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Mapping the Roman World: The Contribution of Field Survey Data

David Mattingly and Robert Witcher

Introduction

There has been much debate about the appropriate territorial unit of analysis in archaeological field survey (Francovich *et al.* 2000). Favoured solutions have included: an urban territory (e.g. Barker *et al.* 1993; Carreté *et al.* 1995); a bounded topographical feature, such as a river valley (e.g. Attolini *et al.* 1991; Barker 1995) or an island (e.g. Cherry *et al.* 1991; Renfrew and Wagstaff 1972); or a modern political or cartographic unit (e.g. Croft and Mynard 1993; Muzzioli 1980; RCHM 1980). The intensification of survey method since the great pioneer surveys of the 1950s and 1960s (MacDonald and Rapp 1972) has meant that the territorial focus of most surveyors today is a micro-region of tens or hundreds of square km (Barker 1991a; Bernardi 1992; Cherry 1983; Schofield 1990).

However, although the results achieved by such intensification are to be applauded, recent field survey is also open to the accusation that it has become obsessed with minutiae of the relation of people and landscape, sometimes failing to address the bigger picture of the regional settlement pattern (see the pertinent comments of Fentress 2000a). Part of the problem here is a lack of ambition in certain quarters, since the archaeological data now available in many regions should allow the sort of regional synthesis attempted by Alcock for Greece (Alcock 1993; 1997; cf. Mattingly 1997b; 1998; 1999; Stone 1997, for Africa). Indeed, the amount and quality of archaeological data on regional settlement patterns is widely acknowledged as having a major impact on the overall view of the ancient world (Horden and Purcell 2000, 176–77; Shaw 2001, 426–34).

The focus of this paper is a review of how data on rural settlement patterns are used in the cartographic representation of the ancient world. The current state of mapping of the ancient world will be assessed, starting with the Barrington Atlas (Talbert 2000a). We shall review the extent to which field survey (and air-photographic) data have fed into regional mapping projects of the Roman world. However, the main focus of the paper is the potential for even coarse-grained survey data now held (especially through the use of digital formats) to contribute to a radically different cartographic vision of the ancient world.

The State of the Art?

The Barrington Atlas is a long-awaited and a much-needed tool in Classical Studies (Talbert 1992; 2000b). It has been rightly praised as 'comprehensive and comprehensible' within the parameters set by its editorial team (Alcock *et al*. 2001: 457). There is no doubting the exceptional quality of the map production or the rigour of the map research. This will be an enduring work of reference on the geography of the ancient world and its 'look' will shape our collective view of the Greco-Roman world for years to come. A particular feature of the way the maps treat the Roman provincial landscapes is the delineation of centuriated areas (visually stunning in the context of Provence or the Po Valley). The two-volume Map-by-Map Directory that accompanies the Atlas is an impressive gazetteer of ancient toponyms, modern equivalents, site phasing and relevant

bibliography on every site. All its positive qualities make it a difficult work to criticise.

It is also immediately apparent, however, in turning the pages of the Atlas that the traditional image of Classical antiquity as a 'world of cities' has not been superseded here and that knowledge of rural settlement has been drastically under-represented. For example, there is little evidence of the settlement hierarchy of either the centuriated or the non-centuriated landscapes in the Barrington Atlas. As such, the resulting maps do not represent as great a leap forward in knowledge from the last great age of atlas-making in the late 19th century as one might expect. In particular, the results of regional surveys have been largely ignored (Alcock *et al.* 2001: 458–59). All of us involved in landscape archaeology cannot but be disappointed at the outcome, when the results of our labours have been so blatantly and publicly ignored. Considering the growing importance of survey in Classical archaeology through the late 20th century and the balance of fieldwork now existing between excavation and survey archaeology, the non-representation of the results of the latter area of research should actually be a cause of concern. How could this result have been avoided and how best could the barren landscapes of the Barrington Atlas have been populated? These are germane questions for landscape archaeologists to consider. In part, at least, the responsibility rests with survey archaeologists like ourselves who have not always been good at considering the bigger picture, into which their catalogue of, for example, 1 small town, 10 villas, 26 farmsteads, 10 possible habitations, 4 cemeteries, etc. needs to be fitted.

As a compiler of maps for the Barrington Atlas (Mattingly 2000a–e), the first-named author of this paper has an insider's view of the debate that went on during the early stages of the map commissioning and of the compromises that were thrashed out in the later stages to even out somewhat the differences of approach taken by individual compilers. In defence of the team of editors and compilers involved in the project, there are fundamental differences between the various regions of the ancient world, in the history of their archaeological investigation and in the specialist expertise and interests of the various compilers. It is clear that these differences rendered complete homogeneity of approach impossible.

One of the great lessons of this sort of map-making is to discover the extent of our ignorance of the ancient world. Yet many of the blank areas on the Barrington Atlas maps could have been populated, and the suspicion must remain that an opportunity has been missed for gaining a genuinely new vision of the ancient world. For certain categories of evidence (such as ancient toponyms and their archaeological correlates), the pool of evidence is now growing very slowly. Archaeological data on settlement patterns, however, are expanding exponentially through air-photography, field survey and professional archaeological activity in many countries. A key obstacle to dealing with the rural sites in the Barrington Atlas was the editorial stipulation that all sites mapped should normally have a name on the map and a gazetteer entry. There were also those involved in the project who argued vehemently for a policy of only mapping sites whose ancient name was known – a policy that would have limited the work almost entirely to towns, small towns, sanctuaries and road stations. These issues focused attention on the individual significance of every site, rather than the broader implications of the distribution of a particular class of site. Most compilers understandably shied away from sites for which the data available were slight or ambiguous. Yet even where we lack modern data, there are important indications to be had from earlier investigations. There are areas of North Africa, for instance, where the existence of sites of some size and complexity is known, but where there has been virtually no investigation beyond that carried out by French map-makers in the late 19th century (see Fentress 2000b: 483, on the earlier detailed mapping

work of Stephane Gsell). This raised the question of whether it was worse to have large blank areas on our maps (when we knew there were sites there) or to include sites about which the data were very incomplete. To avoid the issue and neglect rural settlement completely (as some contributors appear to have done) places the Barrington Atlas map for certain areas behind the corresponding sheet of the *Tabula Imperii Romani*, where that existed – something that seemed at odds with the overall aims of the new Atlas (compare Talbert 2000a: maps 69–70 showing Palestine, with the Israel sheet of the *Tabula Imperii Romani* [1993]). In the end, contributors negotiated their individual position with the editor and, although there were in theory standard rules governing the map-making process, the inconsistencies of approach are plainly visible when one compares a group of neighbouring maps.

As an example of this point, let us review some of the map sheets from North Africa. The territory of Caesarea (modern Algeria) was the subject of a pioneering survey by Phillipe Leveau (1984) that was important not least for the demonstration of the difference in settlement type between the core urban territory and the wider hinterland. The corresponding map in the Barrington Atlas contains very few rural sites – only the very largest villas and villages (sites of > 1 ha size), plus some enigmatic and apparently isolated tumuli (Potter 2000). The distinction between Caesarea and its hinterland, so clear in Leveau's publication, is completely lost. Other compilers have been more inclusive of rural sites, incorporating data from recent surveys as well as from French colonial surveys, though Fentress (2000b; 2000c) has focused on villages or nucleated settlements of > 1 ha area, whilst Hitchner (2000a; 2000b) has also included 'villas'. Hitchner's maps represent one of the fullest attempts to map rural settlement anywhere in the Atlas (but are still an oversimplification of the best of the data; *cf.* Dietz *et al.* 1996; Hitchner *et al.* 1990). In the sequence of maps extending from southern Tunisia to the western Egyptian desert, Mattingly attempted to depict wherever possible something of the overall pattern of sites by including a cross-section of rural settlement, including some sites of < 1 ha area, especially where they have been featured in the archaeological literature (Mattingly 2000a– e). Where more detailed studies exist, as in the Libyan pre-desert region, the compromises made for the Barrington Atlas map are clear from comparison with the more detailed maps (Barker *et al.* 1996a; 1996b). An important feature of this group of Barrington Atlas maps is the depiction of oasis sites and native sites beyond the Roman frontiers; in the past, many maps of the ancient world have resorted to large capital letters when dealing with the territory of non-Roman peoples and ignored the character of their settlement sites. On the other hand, it should be self-evident that the locations of communication networks and population centres beyond the frontiers of the empire have a real importance when considered alongside, for example, Roman military dispositions.

Problems with Mapping Rural Settlement at Small Scales

There are obvious problems with representing rural settlements on small-scale maps. Provincial mapping tends to be at scales of between 1:500,000 and 1:1,000,000 and these do not allow inclusion of every minor rural site (consider the look of a modern road atlas). So selection of detail for inclusion is a natural consequence – though layered data in a modern GIS will in future allow digital maps at small scales to handle much larger quantities of data. For an example of what is possible, we could consider the mapping of settlement data for medieval England, where *c.* 11,000 sites from small hamlets to towns have been included on a map at a scale of 1:2,000,000, but with the same large dataset also explored at a variety of larger scales (Roberts and Wrathmell 2000: maps 3, 5, 13). There are, of course, problems of spatial discontinuities of the data on rural settlement. Contiguous areas of the landscape may appear to contain radically different densities and

types of sites simply because one area has been subjected to intensive modern survey and the other has not. It can be argued that the patchiness of survey data is at best distracting and at worst seriously misleading. In this context, it is notable that in the most-cited example of comparative survey, Alcock's (1993) *Graecia Capta*, there are no maps of rural settlement density at a scale beyond that of the individual surveys (a similar cartographic tendency is present in Leveau *et al.* 1993). But a further problem concerns the extent to which selection is representative of the total settlement hierarchy or exclusive of settlements below a certain level. For the Roman world, provincial mapping is mostly pre-defined in terms of the most 'Romanised' sites and landscape features. An academic agenda that prioritises certain categories of site and ignores others will perpetuate such an approach for desk-based scholars, but will produce maps that do not match the perceptions of field archaeologists.

Dating is a further concern. All maps tend to be chronological fictions, conflating data from different phases of activity and creating an artificial image of the province that is 'true' for no one moment in time. However, the dating evidence of many rural sites tends to be weaker than for urban or military sites and, as a result, most rural settlement is likely to be weeded out by any test based on chronological diagnostics. These problems raise the issue of whether survey data are thus suitable for inclusion in province-wide maps of the ancient world? The answer to this question may be different depending on whether one looks back at traditional paper maps or thinks forward to future digital resources, linked to large databases with GIS functionality. But even with the traditional folded or atlas map, it is arguable that we have not exploited the full explanatory power of the available evidence of rural settlement.

To illustrate this point, let us consider Roman Britain, one of the most thoroughly mapped provincial areas of the empire. The Barrington maps (Esmonde Cleary 2000a–b) are supplemented by the *Tabula Imperii Romani* sheets (1983/1987) and the Ordnance Survey (OS) map, now in its 5th edition (Ordnance Survey 1924; 1927; 1956; 1978; 1994; 2001). There is also an entire Atlas dedicated to Britain and a series of detailed studies of rural settlement (Jones and Mattingly 1990; *cf.* Dark and Dark 1997; Hingley 1989). Yet close scrutiny of the available map coverage highlights the problems of integrating data from fieldwalking and air photographic survey within a framework that is explicitly selective and subjective. Esmonde Cleary (2001) comments on the 5th revision of the OS map:

'All the main categories of Romanised site are depicted. Strict site selection criteria have been used: accurate location and a high degree of certainty over interpretation of the site were required… The small rural settlements of the native British population that never achieved a high degree of Romanisation, but which underpinned the economy of the whole province are not shown… Although as complete as possible, the features depicted on this map are not exhaustive and are shown subject to the limitations imposed by the scale of the mapping [1:625,000]'.

This seems reasonable at first sight (and one must have sympathy for the editorial committee responsible for the selection from a very large and rich British database); but the academic priorities have produced a map of Roman Britain, rather than Britain in the Roman empire (and these two things are not the same at all). The desire to avoid clutter on the map is understandable, but in the case of the 5th edition OS map of Roman Britain the omission of some Roman-period data was in itself necessitated by the decision to superimpose the selected features onto a topographic base, showing thousands of largely irrelevant modern roads, towns and villages across the length and breadth of the country.

The main categories of site mapped on the OS map have remained fairly consistent since the early editions (though nomenclature has changed slightly, the underlying criteria for selection have remained Romano-centric): major towns, defended small towns ('settlement, defended'), a selection of other nucleated settlements (essentially those along the major roads of the province), spa towns, villas, other substantial rural building, temples, legionary fortresses, forts, fortlets, signal stations, temporary camps, frontier works, roads, milestones, lighthouses, aqueducts, artificial watercourses, mineral extraction sites, salt-making sites, pottery/tile production sites, barrows or mausolea (but not other cemeteries), major hoards. It is worth considering what is not mapped: a large number of substantial villages/hamlets (especially those away from the main road network), distinctive regional settlement types – such as fortified major settlements in the north and west of Britain (for instance, the rounds of Cornwall, nucleated defended sites in Wales, brochs and duns in Scotland). Even the largest native sites are excluded as settlement sites, though to take one notable example, the hillfort of Traprain Law in Scotland is marked, but not named, as the location of a major hoard. There is thus a clear 'Roman' bias in the selection of what to map – what we see are primarily the features of government and domination, and that part of elite society that was most closely aligned with the imperial power. The policy is both elitist and 'racist' in that we map one branch of society down to milestones and isolated hoards, while ignoring even the major settlements of another significant branch. An alternative vision of Britain in the Roman period would be one that brought out more detail of the regional variability in settlement morphology and gave greater consideration to the less Romanised sections of the landscape than is conventionally done.

Just as the selection of typological categories is a subjective choice on the part of the compiler, the sub-sampling within categories to determine which sites to include on the map is also a source of potential bias. For example, 'villa' is a very broad category, covering a wide range of sites from palatial country retreats (Woodchester, Fishbourne) to small cottage-like farms of 'Romanised' appearance (Dark and Dark 1997: 43–75). The division of known sites between the 'villa' and 'other substantial building' categories will inevitably be easier for areas where more extensive excavation has been carried out. The small town/undefended settlement category is another type where much responsibility for inclusion or exclusion rests with the compiler. Not since the OS 2nd edition has the category 'village' been used, though the potential importance of widespread small nucleated centres in Britain is once more becoming increasingly recognised (Dark and Dark 1997; Hingley 1989; 1997). This issue clearly intersects with the question of whether or not to map native settlements in the less Romanised parts of the province.

'Stray finds' have traditionally appeared on the OS map of Roman Britain, though one suspects that the data behind the distribution were increasingly outmoded. In the most recent edition (Ordnance Survey 2001), they have been removed from southern Britain and only retained for Scotland. The decision is a curious one, since many of these finds in fact designate sites occupied in the Roman period, but of non-Roman type. The reasons for privileging such information from Scotland over, say, Wales or Cornwall are unclear. And what of parts of the lowland landscape where there are no villas, such as the Fenland? (This is left blank on Ordnance Survey 2001, though a small map incorporated in the text of the border does show a detail of the dynamic settlement evidence from here. For a new study of the Fenland landscapes, see Fincham 2001).

Air-photography has had a far more dramatic impact in British archaeology (*e.g.* Wilson 1982), than is the case for the Mediterranean countries, but its value is all the greater when combined with field survey results (for instance, Bewley [1994] shows the combined

impact of air-photography and field survey on the landscapes of the northern frontier region). A major study of rural settlement of Iron Age and Roman date in England has recently been undertaken by Jeremy Taylor on behalf of English Heritage, combining the results of local/regional Sites and Monuments Records, archaeological surveys and air-photographic records into a huge GIS database (currently with over 70,000 sites in it). The quality of the data may be variable, but the sheer quantity of information and its geographical coverage creates dramatic new possibilities for analysing settlement at the provincial level. It is on this foundation that future studies of the rural geography of Roman Britain will be built.

Other Approaches to Mapping the Roman World

A key cartographic issue is scale. Conventional paper mapping demands that a decision be made about a single scale of presentation. This will always be a compromise between detail and the physical size of the map. This decision automatically excludes a certain amount of data – such as the small and densely distributed rural sites of antiquity. In contrast, one of the most significant aspects of new digital map technology is that a single data set can be analysed at a variety of different scales; it also permits much greater flexibility to mix and match data of different scales. In other words, zooming-in may allow us to see data and spatial relationships more clearly, but can also allow us to view a different range of larger-scale data. For example, a site may be represented as a dot at 1:25,000, an area at 1:10,000 and a scatter of individual artefacts at 1:2,000. In general, archaeologists have endeavoured to increase the accuracy and precision with which evidence is mapped, aided by such developments as GPS. In particular, this has attempted to move away from the use of points to represent sites and instead to record them as areas. In trying to map macro-regional patterns, therefore, we need to think of similarly innovative ways to present data at smaller scales. For example, we need to look at alternatives to maps of sites each represented by an individual dot or symbol (see below for an example). Zooming-in, we could then switch to more detailed and appropriate mapping of individual sites. This regional approach may, in fact, be well suited to the types of data with which we are dealing. Surface data are notoriously ephemeral (‘coming on and off like traffic lights’) and at a small scale of mapping it can be argued that individual sites are less significant than the overall impression of settlement density or forms. Comparative geography provides good examples of what can be achieved in terms of mapping at small scales. Rather than try to represent every known site on a map, one solution is to convert what we know of settlement density into conventional shadings. Becker-Nielsen (1989) produced an interesting series of maps of northwestern Europe based on the density of urban centres of Roman date (see also Jongman 1988: fig. 2, for urbanism in Italy), and the same approach perhaps merits extension to other classes of rural site.

On the other hand, maps can bear an amazing amount of detail (a common experience of many contributors to the Barrington Atlas was surprise at seeing how their densely-packed overlay sheets translated into printed maps with ample space between sites, captions, etc.). As mentioned above, Roberts and Wrathmell (2000) have shown what is possible with rural settlement data for medieval England and the results are compelling evidence that maps can be produced that contain many thousands of settlement sites (though, of course, it is easier to read the detail when these are reproduced at larger scales). Another of the key characteristics of cartography is that it presents (or creates) definitive versions of geographical phenomena (see Wood 1993). Further, the reader of a map makes implicit assumptions about the evenness of spatial and thematic coverage. In contrast, however, much rural survey data is unstable and derives from erratic spatial coverage. Indeed,

without care, GIS and database architecture may gloss over much of this ambiguity and uncertainty (Miller and Richards 1995). However, this need not be the case, and it will be argued here that GIS provides the type of flexible environment in which to emphasize and understand this inherent fuzziness.

Problems of data compatibility can be divided into spatial, chronological and interpretative issues. At a macro-regional scale, the spatial distribution of survey data is extremely uneven: some areas are much better studied than others (*e.g.* in Italy, areas close to Rome and along the coastal plains have been surveyed much more intensively). The chronological distribution of sites is also highly variable – in part, this relates to differences in dates of conquest by Rome. More significant (though not unrelated) is considerable variation in ceramic typologies and chronological diagnosticity. Finally, the criteria for the definition and interpretation of sites (*e.g.* farm or villa) may vary significantly. Arguably, we have hardly begun to use the potential of (digital) cartography to express these kinds of uncertainty, doubt, bias and unevenness.

One approach is to develop a series of 'filters' or weightings designed to correct for these problems. These can – but do not have to – be quantitative; they could simply use GIS to help us identify and visualise biases and errors. GIS may also provide a flexible means of inferring the evidence of small well-studied or re-surveyed areas across wider regions (see papers in Gillings *et al.* 1999; Lock and Stančič 1995; for examples of both visual and quantitative approaches, see below). Here, it is worth stating that we can never create a bias-free picture of past settlement; but GIS techniques can allow us to recognize where such discrepancies might be, and to comprehend their significance.

The potential of integrated, multi-scale GIS is not easily demonstrated in the format of a paper or electronic document. Apart from issues of scale, the use of colour and so on, this relates to the 'fixed' nature of these maps. The surveyor decides what is included and excluded and in what format, restricting the reader's understanding of the data to a particular perspective. User-defined maps that allow individuals to construct 'maps-to-order' have much to recommend them – permitting others to question existing theories and present alternatives (for a growing archive of online/downloadable data, see Archaeology Data Service). However, it is worth commenting that this is not an argument for simply putting all survey data on the Internet and letting the user get on with it. It is still vital for surveyors to take responsibility for the explanation and interpretation of their results – no amount of metadata can be a substitute for first-hand experience of a survey (for fully integrated digital publications and archives, see *Internet Archaeology*, e.g. Perkins 1998). Regional mapping might also make use of other techniques for visualising data. For example, the shifting location and density of settlement might be well served through phase-by-phase animation (for a different example of animation in the visualisation of archaeological data, see Exon *et al.* 2000).

A Case Study from Roman Italy

There is a long tradition of topographical and landscape studies in Italy (see Cambi and Terrenato 1994). Over time, the focus of this research has shifted and the techniques improved; in Etruria, for example, attention was for long directed towards rock-cut tombs and in the *suburbium* of Rome towards aqueducts, roads and monumental villas. The South Etruria survey of the 1950s and 1960s helped to shift attention towards artefact scatters identifying an unimagined wealth of small, densely distributed farms (Potter 1979). Over the last 25 years in particular there has been a vast amount of field survey by both Italian and foreign scholars (see papers in Barker and Lloyd 1991). One of the key themes

to develop from this work is the diversity of Italian regional landscapes (Terrenato 2001: 2–3). The potential of these data for a comparative study was noted 20 years ago (Celuzza and Regoli 1982; Cherry 1983: 383–89) and has been an implicit theme in much subsequent work (e.g. Patterson 1987: 134–38; Sbonias 1999: 15–16). However, despite the wealth of evidence and the awareness of its potential to illustrate significant patterning, attempts at comparing and mapping at a macro-regional scale have been limited.

The Barrington Atlas divides Italy into 8 sheets (plus Sicily and Sardinia), with a strong emphasis on towns, roads and centuriation. Such features clearly comprise an important part of the landscape of Roman Italy. In many ways, however, they imitate an official, Romano-centric perspective. Still more problematical is that the enormous density – and diversity – of rural settlement brought to light over the last 50 years is nowhere apparent. For example, field survey has demonstrated the *suburbium* of Rome to have been one of the most densely occupied areas of Italy (and the Mediterranean), producing a substantial part of the metropolis' near insatiable demand for food and other supplies (Morley 1996); yet, even in the 1:150,000 detailed coverage (Talbert 2000a: Map 43, *cf.* also Map 44), its countryside is almost as sparsely occupied as the rest of the peninsula.

As discussed above, this situation is partly an issue of scale; the density of settlement is such that it would require an impossibly large scale to show each individual site. GIS clearly has a role to play in this context. However, there is a range of methodological considerations, which are more difficult to resolve. These include variation in the intensity of coverage and significant differences in the archaeological definition of site types (Lloyd 1991). Other problems are more 'structural': for example, differing levels of archaeological knowledge of ceramic typologies and unsuitable survey conditions across wide areas such as alluvial river valleys (e.g. Po valley) and wooded and/or mountainous regions.

Some of the problems of comparative survey can be addressed through the restudy of material collected by earlier surveys and through the use of targeted re-survey. For example, the British School at Rome's Tiber Valley Project is currently restudying *c.*100,000 artefacts collected during the South Etruria Survey; for the first time, this will provide a sound basis for identifying similarities and differences within the middle Tiber valley (*c.*2000 sq. km, Patterson and Millett 1998; Patterson *et al.* 2000). The project is also using targeted re-survey to clarify the results of earlier projects (e.g. Di Giuseppe *et al*. 2002), as is the 'Pathways to Complexity Project' of the Universities of Amsterdam and Groningen which is comparing the Pontino, Sibaritide and Salento regions (Attema, Chapter 7, this volume; Attema *et al*. 1998; http://odin.let. rug.nl/RPC/).

This section presents some preliminary attempts to map the results of Italian survey at a macro-regional scale emphasising the similarities and differences in regional settlement. An important starting point for any landscape and settlement study of Italy is the *Forma Italiae* series. This comprises a series of surveys usually covering a single *Istituto Geografico Militare* mapsheet (*c.*10 x 10 km); there is a particular concentration in the Roman *suburbium*. Figure 13.1 shows the total number of archaeological findspots identified by the *Forma Italiae* volumes in the immediate vicinity of Rome. The shading represents the number of records, though as most of these surveys cover roughly the same area (*c.* 100 sq. km), the map can be read in terms of density.

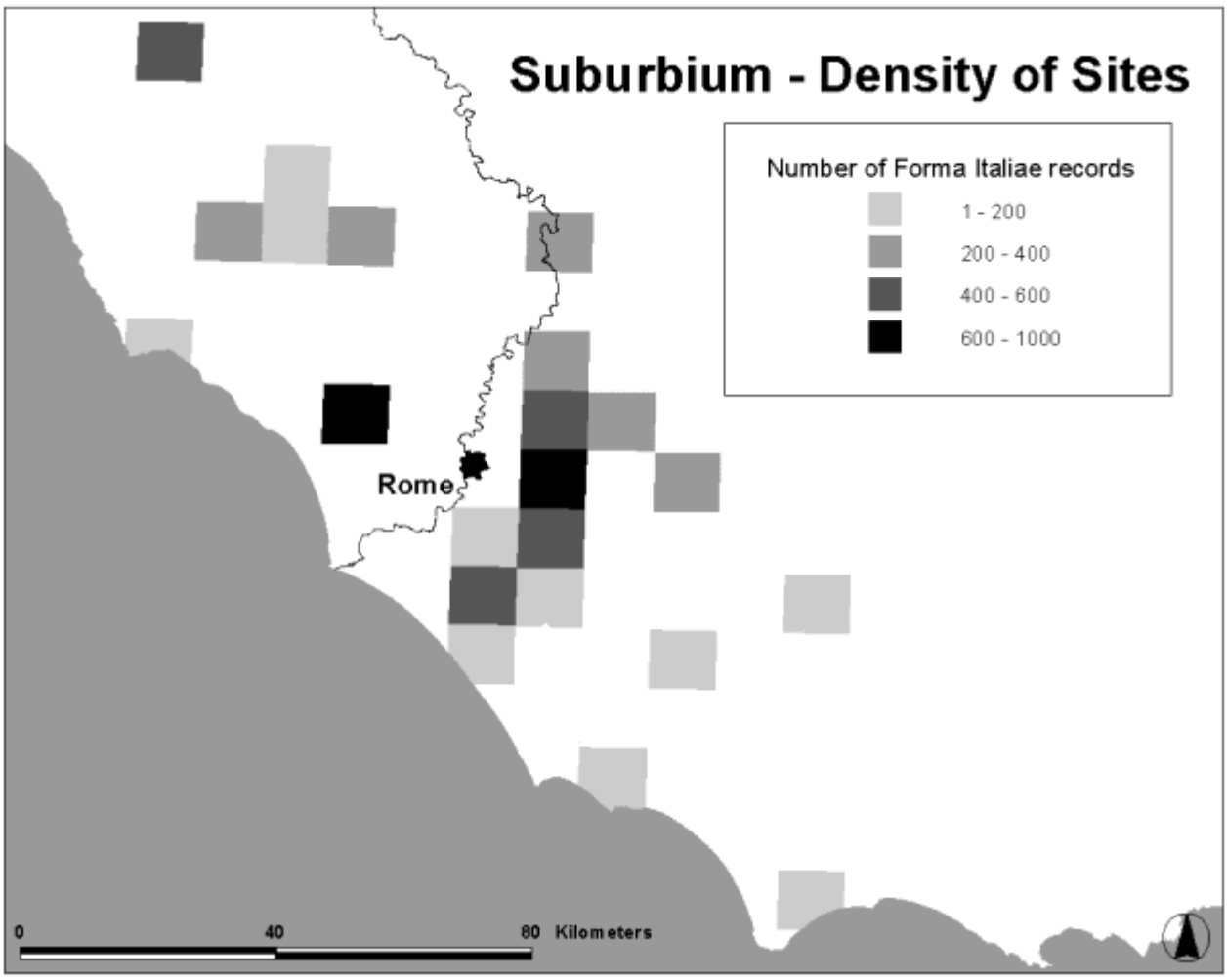

Figure 13.1 Forma Italiae*: density of settlement in the Roman* suburbium*.*

This map quickly reveals some significant differences in the density of archaeological findspots around Rome. The highest densities are closest to Rome with some fall-off with distance; however, in the area immediately south of the city, there is a rather mixed picture. One important consideration in using these particular surveys is the date at which they were completed. Not least, a notable increase in the number of surface scatters identified suggests that techniques have become more intensive; without changes in agricultural practice, the easily eroded tufa landscape of much of this area might lead us to expect a long-term reduction, not increase, in the number of such sites. One approach to this variation of survey intensity could be to map ratios of standing structures to surface scatters or of large to small scatters. However, all of these measures must be treated with caution – ultimately, they are not independent of the genuine patterns of variation in the data that we seek.

It is clear that there is some diversity in settlement patterns within modern Lazio; but this is still a comparatively small region. Is it possible to map this diversity at a still smaller scale? Figure 13.2 shows the location of 14 surveys from Central and Southern Italy. The surveys used here are, from north to south: Tuscania (Barker *et al.* 1993; Rasmussen 1991); Rieti Basin (Coccia and Mat-tingly 1992; 1995); South Etruria (Patterson *et al.* 2000; Potter 1979); Pontine region (Attema 1993; Attema *et al*. 1998); Liri Valley (Hayes and Martini 1994; Biferno Valley (Barker 1991b; Barker 1995); Northern Campania (Arthur 1991); Venosa (Marchi and Sabbatini 1996); San Giovanni (Roberto and Small 1994, 19–23); Gravina (Basilicata and Apulia, Small 1991); Roccagloriosa (west-ern Lucania, Gualtieri

and de Polignac 1991); Metaponto (Carter 1990); Oria (Yntema 1993); Valesio (Boersma *et al.* 1991).

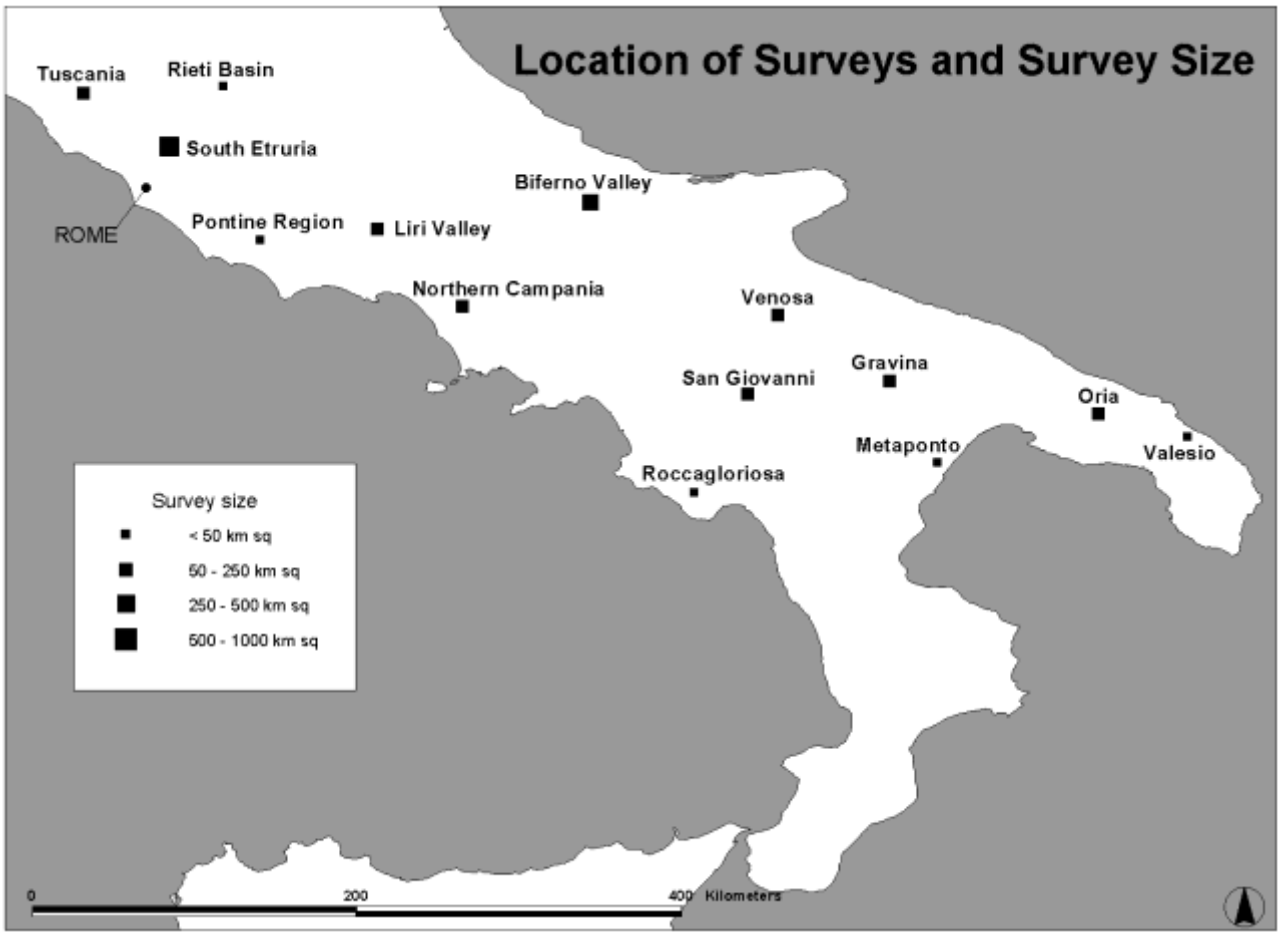

Figure 13.2 Surveys in Central and Southern Italy mentioned in the text.

Figure 13.3 shows the distribution of Early Imperial settlement identified by these 14 surveys. At this scale, it is neither possible to show every site, nor is the precise location of each individual site of significance – it is the overall impression that is of importance. The map therefore simulates the surveys' results: each dot represents three actual sites and the distribution of dots within each area is random.

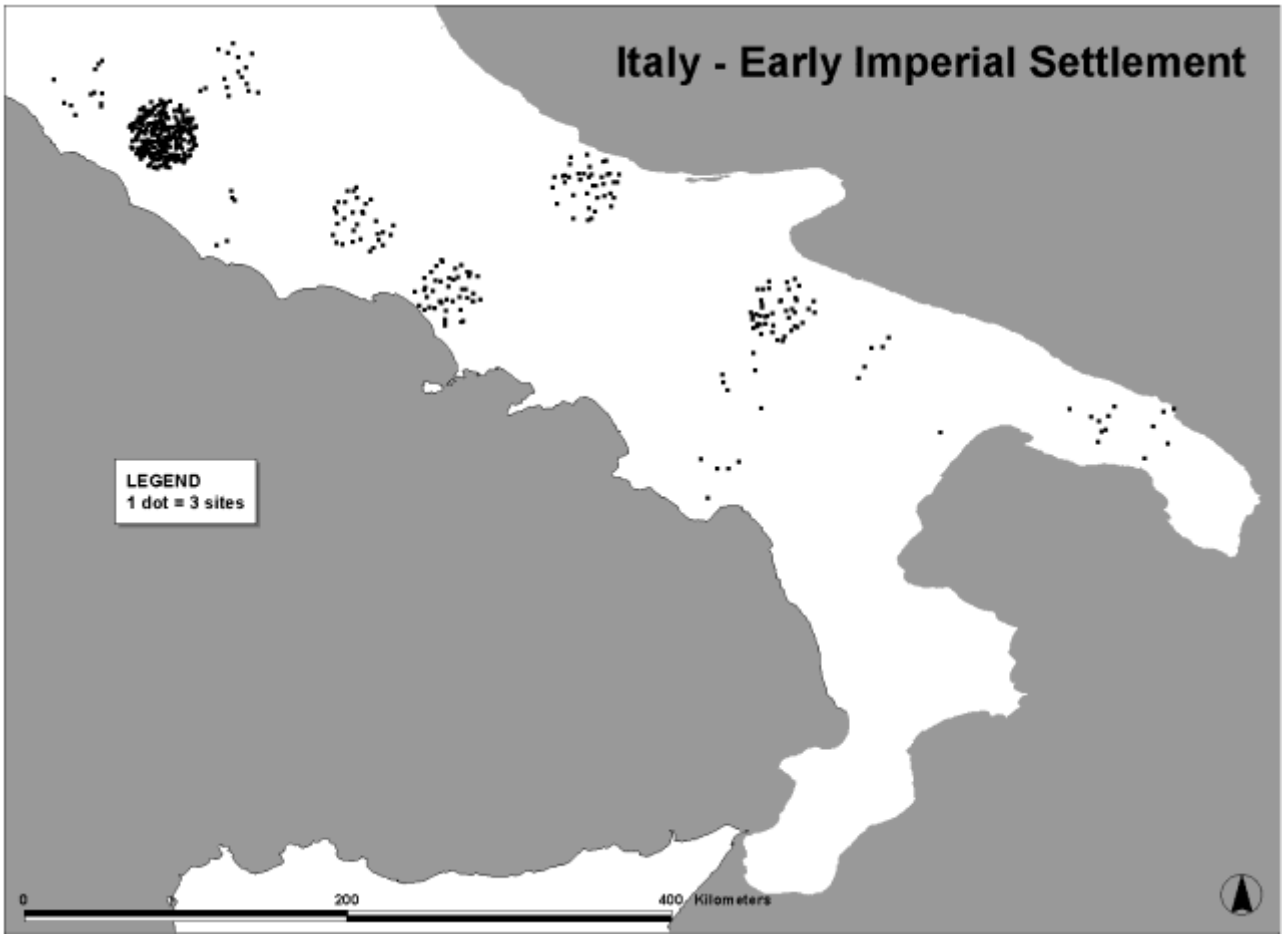

Figure 13.3 Numbers of Early Imperial period settlements in Central and Southern Italy.

The dense distribution of sites identified by the South Etruria survey contrasts sharply with other areas; the thin settlement of southern Italy is also notable (Figure 13.4). As with the map of *Forma Italiae* surveys, however, it is important to add some context to this distribution, in order to tease genuine variation in the archaeological record from methodological considerations. These figures relate to the actual number of Early Imperial sites located; but there are significant differences in the areas covered by these surveys (from 22 to *c.*1000 sq. km). It is therefore necessary to map the densities instead of the numbers of Early Imperial settlement in order to facilitate comparison. As we have already seen, this can be done with shading. However, we can also continue to use dots and therefore make use of a familiar cartographic convention. In this case, each dot is the equivalent of 0.1 site per sq. km; the total number of dots for each survey represents the overall density of settlement. Hence, two dots indicate a density of 0.2 sites per sq. km; ten dots is the equivalent of 1 site per sq. km.

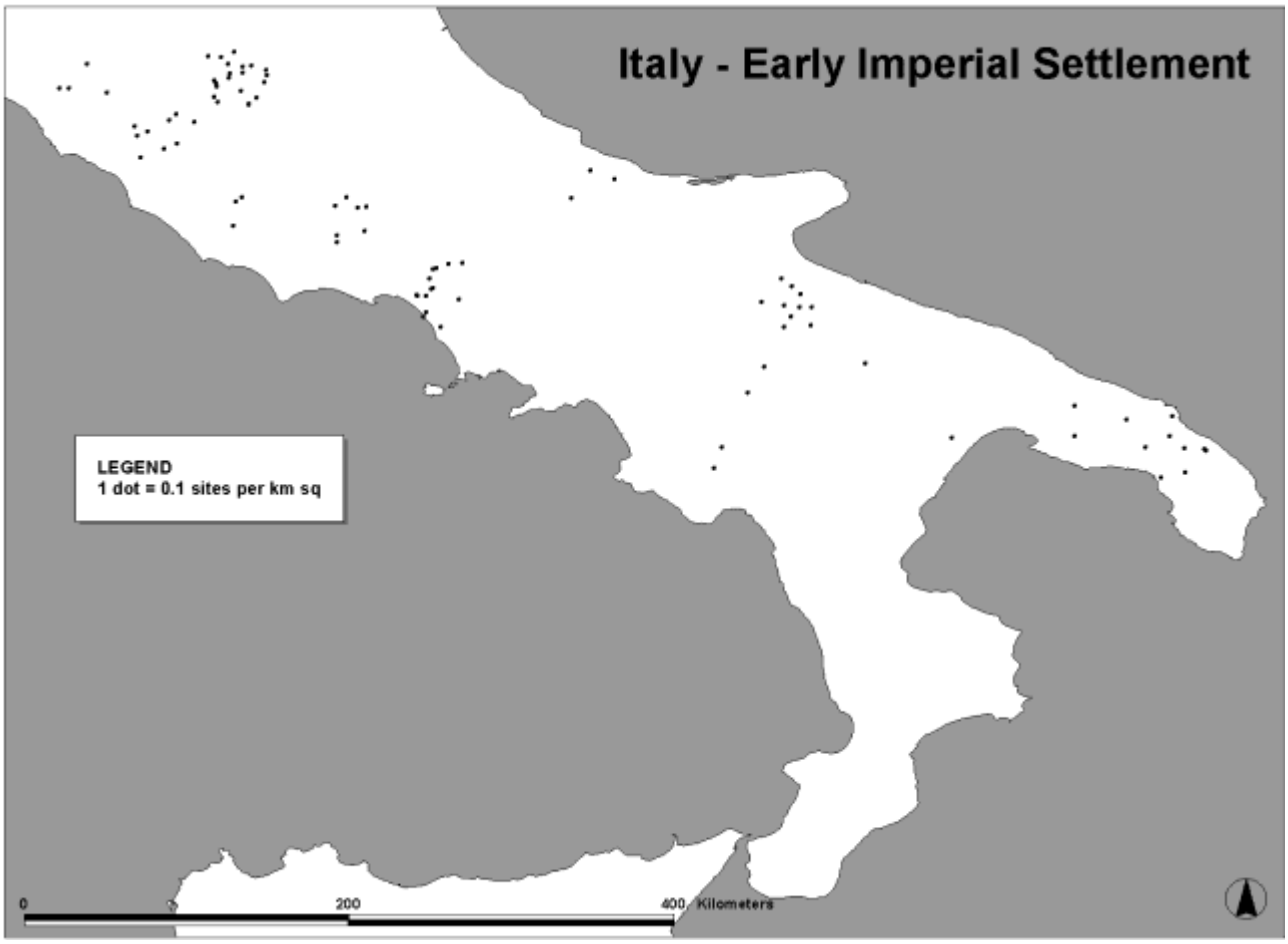

Figure 13.4 Density of Early Imperial period settlement in Central and Southern Italy.

Settlement density in South Etruria now no longer stands out as anomalous, being equalled by the Rieti, Venosa, Valesio and Northern Campania surveys. The Biferno valley, on the other hand, now appears much more like Southern Italy than previously. Broadly, there is a greater density of Early Imperial settlement closer to Rome. However, as with the *Forma Italiae* surveys, there is further variation in survey methodology which needs to be taken into consideration. Perhaps the most important of these is survey intensity, since it has been repeatedly demonstrated that the greater the intensity of survey techniques, the more sites it is possible to identify (Cherry 1983: fig. 1; Schiffer 1987). This can be measured in various ways, for example, the number of person-days per sq. km or the spacing of walkers. Few surveys, however, have published a full range of methodological details with which to attempt widespread systematic mapping of these measures (see Mattingly 2000f; Witcher 1999). As an alternative approach, these surveys have been classified into three classes of intensity: medium, high and very high (some of the earlier *Forma Italiae* would be classified as low) (Figure 13.5). This is a simplistic measure based upon assessment of a range of methodological information such as survey objectives, person-days, and techniques for dealing with visibility and so on. This information can be displayed alongside settlement densities in order to help visualise and assess patterning in the data.

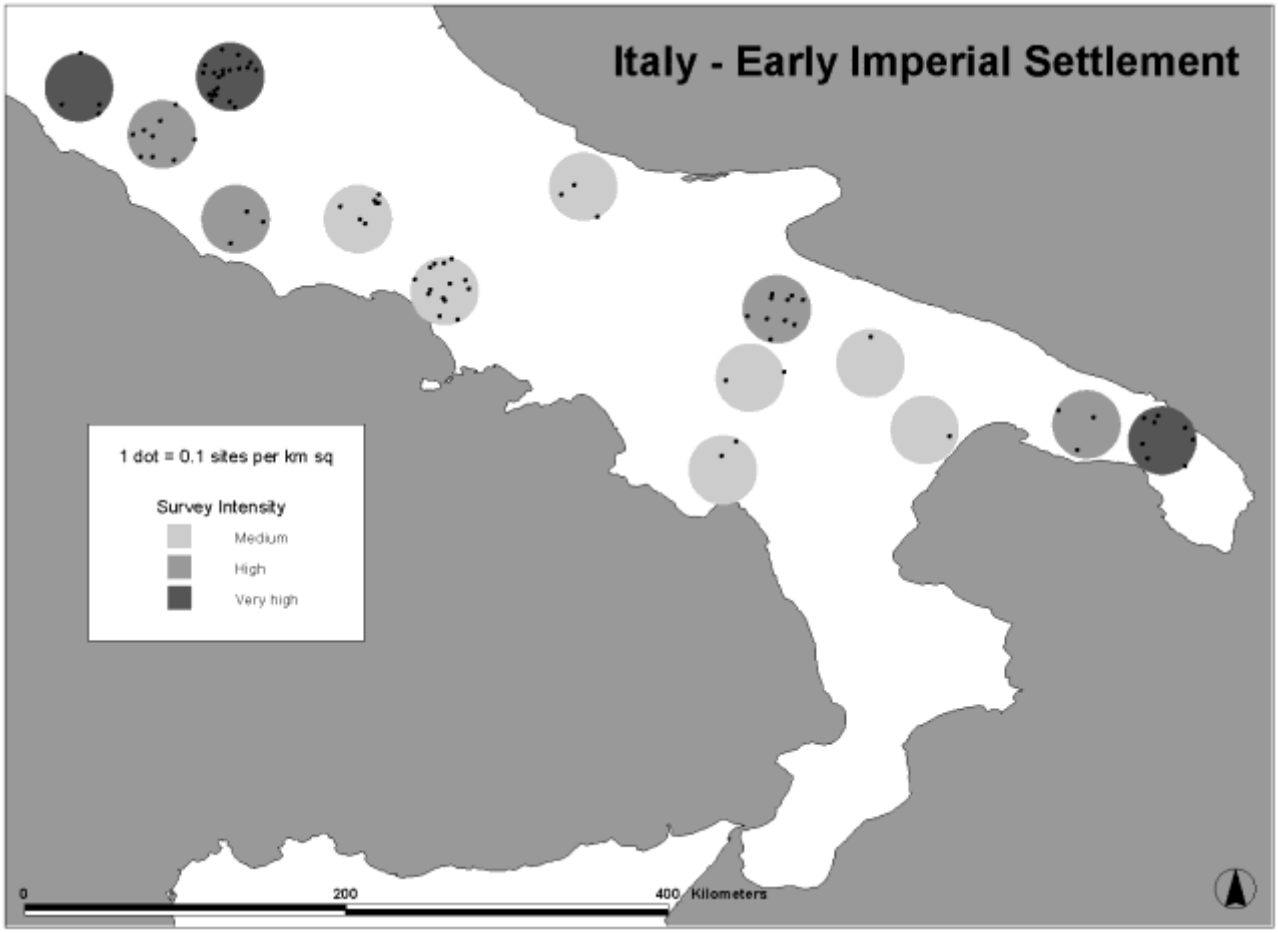

Figure 13.5 Density of Early Imperial period settlement, with survey intensity.

Combining the settlement density plots with a visual representation of survey intensity provides useful con-textual information with which to identify possible biases and assess patterning in the data. It now becomes clear that the high density of settlement at Rieti and Valesio, for example, coincides with particularly intensive surveys. The low densities recorded by surveys in southern Italy is also notable: where survey techniques in this area have been intensified (Venosa, Oria and especially Valesio), settlement numbers are notably higher, though never quite as high as the levels identified in Central West Italy. However, not all the patterns can be explained by survey intensity. For example, despite the high intensity of survey coverage at Tuscania, Early Imperial site density is still comparatively low, indicating a genuine contrast with the neighbouring South Etruria survey area. The density of settlement in Northern Campania is also extremely high despite the relatively low intensity of coverage, again indicating a genuine density of sites.

It should by now be clear that at a macro-regional scale, methodological issues are as likely to exercise influence on patterning as genuine variation in the distribution of Roman settlement. Valid comparison therefore clearly requires some estimation of bias so that we can compensate for such differences.

As a preliminary experiment in weighting survey results for varying survey intensity, the densities from the medium category were doubled and those from the high category increased by 50% to make them comparable with the very high category (Figure 13.6). Clearly these multipliers are arbitrary: firstly, they are likely to vary region by region, depending on the nature of past settlement and the archaeological record; and secondly, they are likely to affect different periods to varying degrees, again depending on the nature

of settlement (*e.g.* dispersed, nucleated, etc.). Nonetheless, GIS provides a flexible space in which to quickly and easily explore such multiple alternative scenarios. In fact, these particular multipliers may be quite conservative – there is good evidence that higher survey intensity can significantly increase site numbers (e.g. a re-survey of the *Forma Italiae* of the Cures Sabini region near Rome, identified three times the number of mid-Republican sites: Di Giuseppe *et al*. 2002; Muzzioli 1980).

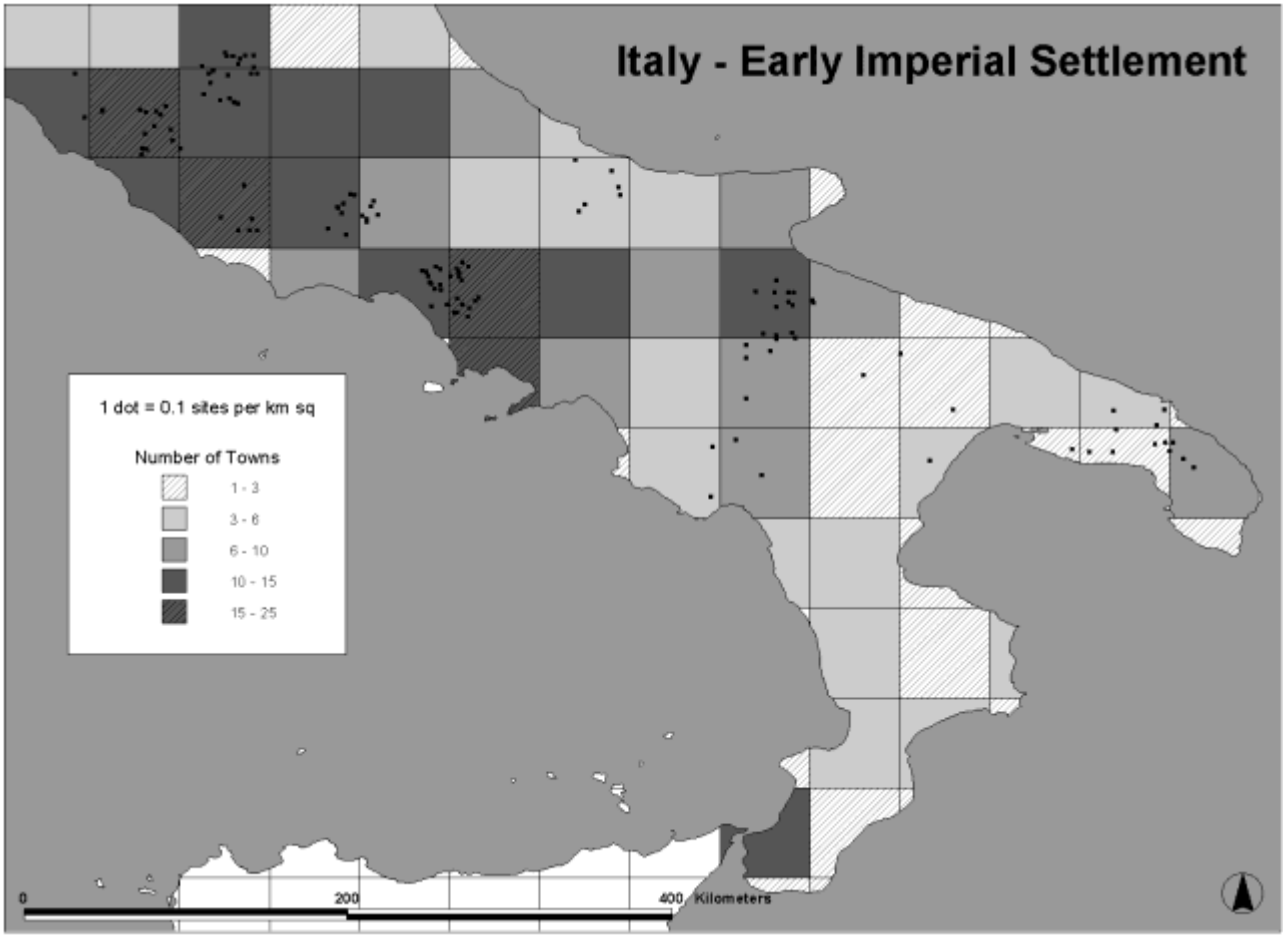

Figure 13.6 Calculated density of Early Imperial period settlement, plus urban densities.

The resulting map shows calculated Early Imperial settlement density, evening out some of the gross biases caused by survey methodology. Patterns to note include a general rise in settlement density in Southern Italy, though it is still lower than that found in Central West Italy. In contrast to Figure 13.3, Northern Campania now stands out as an area of particularly dense settlement, as does another area of colonization, around Venosa. Tuscania and the Pontine Region demonstrate comparatively low settlement density in comparison to nearby areas in the vicinity of Rome such as South Etruria and Rieti. The density of settlement in the latter area is still noticeably (though not implausibly) high.

This distribution of rural settlement is supplemented through an indication of urban density, these data being derived from a simple count of contemporary urban centres mapped in the Barrington Atlas, taking into account all significant population centres, including road stations. (It is worth pointing out that collecting the basic data for this simple measure would have been a major task without the Atlas!) The results are displayed through shading, which illustrates marked contrasts in the distribution and density of urban and nucleated settlement in Early Imperial Italy. Read together with the rural settlement evidence, we can begin to identify general patterns and associations. Broadly, though not

exclusively, areas of high urbanization also demonstrate dense rural settlement (Campania, Etruria, Lazio); in contrast, areas of limited urbanization have much lower densities of dispersed rural settlement (e.g. Basilicata, Northern Puglia). At a basic level, this is what we might expect – urban centres require a certain surplus from their hinterlands in order to fund urban munificence and support non-producing populations, and so on. At a wider scale, the correspondence of these high urban and rural densities with Rome's immediate hinterland also points to the strong influence of the City's economic demand, as well as the means of marketing this surplus (cf. Morley 1996). Dynamic versions of such mapping could help to clarify many aspects of the development and transformation of settlement and economy. Other patterns which might merit more attention include the rather mixed picture from the Salento peninsula (Southern Puglia). More generally, the key to the settlement patterns of Southern Italy might lie in between our arbitrary distinction of urban and rural – the *vicus* is a category of settlement which is comparatively rare in the historical sources (and the Barrington Atlas), although widely identified by surveys in the area as sites of a few hectares (e.g. Small 1991). Although not fully urban in the generally-accepted sense, they undoubtedly served as not only population but also economic centres and continued a long history of nucleated settlement in this area. Such observations demonstrate the importance of integrating some form of settlement hierarchy into our new small-scale maps.

Clearly, this is a very coarse approach that needs to be refined. Nonetheless, it demonstrates a series of potential approaches to visualising and assessing macro-regional settlement patterns. Improvement of survey characterisation could include recent agricultural histories and proximity to modern towns. Such reconstruction of the history of research in a region can provide valuable insights into the structure of archaeological datasets: for example, Rajala *et al*. (1999) identified changing relationships between survey objectives and intensity and the distribution of sites of all periods in relation to Roman roads. The discontinuous nature of survey coverage is also evident; again, GIS may be able to address this issue through the interpolation of settlement evidence to cover less well-studied areas (see Kuna 2000).

Beyond methodological considerations, the attention of comparative survey must also shift towards the interpretative significance of settlement distributions. As already mentioned, the definition of villas is perhaps one of the most discussed issues with regards (Italian) survey; unsurprisingly, therefore, no-one has yet produced a detailed map of Roman villas across Central and Southern Italy. Yet such a map would be invaluable in the debate about their spatial distribution, origins and social and economic functions. Again, we need not restrict ourselves to plotting specific site types. We should also think about producing maps which show ratios of different settlement types (e.g. the ratio of villas to other rural settlements) which may help to visualise variation in settlement hierarchy at a macro-regional scale, or maps of average length of site occupation to assess settlement continuity or instability.

To summarise, the potential of a comparative study of Italian surveys remains largely undeveloped since first being raised 20 years ago. Perhaps this is partly due to an initial over-optimism towards the data previously available; however, over the last 20 years, the quantity and quality of data has grown rapidly. Just as importantly, the widespread adoption of GIS has provided a vital tool with which to help facilitate such comparison. As well as developing techniques to understand how datasets can be integrated (such as re-survey, re-study of material, and setting out basic standards for methodology and publication), it is also important to develop innovative ways of mapping these data to exploit their potential for understanding macro-scale patterning across the Italian peninsula

and beyond.

Conclusions

It is critical that archaeologists highlight more clearly than has been achieved to date the differences between sub-regions of the Roman world. Most current mapping tends to exaggerate the degree of similarity between and within provinces, because of the academic agendas that lie behind the inclusion or exclusion of data. The emphasis on similarity is partly a result of academic interest in certain key features (towns, military installations, villas, etc.), and partly to do with the small scale of mapping. These features are often well-known both archaeologically and historically. The omission of perceived non-Roman settlement types and the mapping of Roman material culture in 'native' areas (as 'stray finds', whilst excluding 'Native' material culture) perpetuates an implicit idea of Romans and Others which no longer enjoys wider theoretical currency. Once we shift our attention to rural settlement, issues of data compatibility become more significant. The sites and scatters that we wish to map are known through quite different circumstances: they must be actively sought on the ground, not through the written sources. In contrast to the basically similar patterns of features presented by the Barrington Atlas, mapping of rural settlement will often demonstrate quite dramatic diversity relating both to methodological considerations and historical differences. Such bias is often not quantifiable; it cannot, however, be ignored and GIS presents one medium through which such unevenness might be tackled.

One of the effective requirements of mapping at a macro-regional scale is that we may need to adjust the way we present our data. It may be less important to plot each individual settlement and to focus instead on the wider picture through a range of simplified and indicative shading and symbols. At no stage does this preclude high-resolution mapping of survey – but rather should complement it, as a means of visualising these extraordinary quantities of data. The type of mapping work described above is dependent upon a degree of consistency in the collection and publication of survey data that has not yet materialised. Survey archaeologists therefore need to plan ahead for how to integrate their data into the bigger picture of the ancient world – to move from the local to the macro-scale inter-regional picture. Without prescribing specific methodological practices, it should still be possible to improve the compatibility of our data. Publication of methods ('metadata') as well as results is one key desideratum. Once we begin to comprehend the significance of these metadata for understanding individual surveys we can move on to compare between surveys. There are currently no accepted techniques for either visualising or attempting to correct survey data at the scales discussed here. However, as techniques to represent these biases develop and data are collected with which to address them, new cartographic models will undoubtedly emerge and facilitate more inclusive approaches to mapping the Roman world.

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