mutual relationship. The problem is whether (or to what extent) it is possible in the search for chronologically contemporaneous components in the given area to start from the similarity/identity of the shapes and/or sizes of the feature plans as captured on aerial images. For the eventual use of these properties of crop marked features it would of course be necessary to conduct a careful analysis of the available photographs together with their digitizing to high resolution. It might thus be possible to establish certain clusters of features with similar properties and spatial data or process them using statistical methods. Such an approach would clearly bring a new quality of understanding, especially of extensive settlement areas. It would be sensible to dedicate a separate project to this, by which means several areas could be processed together. Otherwise it is obviously possible to apply a detailed analysis of crop mark settlement areas to individual cases, where a certain area is detailed through complex research using diverse methods.



It has become ever more necessary to create a specific system for the description of settlement areas (or their parts) captured on aerial photographs through crop marks. A system for the description of such areas (traditionally termed sites) is proposed using the parameters listed in table 1.

**Figure 7:** Maculae – post pits – as part of the plan of an above-ground long early Neolithic house

| Atr. N° | Attributes of a maculae crop mark area   | An area specifications  |
|---------|--|---|
| 1       | Size of the recorded part of a maculae crop mark area                            | small (less than 1 ha.)<br>medium (1-5 ha.)<br>large (over 5 ha.)                                   |
| 2       | Probable relationship to spatial continuation of a nearby maculae crop mark area | yes / no  |
| 3       | Complete plan of the recorded area   | yes / no  |
| 4       | Number of components (maculae crop mark features)                                | x (single)<br>xx (tens)<br>xxx (hundreds)   |
| 5       | Distance between components  | long ( $\geq 10$ m)<br>short ( $< 10$ m)<br>variable  |
| 6       | Presence of pits   | yes / no  |
| 7       | Proportion of pits within total number of components                             | x (small $\geq 50\%$ )<br>xx (medium $\pm 50\%$ )<br>xxx (large 50-90%)<br>xxxx (extra large " 90%) |
| 8       | Presence of houses   | yes / no  |
| 9       | Proportion of houses within total number of components                           | x (small $\geq 50\%$ )<br>xx (medium $\pm 50\%$ )<br>xxx (large 50-75%)<br>xxxx (extra large " 75%) |
| 10      | Presence of linear unenclosing features (lines)                                  | yes / no  |
| 11      | Presence of linear enclosing features (enclosures)                               | yes / no  |

| Atr. N° | Attributes of a maculae crop mark area   | An area specifications                                    |
|---------|--|---|
| 12      | Contemporaneity of two or more components (based on their spatial arrangement and affinity in size, ground-plan and orientation) | yes / no  |
| 13      | Landscape setting (geomorphological types)   | flood plain, (mild) slope, terrace edge, elevated plateau |
| 14      | Dating   | period(s)<br>culture(s)                                   |
| 15      | Type of activity   | residential<br>funeral<br>ritual<br>other                 |

**Table 1.** Basic characteristics of maculae crop mark areas

The parameters (properties) given in the preceding table may be arbitrarily complemented by others, or descriptions of only some may be used in some cases. Other properties might be added to the table, for example, for conducting other types of research (such as surface artefact collection and excavation), which provide chronological data in particular. It would seem that for the processing of certain areas of interest from the point of view of the structure of prehistoric settlement (the topography and continuity of settlement areas), the data from aerial archaeological survey are best evaluated in this manner, and may also be used for a deeper analysis of the settlement history in the given area. It is for this reason that this description was applied as a parallel part of the maps/plans used in processing several selected micro-regions within the framework of the PSPB project.

Lowlands, whose settlement forms the subject of this chapter, are one of the two basic georelief types of the European temperate zone (the other is the upland - territory 300 - 600 m. above sea level, with undulating to broken relief). Strictly speaking, lowlands were, throughout the history of human settlement, the most settled type of natural georelief. In the conditions of the European temperate zone, lowlands are interspersed by a relatively dense network of watercourses. Thanks to the character of the cover, low altitude above sea level, temperatures and average precipitation, they are very fertile. Furthermore, they are, in view of their surfaces and gently undulating relief, easily accessible for the application of agricultural practice and they are very appropriate for the movement of humans.

Due to this, as prehistoric and also medieval populations occupied the space of individual types of natural landscape, permanent or at least long-term changes occurred in the original appearance of these landscapes. Thus, in suitable areas of natural zones, the so-called settlement zones started to emerge progressively. For the wider territory of the European temperate zone we can distinguish four such zones (Gojda 2000, 146-149). Their division results above all from the relief and their height above sea level.

In general terms the most densely occupied settlement zone in prehistory was the lowland. Most have the form of broad, flat wide valleys of the central and lower courses of rivers, spreading over light sandy and loess soils. For example, in Bohemia, this zone is traditionally termed old settlement territory. Settlement areas tend to be located at a distance at the most 300-400 m from water sources, i.e. the main river or its tributary, and most tend to be situated on the terrain breaks (usually edges of river terraces). A significant topic of landscape archaeology is the settlement of the alluvial plain, to which appropriate attention was also paid in the PSPB project. The archaeological and settlement topographical data from this first zone show the evidence of a practically continual existence of settlement areas inhabited in the prehistoric and early medieval period.

In keeping with the theory of settlement areas (Neustupný 1998, we denote the remains of settlement activities of individual prehistoric communities as settlements, which, during the prevailing settled way of life, accumulated in the limited space of the original community areas (this concept indicates the category of a living culture, whose reflection in archaeological sources gives rise to the term settlement area). Settlement areas consist of the components, which came into being by the accumulation of the remains of individual activity areas. These had a definite function, meaning and purpose. Part of the settlement areas were components whose remains can be detected by archaeological methods only with difficulty (for example fields, pastures, areas of exploitation of wood, the boundary of “no-man’s land”), which does not mean however that we should neglect them in our analyses.

The extensive application of non-destructive fieldwork in lowland settlement zones in the chosen territory of Bohemia in the last decade identified a concentration of components of prehistoric settlements. Beside smaller areas several spatially extensive areas were recorded, which are distinguished on the one hand by an accumulation of a large number of buried features/structures (aerial prospection) and on the other hand by a large number of artefacts spread on the surface (plough walking surface collection). Most often these concentrations are found in the close vicinity of current village settlements. Also, their occurrence in open countryside in the middle of fields, quite often halfway between contemporary villages, has been evidenced occasionally.

If we are aware that our existing knowledge about the size of settlement areas within the scope of the PSPB project is still not yet complete (just by means of aerial prospection almost every year new, until then unrecorded settlement areas or new components are recorded), it is evident that spatial distribution of prehistoric settlement components is far larger than the current settlement network. This is because on the one hand they were more mobile (in terms of local spatial shift of activity areas) and on the other hand they advanced after a period longer than areas of historic (medieval – modern period) settlements. If we want to classify them according to the categories mentioned in chapter 3 (table 1), then we would have the following results (table 2).

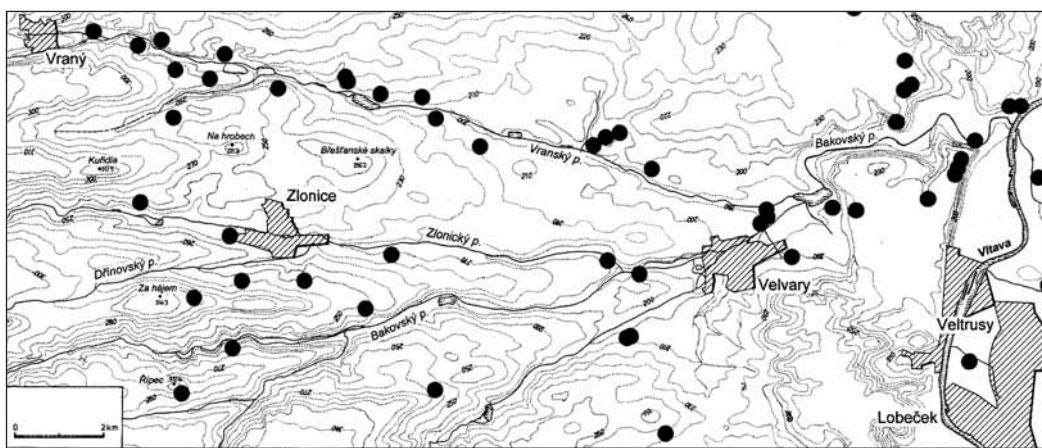
| Crop mark<br>settl. area | Račiněves<br>2                 | Ledčice 1             | Ledčice 2                               | Hrdly 1  | Obříství 1  | Jiřice 2                                  |
|--------------------------|--------------------------------|-----------------------|---|--|---|---|
| Attr. N°                 |                                |                       |   |  |   |   |
| 1                        | large<br>(10 ha.)              | medium<br>(1,5 ha.)   | medium<br>(2 ha.)                       | large<br>(8 ha.)                                 | medium -<br>large (5 ha.)   | large<br>(6 ha.)                          |
| 2                        | no                             | no                    | yes                                     | yes  | no  | no  |
| 3                        | yes (?)                        | yes (?)               | no                                      | no   | no  | no  |
| 4                        | xxx                            | xx-xxx                | xxx                                     | xx-xxx   | xx  | xx-xxx                                    |
| 5                        | variable                       | variable              | short                                   | variable   | variable  | variable                                  |
| 6                        | yes                            | yes                   | yes                                     | yes  | yes   | yes                                       |
| 7                        | x                              | x                     | xxxx                                    | xxx  | x   | xx  |
| 8                        | yes                            | yes                   | yes                                     | yes  | yes   | yes                                       |
| 9                        | xxx                            | xxx                   | x                                       | x  | xxxx  | xx  |
| 10                       | yes                            | no                    | yes                                     | yes  | no  | no  |
| 11                       | no                             | yes                   | yes                                     | yes  | no  | yes                                       |
| 12                       | yes                            | yes                   | yes                                     | yes  | no  | yes                                       |
| 13                       | elevated<br>plateau -<br>slope | slope                 | elevated<br>plateau                     | mild slope                                       | terrace<br>edge   | terrace<br>edge                           |
| 14                       | later pre-<br>history          | later pre-<br>history | middle<br>Bronze -<br>late Iron<br>Ages | early<br>Neolithic,<br>late<br>Eneolithic<br>(?) | middle<br>Eneolithic<br>(?), late<br>Iron Age,<br>Roman<br>period | Late Iron<br>Age, early<br>Middle<br>Ages |
| 15                       | residential                    | residential           | residential<br>burial (?)               | residential<br>burial<br>ritual (?)              | residential   | residential<br>burial                     |

**Table 2.** The attributes of a group of selected maculae crop marked areas in the PSPB project territory

By comparison of the qualities of maculae areas of medium to large size (all of them, not only examples in table 2) we can ascertain that in most cases it is commonly just a part of the identified residential area, that one which is situated in places where there is increased erosion. Even when the isolated areas are discovered which appear to be fully detected and which do not have a direct link to other concentration of components situated nearby, they do not tend to be completely isolated, and further traces of settlement activities are in the main identified within a distance of several hundred metres to one or two kilometres (such as Račiněves 2 and Ledčice 1). These areas contain dozens to hundreds of sunken features, which are usually houses and pits. Oddly enough, areas with a higher share of dwellings predominate slightly, and in some places the pits are almost missing (i.e. they are not recorded). If pits unambiguously predominate in identified sites, it was probably the detected part of the settlement area, in which waste was gathered (e.g., Ledčice 2, fig. 2). In many cases other fea-



tures, such as enclosures and lines, are detected. This may indicate activities other than residential (burial, ritual, recent). They were placed practically on all types of georelief and should we have them detected most of all on terrace edges and on elevated plateaus and slopes, it is supposed that it is given by post depositional processes (erosion) and may not necessarily reflect the true state in the past. Besides the spatially extensive settlement areas oscillating in proximity to current villages, we found evidence of a further group, which was characterised by a direct link to a water-course, coming from higher altitudes of lowland zone to its lowest part or from the upland to the lowland zone. A typical example of these linear concentrations of settlement areas is the approximately 15 kilometre-long valley of the Vranský stream, which transects the Říp plateau (from west to east) and descends from the broken terrain at 280 m above sea level to the south-eastern territory of this plateau, at a height of 180 m above sea level. On both banks and the edges of the local hills 15 sites with residential and burial components have been evidenced so far (fig. 8). We have recorded a similar situation on the banks of the lower Cidlina river: in a length of around 4 km seven concentrations of settlement (residential, burial, ritual) components were identified by aerial reconnaissance.



**Figure 8:** Sites identified from the air on the territory of the Vranský stream valley between 1992-2004. This is an excellent example of a continual settlement zone with plenty of settlement areas of which aerial survey is usually able to reveal just sections

Besides the evidence on long-term use of settlement areas shown by aerial archaeology, this fact is also confirmed by the results of surface collections, which generally has recorded artefacts of different ages on them. On the basis of analysis of the results presented, a model of continuous prehistoric areas was created. This is the most important contribution of analytical surface collections for a solution to the theory of settlement dynamics in the prehistoric age. It is established in fact that the location of prehistoric areas in the landscape was not strictly defined by natural conditions or by chance, but connected with the permanent creation and maintenance of cultural landscape. According to the results of research in certain Central Bohemian parts, the so-called old settlement territory proves the settlement structure to be stable, changing gradually into long-term time sectors, not in the measurement of individual prehistoric cultures. Explaining the settlement behaviour of prehistoric communities solely by natural invariables of the landscape however is shown to be unlikely. The results of collections have revealed the uneven arrangement of prehistoric finds on surfaces,

which can be from the viewpoint of natural conditions considered to be optimal for the basis of residential areas, and therefore also the definite tendency for their concentration only in some parts of the space. It is therefore important to consider the structuring of activities into areas of different functions. The placing of prehistoric areas in the countryside was neither accidental nor strictly determined by natural conditions. It was connected with the continual creation and maintenance of the cultural landscape of man, with the sequence of specific decision of prehistoric communities during individual phases of the evolution of the settlement. The structure of the landscape created specific objective conditions for the further existence and development of the settlement, but at the same time it was exposed to conscious (symbolic) aspects of human intervention in it. The continuity of the areas must have had a real, functional and symbolic aspect, determined by the previous phase of the settlement, and was a vital factor in the evolution of the settlement system. Possible changes in the structure of settlement areas are then a reflection not only of the environment itself and the economic demands of prehistoric communities, but also the evolution of the social structure, symbolic systems and strategies of social groups (Kuna 1998).

#### 4 | Conclusion

We can summarize that the data gathered in the PSPB project show that the landscape of the old (traditional) settlement zone represented a structure with a relatively high level of stability and continuity in time and space. Areas of prehistoric populations are according to the evidence of non-destructive techniques – above all aerial research – established by a relatively rich range of settlement components. Most of these testify to the fact that the components were part of the residential core of settlements. A palimpsest of features (dwellings, pits, enclosures) visible from the air on their surface testifies the long-term use of them, which is attributed to the repeated inhabitation of these sites. This evidence is confirmation of the value of surface collections, which clearly show the long-term continual use of intended space in prehistory. A relatively frequent occurrence of features other than residential in this palimpsest (few enclosures linked with burials, many enclosures linked with ceremonial/ritual practices) however shows that during long periods of time the function and meaning of these areas was changing (table 3).

| <b>Crop mark settlement area</b> | <b>Hrdly 1</b> | <b>Chleby 1</b> | <b>Jiřice 1</b> | <b>Kly 1</b> | <b>Ledčice 2</b> | <b>Trpoměchy 1</b> |
|----------------------------------|----------------|-----------------|-----------------|--------------|------------------|--------------------|
| <b>Types of activity</b>         |                |                 |                 |              |                  |                    |
| residential                      | x              | x               | x               | x            | x                | x                  |
| burial                           | x              |                 | x               |              | x (?)            |                    |
| ritual/ceremonial                | x (?)          | x               |                 | x            |                  | x                  |

**Table 3.** Areas with various types of activities as evidenced by aerial survey (PSPB project)

## 5 | Bibliography

- Gojda M., 2000. *Archeologie krajiny*. Praha: Academia.
- Gojda M. (ed.), 2004. *Ancient Landscapes, Settlement Dynamics and Non-Destructive Archaeology*. Prague: Academia.
- Kuna M., 1998. The Memory of Landscapes. In: Neustupný E. (ed.), *Space in Prehistoric Bohemia*, Prague, Institute of Archaeology, 106-115.
- Neustupný E., 1998. The transformation of community areas into settlement areas. In: Neustupný E. (ed.). *Space in Prehistoric Bohemia*. Prague, Institute of Archaeology, 45-61.

