

A MARGINAL LANDSCAPE:
FIELD WORK ON THE BEACH RIDGE COMPLEX NEAR FOGLIANO (SOUTH LAZIO)

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ABSTRACT: This paper reports on the results of archaeological and geographical field work conducted in 1998 and 1999 by members of the Regional Pathways to Complexity project in the coastal landscape of South Lazio (Italy). The proto-historic (Bronze Age to Archaic) settlement history of this area is dominated by its marginal position with respect to the proto-urban settlements of the Alban Hills and the Lepine Margin, and in the historic period (post-Archaic to Roman Imperial) by the strategic and economic interests of Rome. A preliminary reconstruction of the dynamics of both the physical and the human landscape is given for both periods. The interpretation of the results of the field walking survey and the reconstruction of potential proto-historic and Roman land use are both informed by an analysis of recent changes in the physical environment – especially the *Bonifica* carried out in the 1920s.

KEYWORDS: Archaeological survey, land evaluation, Central Italy, Pontine region, proto-history, Roman period.

1. INTRODUCTION

1.1. Marginal landscape units in the RPC project

The Fogliano pedological and archaeological field work reported on here is part of the research program of the *Regional Pathways to Complexity* (RPC) project conducted jointly from 1997 to 2001 by the Groningen Institute of Archaeology and the Free University of Amsterdam. The RPC project studies landscape and settlement dynamics in three proto-historic Italian regions with the processes of centralisation, early urbanisation and colonisation as its main themes (Attema et al., 1998).

Whereas in all three regions much fieldwork has been carried out in the past decades to tackle these themes, such work has invariably neglected the marginal areas in the landscape. By ‘marginal’ we mean those landscape units that, on account of their environmental characteristics (low fertility, inaccessibility, and distance from core areas), were not especially favoured for permanent settlement during the proto- and early historic periods. In spite of their correspondingly less-than-impressive archaeology, we feel that these parts of the ancient landscape should not be excluded from a regional study. On the contrary, they should be considered integral parts of the ancient human landscape because they may have a specific role in the economic system, may constitute a potential zone of demographic expansion, or may function as an area of refuge.

Having been thinly settled in the past, and put to low intensity use, marginal areas pose particular methodological problems on account of the low density of surface material that constitutes the archaeological record. A total of four weeks of survey by

the RPC team in the lagoonal environment near the lake of Fogliano in the Pontine Region in the summer of 1998 and the spring of 1999 were aimed at assessing the influence in this marginal landscape unit of the early urbanisation process (7th and 6th centuries BC) and of Roman expansion in the subsequent period (5th to 4th centuries BC and later). It was found that the area attracted substantial settlement only in an advanced stage of the Roman Republican and early Imperial periods, while featuring continuous but sparse human presence during all earlier periods. We tentatively link this late Republican and early Imperial settlement increase to a socio-economic development very specific to these coastal margins – the establishment of wealthy maritime villas that managed large marine fishponds, as well as a substantial pottery industry exploiting the high quality clay banks found along the coast and now exposed by the sea.

1.2. Outline of the physical and human landscape of the Pontine region

In order to relate the findings of the archaeological surveys of the RPC project to the characteristics and dynamics of the contemporary landscape, physical geographical mappings are carried out in combination with the surveys. Such fieldwork took place in conjunction with the archaeological survey, in the area between Borgo Sabotino and Borgo Grappa, the coast, and the beach ridges of the Minturno level. The primary aim of this study was to check the detailed (scale 1:25,000) soil maps of this region by Kamermans et al. (1979) and Bouman & Rot (1982), and to compile these into one map. A subsidiary aim

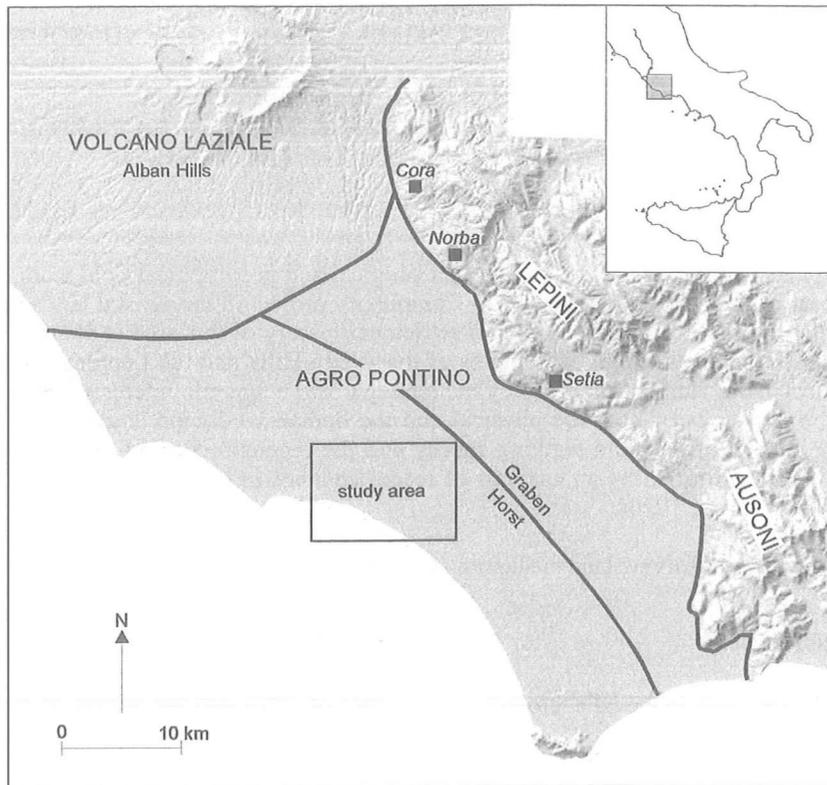


Fig. 1. The location of the Fogliano field work area within the Pontine region. The four major physical geographical regions are outlined on a shaded elevation model.

was to create a soil unit description according to the guidelines of the Food and Agriculture Organisation (1977), in order to do a land evaluation for agriculture from the late Bronze Age till Roman times, reconstructing the potential suitability of a specific land use type for a specific physiographical unit. In this study, only soil properties and characteristics relevant for early agricultural land use have been used, which is reflected in the criteria used in the legend. A final aim of the study was to reconstruct the landscape by examining the units, and especially the recent anthropogenic influences, which drastically changed this landscape.

The landscape of the Agro Pontino has been fully described by Sevink et al. (1982; 1984) and Kamer-mans (1991). In broad outline, it consists of four physical geographical units (see fig. 1):

1. Limestone mountains (Monti Lepini and Monti Ausoni), folded during the middle and late Miocene;
2. Tuff hills originating from the Volcano Laziale which was active between 700,000 and 45,000 BP;
3. A graben formed in the Plio-Pleistocene as a result of vertical movements along NW-SE running fault lines, subsequently filled with fine textured and often organic sediments and draining toward the south-east; and

4. A horst system along the sea coast, consisting of four sandy clayey marine terraces with a local aeolian cover, developed as a consequence of worldwide sea level rises, although locally other factors played a role. From oldest to youngest the terraces are named Latina level, Minturno level, Borgo Ermada level and Terracina level (Sevink et al., 1984). This system as a whole drains to the south-west.

The Minturno level has been dated by fission track, K/Ar and amino acid racemization to about 125,000 years BP. During the next sea level rise in the early Würm (about 90,000 years BP) the Borgo Ermada level was formed (Kamer-mans, 1991). Only in the Holocene were the beach ridges of the Terracina level developed, incised later by rivers filling up the valleys with fluvial and marine sediments (Bouman & Rot, 1982). All units have been locally covered by aeolian sands during dry phases from the Würm to the early Holocene. As part of the fight against the malarial mosquito the Lago di Fogliano was partly deepened and salted, partly filled in during the 1930s (J. Sevink, pers. comm.). Surplus sediment was also dumped around the lake and further inland, these units being classified as anthropogenic.

The settlement dynamics pertaining to the proto-historical and early historical period in the Fogliano

survey area should be evaluated in the light of developments in the core area of Latium Vetus, i.e. the Alban Hills including Rome and its environs (Attema, 1993). The major developments in this area can conveniently be presented as three distinct settlement phases, each implying an exponential growth in agricultural, building, and industrial activities affecting ever more landscape units, including marginal areas such as Fogliano (see fig. 1):

1) Centralisation of settlement during the Bronze Age and early Iron Age (c. 1500-700 BC) featuring a very gradual infill of the volcanic landscape of the Alban Hills and the core area around Rome, and marginal presence on the slopes of the limestone mountain range of the Monti Lepini;

2) Proto-urbanisation during the late Iron Age and Archaic periods (c. 700-400 BC), a process which saw the formation of early towns, and which included the growth of a rural landscape along the slopes of the Monti Lepini and along the ancient beach ridges into the Pontine region proper;

3) Romanisation of the proto-urban landscape and full colonisation of the Pontine plain (400-100 BC), a process which gradually also began to affect the more marginal areas, such as the beach ridges along the coast of which the Fogliano survey area forms a part. This phase also sees the growth of industrial activities.

Following this brief sketch of the regional context of our research, the remainder of this article will be used to describe the physical geographical units and their agricultural potential (section 2), to discuss the archaeological results and some problems in their interpretation (section 3), and, lastly, to consider how our research may influence our interpretation of the regional context (section 4).

2. EVALUATING THE AGRICULTURAL POTENTIAL OF THE LANDSCAPE

Evaluating the agricultural potential of the proto-historic and Roman landscape of Fogliano is a three-step process. First a physical geographical map of the area is made; then follows an assessment of any substantial changes the landscape may have undergone through natural and human agents; and finally an agricultural land evaluation is carried out. Figure 2 shows the physical geography of the study area as mapped by the RPC project. Table 1 summarises the process by which these units were constructed from two earlier partial mappings. In the following paragraphs each legend unit is briefly discussed and a preliminary land evaluation is given. A complete land evaluation of the Pontine region is being prepared by Van Joolen (in prep.)

2.1. Description of the units

Beach ridge unit. The beach ridges of the Minturno level (M1) and those of the Borgo Ermada level (B1 to B6) can be classified into the same unit for land evaluation, despite the fact that elevation levels can differ significantly (respectively 13 m and 6 m asl), the texture, soils and drainage class are more or less the same. The ages of the different beach ridges are not relevant for the land evaluation, because in all units more or less the same soils have developed. However, since the older beach ridges had a longer period for soil development, they have a more clayey texture and more chromic properties (darker colouring).

Lagoonal unit between beach ridges. This unit consists of fluvial and/or lagoonal sediments. The unit is relatively narrow (less than 150 m). North of the Strada Litoranea the units B7 and B9 (deposits between and alongside the beach ridges, Kamermans et al.) and the units B4 (valley-units, Bouman & Rot) coincide. South of the Minturno beach ridge M1 the unit B9 (Kamermans et al.) coincides with unit M4 (Bouman & Rot). South of the Strada Litoranea the units B7 and B9 of Kamermans et al. coincide with unit B6 and T4 of Bouman and Rot. The aeolian unit B6 could not be differentiated from the beach ridge deposit B1; it lies in the same position as the B7 and B9 deposits and has the same texture. Unit T4 just west of the village of Fogliano could not be differentiated from the beach ridge unit B1, and is therefore classified alike.

Level lagoonal unit. Despite the fact that Bouman and Rot classify T7 as anthropogenic, it seems justified to consider T7 similar to T2, since it has the same position in the landscape and (probably) the same fluvial genesis.

Aeolian unit. North of the western side of Lago di Fogliano the aeolian units (B6) of Bouman and Rot are classified as lagoonal between beach ridge deposits, because the texture (clayey loam) resembles that of the lagoonal deposits. North of the Strada Litoranea the aeolian deposits are classified as beach ridge unit.

Anthropogenic unit. All anthropogenic units of Bouman and Rot are classified as level lagoonal unit, except for the one north of Canale Allacciante at the western side of Lago di Fogliano, for which insufficient information was available. The anthropogenic unit B13 of Kamermans et al. is considered to be a beach ridge unit, because it forms a well drained elongated ridge in the landscape at an elevation of 10 to 11 m above sea level. On the map the other

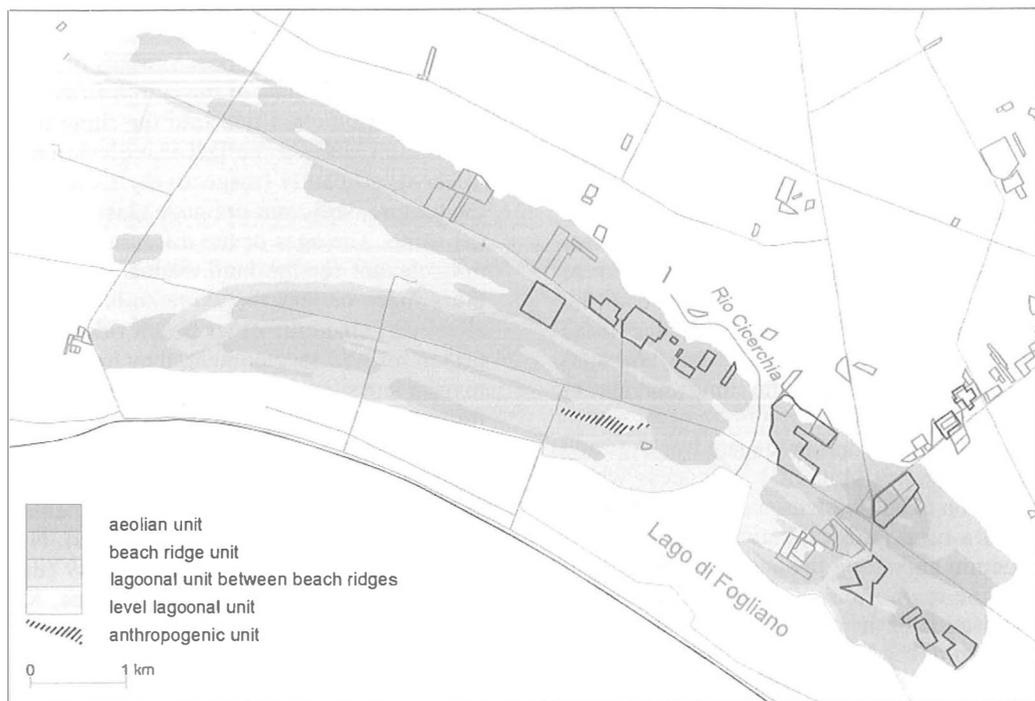


Fig. 2. The physical geography of the Fogliano field work area. Fields outlined in bold were surveyed by the RPC project in 1998-1999; those outlined in grey were surveyed by the Agro Pontino project in the 1980s.

Table 1. Description of new legend units on the basis of the partial mappings by Kamermans et al. (1979) and Bouman & Rot (1982). N/A = Not Applicable; asl = above sea level. Drainage classes according to FAO (1977): Class 1: poorly drained; Class 2: imperfectly drained; Class 3: moderately well drained; Class 4: well drained; Class 5: somewhat excessively drained; Class 6: excessively drained. Slope classes according to FAO (1977): 0-2% flat or almost flat; 2-6% gently sloping.

Units Kamermans et al. (1979)	Units Bouman & Rot (1982)	Units Van Joolen (this article)	Texture	Struc- ture	Soil classi- fication (FAO, '77)	Drainage class	Elevation (m asl)	Slope class
B1 to B6; B13; M1	B1; B6; M1	Beach ridge unit	Sandy clay loam or sandy loam	N/A	Chromic, orthic, albic and gleyic luvisols	4-6	2-13	Gently sloping
T4; B7; B9	T4; B4; M4	Lagoonal unit between beach ridges	Sandy loam or clay	Cracks	Chromic vertisols, gleyic and orthic luvisols	2	2-5	Almost flat
B8; B10 to B12	T2; T7; B2	Level lagoonal unit	Sandy clay or clay, sand on sand	Cracks	Solodic planosols, albic luvisols, pellic vertisols, fluvisols	1-2	5-10	Flat or almost flat
	B6	Aeolian unit	Fine, well- sorted sands	N/A	Eutric cambisols, gleyic, orthic and chromic luvisols	4-5	Vari- able	Gently sloping
	T7	Anthropogenic unit	-	-	-	-	-	-

anthropogenic units from which the genesis could be reconstructed are hatched.

2.2. Preliminary land evaluation

The method of land evaluation compares the soil requirements of different land utilisation types with the land qualities and characteristics of the described units, to determine their agricultural suitability. The results of our preliminary evaluation are given here.

Beach ridge unit. Because of the medium textured sediments and the drainage varying between well drained and excessively drained, the soils of this unit need fertilisation (by manuring) and if needed irrigation to cultivate crops. Such practices were not in widespread use in the Bronze Age, but were used in Roman times (Spurr, 1986). In the latter period millet ("can grow almost anywhere", Spurr, 1986), fodder crops, and vines were best adapted to these circumstances in a mixed farming rotation system.

Lagoonal unit between the beach ridges. Because of its clayey texture this unit may have been relatively difficult to cultivate. The deposits may have been suitable for small scale agriculture of wheat or grass for hay, together with dry and wet meadows. During the Bronze Age the unit probably was not attractive because of the heavy texture and possibility of waterlogging and may have been only used for transhumant grazing of cattle, but in Roman times the biennial system of wheat cultivation followed by fallow was possible. It could also be used for long and short fallow and *pratium* (maintenance of dry and wet meadowland, Spurr, 1986).

Level lagoonal unit. Because the presence of lagoonal sandy clay or clay at shallow depth (less than 45 cm), which acts as an impermeable layer, causes waterlogging and/or cracking of the soil, cultivation of crops is nearly impossible on this unit. It is only suitable for the cultivation of hay from dry or wet grasslands or as grazing lands for cattle. *Pascuum* (long fallow, Spurr, 1986), *pratium*, short fallow, and transhumance may have been practised in both Bronze Age and Roman times.

Aeolian unit. Because of the high fertility (fine, well sorted sands) these deposits are suitable for a wide variety of crops. The unit is flat or nearly so, and would have been suitable for cultivation of barley, millet and vine, perhaps with occasional irrigation in dry periods, in both the Bronze Age and in Roman times. Usage of these soils for grassland would not have been logical. So cultivation practices such as mixed farming of barley and vine in both periods would have been possible, also because of the easily workable soils for manual tools and light ploughs.

3. THE ARCHAEOLOGICAL SURVEYS

3.1. Methodology

3.1.1. Biases inherent in the archaeological survey

As always, a discussion of the results of a field walking survey must begin with an assessment of the factors that bias the samples that were taken. In the Fogliano area these may be grouped under the headings of visibility factors, post-depositional processes, and surveyor biases.

Artefact visibility was generally low to very low throughout the 1998 Fogliano survey, due to the dusty conditions and intense sunlight. Excepting in a very small number of cases, the fields had been dry for several weeks and had apparently been harrowed several times so that a 10-15 cm thick top layer of fine and loose sand resulted. The direct sunlight also caused large differences in artefact visibility during the day, because of the variable angle of the sun above the horizon (altitude), its angle to our walking direction (azimuth), and the sharp shadows thrown by high crops and trees. A control survey conducted under better conditions in the spring of 1999 confirmed the importance of these visibility conditions, especially for pre- and proto-historic sites. It appears that even our intensive surveying could not consistently identify the Bronze and Iron Age material present in the study area in low numbers. With Archaic and post-Archaic ceramics the danger is slightly less because the sherds can be more easily distinguished (by size, color, and texture) from the soil matrix; and with Roman Republican and Imperial material visibility did not appear to be a factor at all. Artefact visibility bias has therefore mainly affected our observations of proto-historic ceramics.

A second factor affecting artefact collection are the *post-depositional processes*. Three centuries of Roman agricultural exploitation of the area during the late Republican and early Imperial period (200 BC-AD 100) constitute the first major post-depositional factor in the study area, significantly reducing our chances of finding pre-Roman ceramics. In addition to this, the *Bonifica Integrale* – the wholesale land reclamation of the Pontine plain brought about by the Italian government in the late 1920s and early 1930s – finally brought about the long wished-for transformation of the natural landscape of the Fogliano area into farming land. The characteristic landscape of beach ridges dissected by natural streams disappeared under the plough, whereas the lagoons of Fogliano and Dei Monaci were reduced in size and partly embanked. Interventions in the hydrography of the area had begun on a very small scale some 15 years earlier, as part of local private

enterprises. Until then the size of the lagoons, having no natural outlets to the sea, was variable and depended on the water supply by rivers from the interior, such as the Rio Cicerchia (since regulated) and the Bracciolo (since filled in).

In many areas peaty and clayey soil was added to improve the less fertile sandy fields, while sandy soil may have been added both to improve workability and to raise the level of some of the lower-lying heavy clayey fields. Many other fields, especially those on ridges, may also have been levelled to make them more easily workable with modern farm machinery. Given the original relief of the area, marginal increases of the ground water level and of the water level in the lagoons will have resulted in significant decreases in accessibility, with marshes and lagoons closing in on the sandy ridges, as indicated by the presence of clayey deposits in between these ridges. This will have had great significance for the use of the smaller landscape units in antiquity. An analysis of the relief maps produced for the *Bonifica* of the 1920s is currently underway (Feiken & Van Leusen, forthcoming) and may in future allow us to correlate water level rises with the location of the archaeological sites in the proto-historic and Roman landscape. Taken together, these alterations may have significantly and non-randomly lowered artefact visibility in the area. However, no precise record of such activity was kept, and we therefore must rely on our own observations and on the memories of the local peasants.

The third and last factor influencing artefact recovery are *inter-walker differences* in training and in visual acuity. To minimise the effect of these, walkers were instructed to recover all flint and ceramic objects encountered; but of course the differences in experience did express themselves in one walker preferentially finding flint, and another mainly red, black, and orange wares. Whilst differences between the surveyors generally did not affect the highly visible Roman Republican finds, the older proto-historic ceramics were often caked in sand and had approximately the same size as many of the natural sand clumps produced by the fine ploughing in the area; and so it was quite easy to miss individual shards and even small scatters.

Because of the importance of these three visibility factors, our analysis of the survey results must take them into account. Our field recording methods allowed us to do this with two factors (dust conditions and vegetation cover, and soil addition/levelling) but not with inter-walker differences. In addition, we attempted to control and quantify biases by re-surveying representative fields and by comparing our results to those obtained earlier by the Agro Pontino project (Voorrips et al., 1991).

All recovery factors identified in the Fogliano surveys have tended to bias results away from the proto-historic periods. The re-surveying of selected fields in the Fogliano survey area has indeed shown that the visibility of proto- and early historic sites is highly dependent on survey conditions, land use and weather conditions being the two most important factors. From our comparison of the results obtained on the ploughed but very dusty fields of August 1998 with those obtained on the recently planted but moist fields of April 1999, two major consequences follow for the interpretation of settlement history. Firstly, the find of even a single sherd of pre-Roman ceramics is likely to indicate the presence of a small site. Given that this single sherd is relative unlikely to be picked up even in an intensive systematic survey such as was used by the RPC project (with typically about 30% coverage), we must assume that our surveys can only identify some of the Bronze Age and Iron Age sites present; for Archaic and post-Archaic sites this danger is less great because the ceramics are not so similar to the soil matrix; whereas for the even more easily visible Roman Republican and early Imperial material, occurring at much higher densities, we may assume all sites present in the survey fields have been discovered. Unfortunately the much higher density of the later material also masks the presence of small and dispersed scatters of early ceramics; in such a case the latter are much less likely to receive the attention and follow-up that the same sherds would get when found in an otherwise sterile field.

Modern land management and agricultural practices have been another major factor influencing the recovery of artefacts from the Fogliano study area, and research attempting to map and quantify this factor is currently underway (Feiken & Van Leusen, forthcoming).

3.1.2. *Definition of site and off-site*

The density at which we put the distinction between site and off-site material varies according to the type of material being analysed; in general, 'off-site density' can be taken to mean a density of less than 10 percent of the typical site density. For some materials that only occur in very low quantities and for which there are severe visibility problems, this can mean that a single ceramic find is interpreted as a probable site; at the other extreme, it can mean that high densities of Republican sherds occurring within 150 meters of a Republican site are classified as off-site material.

The main characteristic of the proto-historic off-site landscape as it appears from our survey is the extremely low finds density of 1-5 finds per hectare. A comparison with equivalent figures for the

Unit	Site	BA – EJA < 800 BC	MIA & LIA 800–600 BC	Archaic 600–500 BC	Post-Archaic 500–350 BC	Early & Mid Republican 350–200 BC	Late Republican & Early Imperial 200 BC – AD 100	Imperial > AD 100
Minturno beach ridge	225							
	202							
	201, 231							
	101							
	102							
Aeolian & sandy body	F227/3							
	219							
	227							
	226							
	005							
	211							
	214							
	210							
	205							
	217							
	215							
	216							
	103							
	105, 106, 107							
	104							
	208							
	218							
	204							
	212							
	213							
003								
002								
206								
207								
Younger beach ridge	226							
	004							
	228							
	230							
	222							
	228							
	110							
	001							
	220							
109								

Fig. 3. Summary results of the 1998 and 1999 Fogliano survey campaigns indicate the main trends in the development of settlement patterns from the LBA onwards in the three major landscape units. The width of the columns is proportional to the duration of each period. Light grey: presence of site uncertain.

contemporary Alban Hills which are 30 kms away (c. 50 finds per hectare), or even the Lepine Margins at less than 20 kms distance (c. 15 finds per hectare), reveals that human use of the coastal landscape must have been relatively marginal. In the late to post-Archaic period finds densities increase somewhat, and four distinct areas of use become apparent on the map. The non-use (or at least non-intensive use) of large parts of the landscape is evident from the percentage of fields with no finds from this period at all (80%).

This can be contrasted with the situation developing throughout the middle and late Republic, in which more or less all the available land was taken up for settlement and agricultural or other use. This

is reflected in the occurrence of small amounts of Roman Republican or early Imperial ceramics in nearly all of the fields surveyed by us.

3.2. Summary results

Figure 2 shows the location of the fields that were surveyed by the RPC project and the earlier Agro Pontino project in the Fogliano area. For the purposes of our discussion of the results, the landscape is divided into units on the basis of its physical geographical characteristics as described in section 2, the aim being to show more clearly the continuity in occupation of the basic terrain units and the changes in occupation density over time. The Minturno level



Fig. 4. Density of pre-Roman (late Bronze Age to Archaic) ceramics in the Fogliano survey area.

beach ridge is ca. 400 m wide with an average elevation of 13 m asl. The aeolian and sandy body connects with and overlies part of this ridge; it is several kms deep and provides easily the most space for settlement and agriculture. The younger beach ridges, just inland from the lagoons and separated from the two other units by bands of clayey alluvial and/or lagoonal sediments, are less wide (about 150 m) and less high (maximum 9 m asl) than the older Minturno level beach ridge. Figure 3 sets out the main trends and chronology of settlement in these three units.

Traces of human occupation of the Fogliano area are present in an unbroken sequence from the Middle Palaeolithic onwards. The lithic material collected during the survey, which dates from the Middle Palaeolithic to the Neolithic, will be the subject of a separate publication; discussion here will be restricted to the ceramic finds dating from the Bronze Age to the Roman Imperial period. The earliest ceramics, which are of a friable reddish brown fabric with sand temper, probably date to the Bronze Age/early Iron Age (c. 1000 BC) and occur in at least two of the three landscape units; certainly all of the area

was regularly used from the advanced Iron Age (c. 800 BC) onwards, although precise dating of the material only becomes possible with the appearance of red slipped wares in the 7th century BC. A detailed fabric analysis of the proto-historic material will be carried out in the near future. Figure 3 shows that, by the Iron Age/Archaic transition (around 600 BC), essentially all of the coastal beach ridge and lagoonal landscape was in use, with site numbers doubling and low levels of ceramics (1-5 sherds per hectare) occurring in almost all fields. Small sites are dotted across the elevated parts of the landscape every few hundred meters, avoiding only the clayey hinterland (see fig. 4).

On the beach ridges, no major changes in this picture seem to have occurred, although a gradual incorporation of the area into the expanding Roman Republic did lead to changes in building style (tiled roofs) and in pottery consumption (wheel-thrown industrial pottery and fine wares) during the 5th and 4th centuries BC. The number of sites gradually rises until the early Imperial period. The picture is dramatically different for the aeolian and sandy body.



Fig. 5. Density of Roman (post-Archaic to early Imperial) ceramics in the Fogliano survey area.

Here, the relative lack of multiperiod settlements throughout proto-history seems to indicate the unconstrained nature of the terrain, and the number of sites doubles in the post-Archaic period. The early and middle Republican periods see a slight fall in the number of sites, but some are re-occupied when, in the late Republican period (from c. 200 BC), a comparatively sudden five-fold increase in the number of sites reflects demographic growth perhaps brought about by an influx of labour from other areas. Although difficult to quantify, this period sees the growth of a rural village at Borgo Grappa, with isolated rural villas dotting the rest of the beach ridge landscape. This development may perhaps be understood in the context of the establishment of a production economy centring around the exploitation of the lagoons for fish farming, the importance of which is indicated by infrastructural works to regulate water levels and salinity (see section 4 for a more detailed discussion).

The late Republican flowering of the area lasted perhaps until the early 2nd century AD, after which period our surveys found very little evidence for con-

tinued occupation into the middle Empire. The virtual absence of finds from the late Empire and the post-Roman period might indicate that the area reverted to occasional and marginal uses, but an alternative hypothesis suggests that the population was concentrated into a small number of larger centres associated with Imperial villas, such as the one belonging to Alfeius Ceionius Julianus Camenius, mentioned in an inscription from Fogliano (Cecere, 1989: p. 22).

3.3. Site interpretation

Whereas the finds assemblage at sites dating to the Roman period, with its building stone, roof tiles, and storage vessels, indicates fairly clearly that we are dealing with various types of (farm) building, such clarity cannot often be obtained at the pre-Roman sites. For one thing, no traces of roof tiles were found before the post-Archaic period; but even if the custom of tiling roofs had not yet reached the coastal landscape yet, one would expect settlement sites to

possess at least some thick-walled vessels for storage purposes. One of the relevant results of the Fogliano survey was therefore the discovery of late Archaic ceramic scatters consisting of small to medium pottery shapes mostly intended for food preparation. In addition, nearly all of these sites occur as isolated scatters, that is, at locations that were not re-used for later Roman settlements. It is possible that these are the remains of ploughed-out graves, an idea supported by the fact that some of them occur in fields from which a considerable amount of topsoil is said to have been removed (F. Gardosi, pers. comm.). Such graves would be likely to date to the late and post-Archaic period (500-350 BC), when such burials are known to occur elsewhere. However, an alternative explanation seems more likely at this stage – namely, that the early inhabitants of the coastal areas lived in simple huts until well into the 4th century BC. This is in striking contrast to the proto-urban tendencies present in the core areas of South Lazio.

4. DISCUSSION

The following paragraphs offer a preliminary interpretation of the results described above, in the context of regional and supra-regional processes.

4.1. The proto-historic landscape

For all of the proto-historic period from the Bronze Age to the end of the Iron Age, the archaeology of the Lago di Fogliano survey area suggests a non-hierarchical settlement organisation consisting of small settlements dotted over the landscape. Bronze Age sites (supposing that our sandy fabrics are diagnostic for this period) are very small and few in number. In this respect the Lago di Fogliano survey confirms the results of the Agro Pontino surveys which recorded no more than six small sites with material dating to the second millennium BC for the whole of the Pontine plain. Of these only one was said to contain more than the usual few sherds (Voorrips et al., 1991: p. 125). In his analysis of Bronze Age settlement in South Lazio, Guidi (1986) notes that the Bronze Age period in general is characterised by a preference for lake-side locations with, in its later phase, a more specific preference for the volcanic lakes situated inland. The substantial and rich Bronze Age site known as the *Vilaggio delle Macine* (village of the grinding stones), found submerged in the Alban crater lake, suggests that here indeed a process of centralisation had begun by the middle Bronze Age (17th/16th centuries BC; Chiarucci, 1985). The site of Casale Nuovo along the Astura river with traces of metallurgy and the find of a Mycenaean IIIB shard indicates the development of trade

routes connecting the coast to the mountainous hinterland (Angle & Gianni, 1985). The beach ridge complex of which our study area forms a part appears as yet to have been excluded from these developments.

This must have remained so well into the Archaic period. Although human presence seems to have increased judging from the increase in the number of sites and the quantity of shards found per site, the finds assemblages do not contain roofing tiles or industrial-size storage vessels. In combination with the small size of the scatters this indicates that in the 6th century BC the beach ridge complex was still very much peripheral to the development of large proto-urban settlements and substantial rural infilling in the Alban Hills (cf. Attema, 1993: pp. 219-224). It therefore seems likely that during all of the proto-historic period the economic basis of life was intimately tied up with the exploitation of the lagoonal milieu, with subsistence farming taking place in the immediate vicinity of simple hut dwellings. This is confirmed by the agricultural evaluation, which indicates that, before technological advances made possible exploitation of the heavier soils, only the aeolian deposits were suitable as arable; most of the remaining dry land would only be suitable for extensive use, e.g. as grazing lands.

It is interesting to note the parallel between this proto-historic settlement pattern in the beach ridge area, and that which can be deduced from maps that show a system of *lestre* (simple hut settlements and their yards) used by fishermen and transhumant pastoralists, dotting the beach ridge area as late as 1851 (Attema, 1993: p. 51 and fig. 13).

4.2. The Roman landscape

As is shown by figure 3, the number of sites rises in all three topographical units from the Iron Age/Archaic transition onwards. Although the data are not very explicit yet on the post-Archaic period (5th/4th centuries BC) pending closer ceramic dating of the survey material, there is no reason to believe that, except for the introduction of farm houses with tiled roofs and maybe a corresponding shift in the economy towards farming, substantial changes occurred in settlement intensity in the Lago di Fogliano area. The largest increase in site density – from 3 to 16 occupied sites – occurs in the main aeolian/other sandy body by the late Republican period, but it was argued in section 3 that this may be partially the result of visibility biases. The agricultural land evaluation does indicate that technological advances introduced by the Romans would have made both the beach ridge unit and the lagoonal unit between ridges suitable for arable use – multiplying the area available for such use – but at the same time more effi-



Fig 6. A detail of the Fogliano survey area illustrates the value of the combined approach to the physical and human landscapes. Both off-site finds densities and sites of all ceramic periods are depicted against the background of the potential arable land use. For the legend to the finds densities, see figure 5. Surveyed fields with continuous outline: RPC project; with dotted outline: Agro Pontino project.

cient farming practices would obviate the need for additional workers.

A substantial economic interest from outside the core area of Latium Vetus only took shape in the late Republican period and is probably to be connected with the establishment of large and luxurious villas along the coast, some of which exploited large artificial fishponds, and with industrial pottery production also along the coast near the mouth of the Astura river (Picarreta, 1977). This interest was backed up by means of infrastructural works such as the Via Severiana, a Roman road that ran along the seaward or landward side of the lagoons (Egidi, 1980), and by interventions in the hydrography of the area, such as the digging of the Martino Canal (the Rio Martino). In his study of artificial fishponds in Roman

Italy, James Higginbotham notes that in Roman Republican times (3rd and 2nd centuries) inland bodies of water were favoured for the farming of fish, but that at the beginning of the 1st century BC a change in taste occurred towards sea fish. It is from this period onwards that elaborate seaside fishponds were constructed, a number of which are found along the coast between Nettuno and Circeo (Higginbotham, 1997: pp. 4-5). It is against this background that we should evaluate the Roman site and off-site distribution found in the Fogliano survey.

The original hydrography of the Fogliano area would have been much different from its current state. This is illustrated by historical maps, and it is probable that the Romans were the first to make substantial changes in the landscape. The Martino Ca-

nal, draining the graben, was supposedly already dug through the horst system in Roman times, thereby flowing into the coastal watershed area. It appears already on the earliest maps dating around 1600 AD. In between the Lago di Fogliano and the Lago dei Monaci the landscape changed gradually into marshland and rushes. Here the Rio Martino – coming from the Via Appia – dispersed, partly discharging into the Lago dei Monaci and unable to reach the sea. Cecere (1989: p. 22) suggests that the Rio Martino may not primarily have been aimed at draining the Pontine marshes lying north of the Via Appia, but rather was meant to provide the lagoons with additional fresh water to improve conditions for fish farming in the Republican period. In any case, interventions in the hydrography of the coastal landscape go back to Roman times as was proven by the German archaeologist Elter (1884), who reports on an inscription found on a 1st c. AD Roman villa terrain at San Donato immediately to the north of the Lago dei Monaci. This inscription attributes to one Phaenippus the carrying out of construction or maintenance at water management works built earlier in the area. Cecere suggests that these works are related to the Martino Canal itself and were intended to regulate the supply of fresh water to the lagoons.

Elter relates the archaeological remains found on both sides of the Rio Martino in the vicinity of present-day Borgo Grappa to a vast villa complex at San Donato that specialised in fish farming as well. According to him this villa was continually enlarged between the 1st and 4th centuries AD. Although the functional identification is not certain (Egidi (1980) provides an alternative identification as the way station *Ad Turres Albas* on the Via Severiana), there seems sufficient reason to believe that the increase in settlement intensity during the late Republican and early Imperial period recorded in the Fogliano survey must be connected to the developments in the fish farming industry. Although the latter may have eventually been monopolised by the large maritime villas, the increased level of economic activity would have attracted others to set up as independent farmers in the area, or in a ‘service industry’ to the Roman villa owners.

4.3. Correlating the physical and human landscapes

If we look at the most stable sites listed in figure 3, we see that the Minturno Beach ridge and the aeolian landscape were probably occupied in all periods from the late Bronze Age to the high Empire, while on the younger beach ridges evidence for the very earliest and latest occupation phases is probably lacking only because of the stochastic nature of the survey.

In order to illustrate the interplay between the human and natural landscape of the Fogliano region,

figure 6 shows the combined results of the agricultural land use potential mapping and the archaeological surveys for part of the study area. We will first discuss the diachronic changes in land use in relation to the changing agricultural potential of the units in this area, then follow with a discussion of the correlation between settlement location choice and the topography of the terrain.

As was stated above, the aeolian soil unit remains the best suited for agricultural use throughout the whole period, whereas the suitability of clayey landscape units such as the lagoonal unit between the beach ridges increases in the Roman period through soil improvement (adding sand) and technological change (using heavier ploughs). The suitability of the beach ridge unit itself also increases with the introduction of irrigation and manuring practices. It is only the level lagoonal unit which remains too clayey for intensive agricultural use in any period. We would therefore expect a much wider agricultural use of the landscape in the Roman period as compared to the proto-historic period, and the wide distribution of Roman sites and offsite ceramics confirms this. On the level lagoonal unit we expect to find no settlements of any period, and little if any original off-site material. Again this is largely confirmed by the results of the Agro Pontino Project surveys, which report the majority of fields in this unit to be aceramic, with indeterminate Roman finds occurring in one field where the unit borders on a beach ridge.

In addition to soils, the topography of the area also patterns the human landscape in a non-random way. Factors such as exposure to the weather, viewshed, accessibility, and access to natural resources (water, fish?) determine the precise location for settlement and other activities. We cannot hope to be able to link the location of individual settlements to environmental factors operating at such small scales, but we are nonetheless fortunate to possess detailed maps of the relief, hydrography, and general vegetation type of the Fogliano area during the late 1920s. These allow us to reconstruct, to some extent, the potential of the landscape for travel, settlement, and various types of exploitation. Mesolithic to Archaic sites, for example, nearly all occur at dry elevated parts of the landscape that strategically overlook lagoonal or fluvial valleys, whereas the many late Republican settlements are preferentially located some distance away from such locations and rather seem to be centred on prime agricultural land. The effects of exposure and viewshed should be most clearly visible on the Minturno Beach ridge, the south side of which receives much more sunlight and sea wind than the north side (the other ridges are probably too low for these factors to be significant). Although our own work indicates that sites dating from the Iron Age to the Roman period were indeed situ-

ated on the south-facing slope of this ridge, the Agro Pontino Project surveys found at least one late Iron Age site on its north slope.

The scope of field walking surveys does not allow us to extend our models of the correlation between the physical and human landscapes by including site function as a variable. Neither is the area large enough to allow quantitative analysis, but our analysis does illustrate in a qualitative sense how the history of settlement and land use in the Fogliano region may be understood by reference to the physical landscape.

5. CONCLUSIONS

The surveys of the RPC project in the Fogliano area have been very successful in establishing a basic settlement history that can probably be extrapolated to the whole Pontine coastal landscape. Continuity of occupation has now been proven from the 8th century BC down to the 3rd century AD, and among the proto-historic ceramic finds there may still be hidden a significant amount of Bronze Age and early Iron Age material. Further study of these fabrics will be undertaken in order to reliably recognize this material.

The RPC approach of combining geographical work with archaeological survey has proved important not only for a more detailed reconstruction of past land use than would otherwise have been possible, but also because it has helped identify areas of anthropogenic disturbance. A more detailed formal land evaluation using the FAO system is in progress (Van Joolen, in prep.).

Similarly, our emphasis on understanding the biases that occur during an intensive systematic field walking survey has prevented us from jumping to some unwarranted conclusions and has generally helped us in our interpretation of the results. We feel this aspect of our research is so important as to deserve further study – the Pontine landscape has been subject to so many recent changes, especially since the 1930s, that a more detailed reconstruction of its original geomorphology and hydrology is needed before the results of the archaeological surveys can be fully understood. We obtained elevation contour maps of the area as it was during the *Bonifica* of the 1920s, and by studying the differences between these and the modern relief we have mapped the main landscape changes and modeled the effects on the accessibility of the landscape of fluctuations in the ground and surface water levels (Feiken & Van Leusen, forthcoming).

The results of the Fogliano survey are best interpreted in the context of the developments in the wider region by relating them to processes of centralisation and early urbanisation in the core areas around

the Alban Massif and Rome. The development there during the Bronze Age, Iron Age and Archaic period (i.e. to the 6th century BC) of, first, centralised settlements and, later, peer polity city states is reflected by a similar, but late and stunted, development of marginal polities such as Caracupa/Valvisciolo on the Lepine footslopes and Cisterna di Latina on the south-eastern margin of the Alban Massif. During the post-Archaic and Republican period the growing political, military and economic influence of Rome expressed itself archaeologically first in the establishment of colonies on the Lepine Margin and, later, in the exploitation of the marginal coastal landscape for fish farming, pottery production and leisure industry on the lagoons, and mixed farming on the colluvial slopes and (though much less so) along the Via Appia. The apparent dismantling of the Lepine olive culture and the near abandonment of settlement there and in the coastal area following the early Empire indicates that the Pontine region generally became economically marginalised as the Roman Empire moved its large-scale agriculture and industry elsewhere.

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