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SACRIFICIAL LANDSCAPES

CULTURAL BIOGRAPHIES OF PERSONS, OBJECTS AND 'NATURAL' PLACES
IN THE BRONZE AGE OF THE SOUTHERN NETHERLANDS, C. 2300-600 BC

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Non multo post in Cantabriae lacum fulmen decidit repertaeque sunt duodecim secures, haud ambiguum summae imperii signum.

(Suetonius, book VII: Galba, Otho, Vitellius)

Und dast Sterben, dieses Nichtmehrfassen
Jenes Grunds, auf dem wir täglich stehn,
Seinem ängstlichen Sich-Niederlassen -:

In die Wasser, die ihn sanft empfangen
Und die sich, wie glücklich und vergangen,
Unter ihm zurückziehn, Flut um Flut

(R.M. Rilke ‘der Schwan’)

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4.1 INTRODUCTION

In the previous two chapters, the problem of bronze deposition was discussed from an epistemological point of view (chapter 2), followed by the outline of a theoretical approach to study the problem (chapter 3). It is now necessary to consider the phenomenon of selective object deposition from the point of view of the possibilities and constraints of the evidence at hand: how can we study prehistoric depositional practices on the basis of the archaeological record of the southern Netherlands? In chapter 3, it was argued that empirically the evidence on the deposited objects themselves and the context of deposition are the only clues available to archaeology for a study of the practice of deposition. Since the phenomenon of selective deposition is by its very nature defined in terms of patterns of presence of objects in one context and absence in others, the question of representativity of such presence/absence patterns is of the utmost relevance.

This chapter will describe how the data were collected and what method was used for identifying patterns of deposition. Subsequently, I shall investigate in which way such patterns are influenced by site formation processes (Schiffer 1976), and outline the constraints and possibilities of the available evidence for the present research.

4.2 HOW TO RECOGNIZE PERMANENT DEPOSITIONS

What are the empirical possibilities of recognizing permanent deposition, apart from temporary storage, loss and discard? In chapter 2, it was argued that a profane interpretation of object deposition has always been something that went without saying, whereas one in terms of ritual should be sustained by arguments. Now, one might easily reverse the argument, and state that all depositions are 'ritual' until proven otherwise (Menke 1978/1979), but I feel that this still does not help us any further either. It is better to abandon this theoretical debate, and return to the data themselves: what arguments can be found in the evidence itself to make an explanation of a metalwork find as a permanently deposited object *more likely* than one in terms of casual loss or temporary storage? I shall argue that, for a proper recognition of permanent deposition, considering and comparing *patterns* of deposition should be the starting point of our analysis. First, in trying to isolate acts of deliberate permanent deposition, it is necessary to find verifiable characteristics of both permanent and non-permanent deposition, as well as of unintentional deposition.

Loss, to start with, is unintentional and incidental. If objects merely entered the archaeological record as a result of loss, then a random distribution pattern of finds would emerge. Only post-depositional processes (the presence of artefact traps) may yield some patterns. These will act indifferently to objects of various materials, and cannot account for the presence of metal objects alone in such artefact traps.

The presence of *never retrieved temporary object stores* in the archaeological record must also be the result of casual events, since by their very nature, they were not supposed to be there to be found by us. Only social disasters involving the sudden departure of entire groups of people, who are not even capable of taking their hidden wealth with them (or of returning later to retrieve it), will result in a patterned distribution of such stores. It is not likely that such disasters took place very often, and it may be expected they left traces in other evidence. At any rate, such stores should have at least one – empirically testable – characteristic: they must be retrievable, i.e. marked and buried in an accessible location.

Discard, on the other hand, is intentional, meant to be permanent, and a structural, recurrent way of deposition. As such it has all the aspects of what has been termed permanent object deposition. In our own society, to say that an object is discarded means that it is no longer considered to be useful and meaningful. For a non-metalliferous region like the southern Netherlands we should realize that, If a bronze artefact was seen thus, it is most likely that it was melted down. However, if bronze artefacts were thrown away for such a reason, they would probably enter the archaeological record in an arbitrary way, following the general discard patterns of other materials.

In chapter 2 it was established why there has always been a readiness to accept explanations of bronze depositions as loss, non-retrieval and discard, rather than the 'irrational' act of deliberately depositing objects without the intention of retrieval. However, accepting 'loss' and 'accidental non-retrieval' as general explanations also implies irrationalities, since we then suppose that Bronze Age communities were characterized by a general clumsiness and forgetfulness,

which is especially unlikely since bronze objects must have been relatively rare in the non-metal yielding regions. Accepting 'discard' as a general explanation implies that metalwork was available so amply that worn objects no longer needed to serve as scrap. This is not very likely.

To sum up, meaningful and permanent object deposition can be recognized archaeologically, depending on the following observations:

1 If it is patterned, that is, if within the region metal objects are repeatedly found in similar locations, and not in others.
2 If such patterns cannot be explained by other (depositional) processes (discard, general non-retrieval of stores in the case of social crises).
3 If such patterns are not solely determined by post-depositional processes and research factors.

It should be noted that when a pattern could also have been created by post-depositional processes, this does not automatically imply that the post-depositional processes rather than depositional activities explain it. It is better to see such a case as a situation where two conflicting explanations can explain the same pattern. Often we are in no position to make a well-argued choice between them.

Advantages of the method: getting round the wet-dry differentiation as decisive for an interpretation in ritual or profane terms

From this it follows that for every period a substantial number of finds should be present in the region, and that as much as possible contextual evidence should be gathered on the character of the location during deposition. Similarly, contextual evidence of contemporary sites where apparently no objects were deposited should be gathered and compared. The question should be: what constitutes the difference between them? This is in the first place a comparison of depositional behaviour of people in different locations in the landscape, but especially differences concerning the preservational character of the archaeological record of both contexts should also be taken into account.

This approach has the advantage of not disregarding a certain set of evidence from the start. As mentioned in chapter 2, most dry finds have always been prone to be *a priori* interpreted as non-retrieved stores or loss, and intentional depositions were subsequently looked for among finds from wet locations only. The approach outlined here evaluates depositional patterns, regardless of the question of whether their location is wet or dry.

Disadvantages of the method

However, there still are some drawbacks to the approach that need to be discussed.

1 It is a positivist approach, and as such just as much situated within a post-enlightenment discourse as the ones described in chapter 2. The difference is that this approach does not dismiss or prioritise a certain interpretation of bronze finds from the outset, and that it pays some attention to the way in which every interpretation is situated within a wider discourse.
2 Unpatterned events are still difficult to interpret. If in a given period, for example, just one bronze axe is known from a river, then it could theoretically be either a lost object (for example from a shipwreck) or a deliberately deposited object (in view of the inaccessible context, it cannot represent an object store). Only if more bronze axes from rivers are known, the interpretation of this find as a permanent deposition becomes more likely. Reference to other evidence is thus quintessential for interpretation. If this reference material is not available, in the case of 'unique' cases, interpretation becomes much more difficult.
3 This approach is designed for the problem at hand, the phenomenon that particular types of bronze objects seem to be found in certain contexts and not in others. In order to study the deposition of other materials, from other periods, quite other strategies are needed. See for an example Gerritsen (2001, 91-4) on depositions of pottery in the Iron Age of the southern Netherlands, a find category that is not exclusively associated with certain contexts, but where distribution patterns overlap.

4.3 How the data were collected and evaluated

At the heart of this research stands an intensive survey of the literature. The published parts of the Bronze Age catalogue of Butler, O'Connor (1980) and Warmenbol (references cited in appendices) formed the foundation for insight in the most important bronze finds in the regions, to which the case studies of some important Belgian hoard finds from the region could be added (Van Impe 1973; 1994; 1995/1996; Van Impe/Creemers 1993).[1] Information on more recent finds was collected from amateur journals, find reports of provincial archaeologists, ARCHIS, *Helinium*, the recent issues of the *Rapportage Archeologische Monumentenzorg (RAM)* of the *ROB*, and the numerous publications on urnfield excavations (see the references cited in the appendices). The literature survey was complemented by a study of two major museum collections: that of the *Rijksmuseum van Oudheden* in Leiden (henceforth RMO or 'Museum Leiden') and the *Valkhof Museum* in Nijmegen (henceforth 'Museum Nijmegen'), both possessing an important and representative collection of bronze finds from the Dutch part of the research region (in total 226 objects; 24 % of all finds known). On top of that, all new finds by amateurs and metaldetectorists during the last four years have been studied by Butler and Steegstra (University of Groningen), and I am fortunate to have been allowed to use their documentation. In all, a fairly representative picture of

the bronze finds from the Dutch part of the research region was built up, consisting not just of evidence from often old museum collections, but from recent amateur and metal-detectorist finds as well. For the Belgian part, the lesser degree of amateur and metal-detectorist organization and cooperation with archaeological authorities led to the situation that the picture for that part is more biased towards finds outside museum collections. Excluding the small metalwork finds from Late Bronze Age and Early Iron Age urnfields listed in appendices 7.3 and 7.4, 961 objects were recorded (compiled of the data from tables 5.1, 5.2., 6.1, 7.1 and 8.1). The majority are bronze and a few copper finds (approximately 96 %).[2] There are only a few gold objects and one made of tin. Most metalwork objects are single finds. They thus potentially represent individual acts of deposition. Seeing hoards (which contain by definition more than one object) as single acts of deposition as well, the number of potential individual deposition sites then would be 734 (excluding the small metalwork items from urnfields but including Late Neolithic and Middle Bronze Age burial deposits). If we include the many small metalwork finds from both the Late Bronze Age and Early Iron Age urnfields, approximately 1300 objects have been recorded.[3]

4.3.1 Assessing the reliability of data

One of the existing prejudices on bronze finds is the idea that they are in general not trustworthy, and have to be approached very critically or not at all. Verlaeckt (1996, chapter 3) has developed a method of evaluating the reliability of such finds. Although his method does not provide absolute certainty either, it has the advantage of making the evaluation procedure a transparent one. With some alterations,[4] I have adopted his method, and used it for evaluating my own database.

The focus should be on objects of which at least some information is recorded on find spot and find circumstances. After all, these may potentially represent finds of which the depositional context can be reconstructed. The main problem then is whether objects really came from the claimed find-spots. Unfortunately, bronzes have always been a popular item for antique dealers, and there is evidence that bronzes were sold to museums or collectors with deliberately faked contextual information (Verlaeckt 1996, 33). It is vital to assess the reliability of recorded contextual information first. We should take two steps to find this out. The first is to assess the reliability of a find by tracing who or which authorities were involved in the reporting of the find. Are these reliable sources? The second is to check the contextual information by seeing whether find circumstances and patina of the find match.

Step 1: assessing the reliability of the find report

As much information as possible should be gathered on the individuals who are said to have found or sold the object, as well as on the intermediaries involved. The following categories of reporting bodies can be distinguished:

1 large private collections from the late 19th-early 20th century, that are now part of museum collections;
2 finds purchased from antique dealers;
3 finds by laymen or amateurs, who reported their finds to archaeological authorities including metal-detectorists;[5]
4 finds discovered during professional or amateur excavations;
5 unknown.

Fig. 4.1 shows the distribution of finds over these categories. In general, I regard finds from antique dealers as suspicious, particularly since some of them are unique objects that are in addition only known from far-away countries. An example is the totally unique find of a Scandinavian ceremonial axe, said to have been dredged from the Meuse between Maaseik and Stokkem (Van Impe/Verlaeckt 1992). The entire history of the find, the involvement of commercial dealers and the large amount of money for which it was sold, should cause suspicion. I side with Butler (personal comment) who thinks

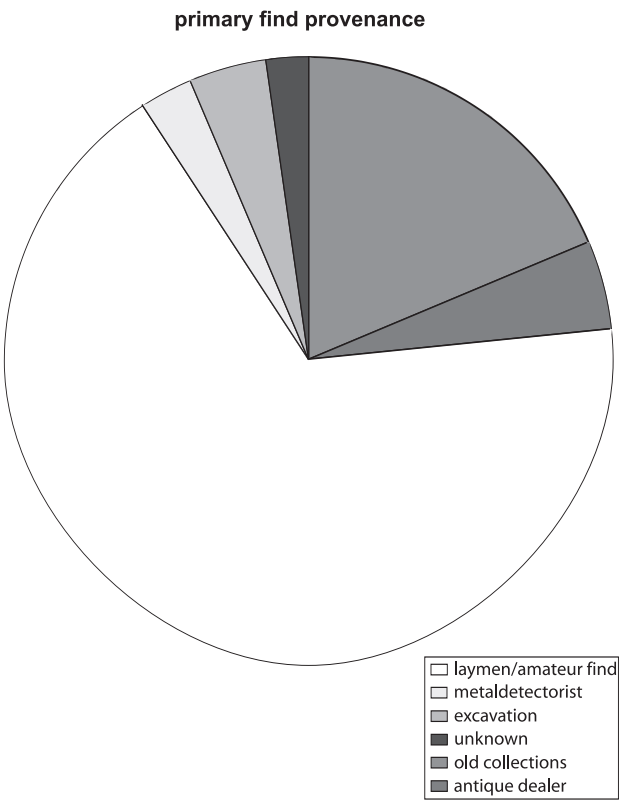

Figure 4.1 Primary find provenance.

it better not to include this find in any account of the Dutch-Belgian Bronze Age. Alternatively, the axe found in tumulus VI in Goirle is also a unique type, probably an import from regions as far away as Hungary (chapter 7). This find, however, was discovered during a professional excavation and there is no reason to doubt its reliability. Only if similar finds are made in a more trustworthy context, the antique dealer objection becomes less suspicious. Notoriously untrustworthy are the finds from the antique dealer J.N. Esser who sold a lot of bronze objects to the RMO. I shall not disregard finds from antique dealers (they will be mentioned in the find lists published here), but they must never be the pivotal element in the construction of a theory.

Verlaeckt (1996) and Warmenbol (1987b) showed the problems one comes up against in dealing with finds from old collections (category 1). Many collectors had a genuine interest in the history of their own region and bought objects from dealers and dredgers who told them that these objects came from this region. Often, however, the collectors were deceived. For the Netherlands, G.M. Kam, collector of antiquities from the Nijmegen area, is a good example; for Belgium, G. Hasse, collector of finds from Antwerpen is another (Warmenbol 1987b). It is difficult to trace whether such old collections are largely problematic or not. The reliability of large collections as a whole can be assessed by taking all finds (not just those from the Bronze Age) into account (cf. Verlaeckt 1996, 35-6). In general, I shall treat this category, like antique dealer find's, with caution.

There are no reasons to doubt the general reliability of category 3 to 5. I have more than once experienced that the find documentation of amateur collections is excellent. With regard to metal-detectorist's finds: they are often regarded with suspicion by official archaeological authorities since their surveys are legally forbidden (Willems 1990). Leaving the legal discussion aside, the increase in bronze finds of the last decades is largely due to their activities. Their finds simply cannot be disregarded by any archaeologist who studies metal finds. Most metal-detectorists I met do their surveying for the pleasure of finding, and for building a collection of their own finds. There are not many indications that objects are offered with faked find circumstances. Rather, the problem is that among this group the find circumstances themselves, or even the find-spot, are very often not recorded. This makes these groups of finds often less interesting for the present research goals.

Step 2: evaluation by means of matching patina and find location

For finds with known find circumstances, another way to test their reliability is to check whether the patina of the object is in accordance with the find circumstances. Patina is actually a misnomer for the chemical change – or lack of it – of the surface of a bronze object (the term originally implies weathering taking place). Since it is so widely used, I shall go on using the term.

In non-oxidizing circumstances, the process of corrosion cannot take place; a bronze object therefore retains its own – golden – colour. Wet locations usually provide such milieus, and therefore wet-context finds still have their original golden colour. In the literature this is often indicated as 'river patina', which is the wrong term since it is not a patina at all (it is actually the lack of corrosion), and since it is not confined to river finds (objects lying in stream valleys in peat bogs can for example have such colours too). Also, the lack of corrosion keeps the metal in excellent condition (its surface is not thinned, burst or crumbled). A well-preserved uncorroded object can therefore only have come from a waterlogged milieu. Wet environments can also lead to change in the surface; in particular conditions, the outer surface turns black or brown, or otherwise dark-coloured. This process is actually not well understood in chemical terms, but it has to do with the chemical interaction between the milieu and the specific nature of the metal alloy. Peaty environments in particular seem to effect a brown or black patina on the surface. This is often called 'peat patina', but also objects known to have been genuine river finds can show this colour (perhaps because they were originally deposited in its backswamps; see also Verlaeckt 1996, 33-4). Apart from the discolorations, these objects are also in well-preserved conditions. Actually most finds show a combination of both 'patinas': a golden surface, covered with black or brown shades. Objects deposited in wet locations can be recognized on the basis of their fine preservation and a characteristic 'patina': a golden colour or a brown or black discolouration. Objects deposited on dry land will corrode and therefore show a green colour, and are often less well-preserved. 'Patina', or better, the colour and preservation of the surface, is thus related to the context of deposition. An object that was deposited in a peat bog should show the brown-black patina or not be patinated at all. And here we have a means to check the reliability of the said find circumstances from objects stored in museums.

Pitfalls in the use of patina as an indicator of context

There are, however, some pitfalls involved that are not often realized. What about an object which was deposited in dry ground that later became wet (for example, by blanket bogs covering older sediment)? Such a find can still be recognized by its 'patina' as stemming from originally dry conditions. Some corrosion will already have taken place. The later waterlogged conditions will have prevented further corrosion from taking place or the surface may for example have reacted with the peaty milieu and become black or brown.

Still, the primary bronze-oxides on the surface indicate its earlier history in a dry milieu. Important to note is that non-oxidation primarily relates to waterlogged conditions, and not to the object's presence in peat. An object may for example have been deposited in the sandy slope next to a small lake where a peat layer was growing. The peat may cover the sediment in which the object was deposited only centuries later, but if this sandy slope in which the object was deposited that was already within the water-table at that moment, the object would have all the characteristics of a 'wet context deposit'. In regions where that water-table was already very high at the moment of deposition, it then becomes difficult to know whether the association between the object and a wet location was deliberate or not, since every object dug in shows the characteristic of such locations. This is particularly a characteristic of wetland sites. In the southern Netherlands, the only region where such conditions existed is the Holocene clay region of the central Dutch river landscape. Interestingly, the recent large-scale excavations in the Betuwe area made it clear that bronzes found in clayey sediment, often have a quite specific rust-coloured surface, different from river finds (personal comment J. Hielkema, ADC, and my own observation). In the sand and loess regions, such ambivalent situations are generally restricted to transition zones between dry land and marshes. The patina itself then indicates whether this zone was wet or still dry at the time of deposition.

Another problem is raised by finds that come from a wet site that for some reason became dry. Many dredge finds, for example, are known to have been lying among huge amounts of gravel for a long time (some were found for example on gravel riverbanks in the Meuse that became dry land). They then begin to corrode after all. A match between patina and the original wet depositional location cannot be made anymore. In the case of the gravel bank, gravel sediment is often included in the corrosion of the object, thereby still indicating an association between this object and the river (in general, gravel is absent in the sandy soils of the southern Netherlands, the clay areas of the central river area, and the loess region. It may only be present in the sediment of the ice-pushed ridges). Theoretically, another problem preventing an adequate match between patina and depositional location can be caused when a particular object circulates for a very long time. Dependent on the quality of the bronze, it will then start to corrode before deposition. Even if it is deposited in a wet location, it will retain its green corrosion. But although studies on the rate of such corrosion are not available, it cansafely be assumed that it takes a very long time for an object to become totally corroded. In the case of real heirlooms we would expect the objects to show considerable wear.

The patina test

Having discussed the possibilities and limitations of using patina as an indicator of context, we can now test it. Again bronze burial gifts from urnfields are excluded, leaving us with a total of 1059 objects. For only 520 of these objects the original patina is known (many have been lab-treated in museums, others were unavailable for study). 275 of these are finds for which there is information on the find context as well (wet or dry). 169 of these objects are from watery places and have a 'wet context' patina (dark bronze, brownish, blackish). 75 are from dry contexts and have an oxidized green patina. In only 31 cases (11 %) there was no match. These are all finds said to have been found in rivers or swamps, but which are nevertheless green or dark green. The relative low percentage of mismatches does not endanger the general idea that patina indicates find context. Nevertheless, the mismatches should be explained. First of all, we can think of the cases where a wet place became dry land, or of objects from rivers that have been resting in dry gravel heaps for a long time. Such dry gravel heaps occasionally exist in Dutch rivers, particularly in the Meuse valley. Alternatively, the mismatch may just as well be a problem of description. For the majority of finds, I had to work with patina-descriptions made by others. It is conspicuous that many of the mismatches are said to have a 'dark-green' patina in Butler's catalogue. When I studied some of these objects themselves, it appeared to me that many are 'dark' rather than 'green' in my view. By this I mean that traces of severe oxidizing are hard to detect, but the outer surface of the object underwent a darkening which reminds me of wet-context finds.

How is the reliability assessment reflected in the data used in this study?

In the following chapters, numerous finds will be listed in tables. The reliability assessment carried out has the following consequences. Objects that have been recognized as fakes by Butler and/or myself are not included in any list in the appendices. Unique finds from antique dealers or unreliable individuals are not included either (cf. the discussion on the Scandinavian ceremonial axe from Maaseik/Stokkem). Finds from antique dealers or old collections that fit in a pattern are listed though, but they are clearly marked as such (designated 'dubious'). Finds where context and patina do not match are included as well since there is more than one way to explain mismatches between find context and patina (see above); such finds will not be used as the pivotal argument in the construction of ideas though.

4.3.2 Retrieving information on find context

Apart from working with published evidence on find context, it was necessary to collect additional information on the

subject. The reason for this is that the existing syntheses of Butler and O'Connor had hardly paid attention to it so far. Their main emphasis was on the typo-chronology of objects. What was published on contextual evidence was so meagre that it could not serve as a basis for studying depositional practices. For example: Butler's catalogue of the Dutch province of Limburg listed 314 individual objects in 1996. 231 of these were indicated as 'stray finds' for which no additional information on depositional context was available. For only 26 % (83 objects) it was known from which kind of context it came (peat bogs, graves, rivers, hoard). It may be clear that this is much too low a percentage for any general study of bronze deposition. As a result of the present research, however, we can dispose of 203 objects – 64 % – with deposition context known from this province. I shall now continue to describe by what method this was made possible.

Starting point is that there is at least some information on the topographical situation of finds. This can range from the exact coordinates to a vague description or a toponym. If topographical information is available, it is possible to reconstruct the sort of environment where the object was deposited, ranging from very detailed information to superficial interpretations in terms of 'wet' or 'dry' contexts.

A twofold division in the locational information can be made. The first is information that informs us on context; for example: 'found during peat-cutting near the castle of Croy' (chapter 8: the Stiphout hoard). This find record suggests that we are dealing with a peat find. If this is corroborated by the patina (which should be a wet-context patina), then the find is accepted as coming from a marsh. In this case, a look at the map indicates that we are dealing with peat that was formed in the stream valley of the Goorloop next to a higher sand plateau. I shall refer to such information as *primary contextual information*.

The second kind of locational information just mentions a toponym, or a coordinate. In order to retrieve contextual information on such finds, I combined geological and pedological maps (1:50,000 and 1:100,000 for the Netherlands, 1:500,000 for Belgium), as well as the 1:25,000 and 1:50,000 historical maps of the Dutch part of the region. The latter two give detailed information on the undisturbed courses of many stream valleys and the locations of many small marshes before the great reclamations. These, of course, comprise environmental information on a landscape thousands of years after the Bronze Age. If a bronze find, for example, appears to have come from the Echterbroek near Echt (prov. Limburg), the historical and pedological information suggest that it came from a – now disappeared – swamp. I then had to find out whether this swamp already existed in the Bronze Age, something which could not always be established (for the Echterbroek it holds true). In general, the locations of streams, swamps and rivers themselves shifted, but the larger environmental entities of which they were part have not altered much since the Bronze Age. On the sandy soils, all the stream valleys are located within the sand plateaus that originated in the Late Pleistocene. In the Meuse valley, the river-bed of the Meuse is generally defined by the higher pre-Holocene terraces. Most of the larger marshes originated in places where pre-Holocene impermeable layers underground caused water to stagnate. Marsh formation in general set in as early as the Early Holocene, although the peat extension itself of course spread in the course of time (Zagwijn 1986). If the object's original patina is known, I then matched the reconstructed find context with the patina of the object in question, to see whether the location was indeed already 'wet' at the time of deposition. I shall refer to this reconstructed kind of information as *secondary contextual information*.

As a result of this method, contextual information was found for 661 of the objects (69 %). Unfortunately, data on patina was often not available for such finds, preventing us from adequately testing their reliability. In the find lists in the appendices, the information on context will be accompanied by a remark whether contextual information is based on primary records ('P'), or on a reconstruction ('secondary information'; 'S'). Some 245 of the uncontextualised finds have their patina described. Given the results of the 'patina test' (above section), it is tempting to translate patina to 'wet' or 'dry' contexts (as was for example done by Vandkilde 1996 in her study on the Danish finds). Because of the pitfalls in using patina-only finds (particularly the problem of 'dark green' patinas), I shall not do this: 'patina-only' finds do not play a role in discussions on deposition.

4.4 Explaining presence and absence of finds: post-depositional processes

It was argued in section 4.2 that recognizing patterns in deposition is central to the recognition of selective deposition. Any pattern in the archaeological record, however, is an artefact of prehistoric practices, post-depositional processes of disturbance and preservation, as well as research factors (Schiffer 1976). Having collected some 661 bronze finds that are to be analysed for indications of selective deposition, we should now assess the representativity of what we have: to what extent can patterns of absence in certain contexts, count as *evidence* of absence? When do patterns of presence and absence of bronze finds reflect selective deposition, rather than selective preservation or selective research strategies? I shall now try to deal with this question.

Since we are dealing here with a regional study, we should see the role of post-depositional processes and research factors as 'map formation processes', to use Fokkens' terminology (1998a). In his pioneering work, Fokkens has developed an elaborate strategy for analysing the impact of

such map formation processes in his study of a region in the northern Netherlands. I shall follow his approach here, with one restriction. Fokkens was able to assess the impact of processes quantitatively. For the present study this is unfortunately impossible to do. The reason is a fundamental lack of data on the collection habits of amateurs and, particularly, metal-detectorists. In a detailed manner, Fokkens could follow the way in which the most important amateurs surveyed, which areas they visited and which were excluded, and what strategies they followed. He neatly illustrated the great, if not decisive, significance of the role of these amateurs in the formation of the find distribution map. It is easy to see the general relevance of this observation for the evidence in question here. For some micro-regions, all the finds have been made by just one or a few amateurs. For example: a considerable number of dredge finds from Roermond have been found or were collected by C. van der Pijl. This recalls the situation sketched by Fokkens. However, for a much larger number of finds, I do not have any clue as to the identity of the finder and his/her search strategies. Especially the survey methods of most metal-detectorists have so far not been analysed.

Below, I shall discuss the impact of the most important natural (4.4.1) and anthropogenetic post-depositional processes (4.4.2) on the find distribution map. This will be followed by the role of research factors (4.5).

4.4.1 Natural processes

Geological processes

Geological processes involve both sedimentation and erosion. Sedimentation may lead to the covering up of depositional locations, thereby making them potentially irretrievable for archaeological surveys. The remnants of the huge peat bog of the Peel represent such conditions, as do the clay and peat sediments in the western part of the province of Noord-Brabant.[6] The (post-Bronze Age) clay deposits in the central river area are highly varied in thickness, ranging from 40 cm to more than one metre. The most important existing clay and peat covers are depicted in fig. 4.3. For the central river area it should be remarked that the thickness of the cover is, however, highly varied within short distances, making find conditions in one part better than in others.

Erosion is another relevant geological process. The most important aspect of erosion is the distortion of original find contexts. The dynamic life-course of the major rivers Rhine, Meuse and Scheldt may have caused the erosion and distortion of many Bronze Age deposition sites (Berendse/Stouthamer 2001). To a much lesser extent the same is true for the many small streams on the sandy area of the Meuse-Demer-Scheldt region. The tributaries of the Meuse in middle and southern Limburg, on the other hand, can have a much stronger erosive effect due to the considerable fall.

Geochemical processes

Geochemical processes do not influence the metalwork find distribution in the sense that metalwork is not preserved in particular milieus. Unlike iron, copper and bronze can survive in both wet and dry, and in acid and basic milieus. However, there is evidence that the continuous use of artificial dung on the sandy soils may worsen their condition. Probably this relates to an interplay between the specific constituents of the metal, the soil conditions, and the amount of artificial dung being used. The Late Neolithic or Early Bronze Age flat axe of Hoogeloon is an example of an object that is severely damaged by such processes (chapter 5).

In general, bronze objects are better preserved in wet conditions than in dry ones, but the genuine finds from dry conditions show that such milieus do not effect their total destruction.[7]

4.4.2 Anthropogenetic processes

Essen or *plaggen* soils

Since the end of the Late Medieval Period, the farmers living on the sandy soils have improved the quality of the agricultural land by practising sod-manuring (Gerritsen 2001, 30). Throughout the centuries, sods have been placed on the fields, resulting in a heightening of the arable land with sometimes one metre (Fokkens 1998a, 59). Extensive *plaggen* or *essen* complexes developed, sealing off entire areas of land that might contain traces of prehistoric occupation. Pedologists define these layers as being more than 40 cm thick. Fig. 4.3 shows the distribution of *plaggen* soils in the southern Netherlands on the basis of pedological surveys. In the case of covering *plaggen* soils, artefacts cannot be ploughed to the surface anymore, and they are generally too thick as well to allow the use of metal-detectors. Only digging activities in the *essen* may yield prehistoric finds. These *plaggen* soils constitute a considerable part of the research region. Around an *es*, deforested heath areas developed, where sheep-herding was practised. Until the industrial revolution the *essen*-heath landscape was the most conspicuous characteristic of the sandy soils in the research region. Archaeologically, heaths may easily yield finds, whereas *essen* conceal finds. Although by their very nature, *essen* are agricultural fields, they also cover small fens and marshes (Kortlang 1999, fig. 16); they do not exclusively represent the drier and better soils.

Essen are nowadays held in high esteem by archaeologists for their preservation of the traces of entire prehistoric settlement areas (Roymans/Theuws 1999). It should not be forgotten, however, that they were agricultural fields: the original prehistoric surface is ploughed out, and small fens underneath *essen* were also often reclaimed before being covered by sods. Traces of depositions underneath *essen*, for example in such small fens, may thus have been partly disturbed or removed already in early periods.

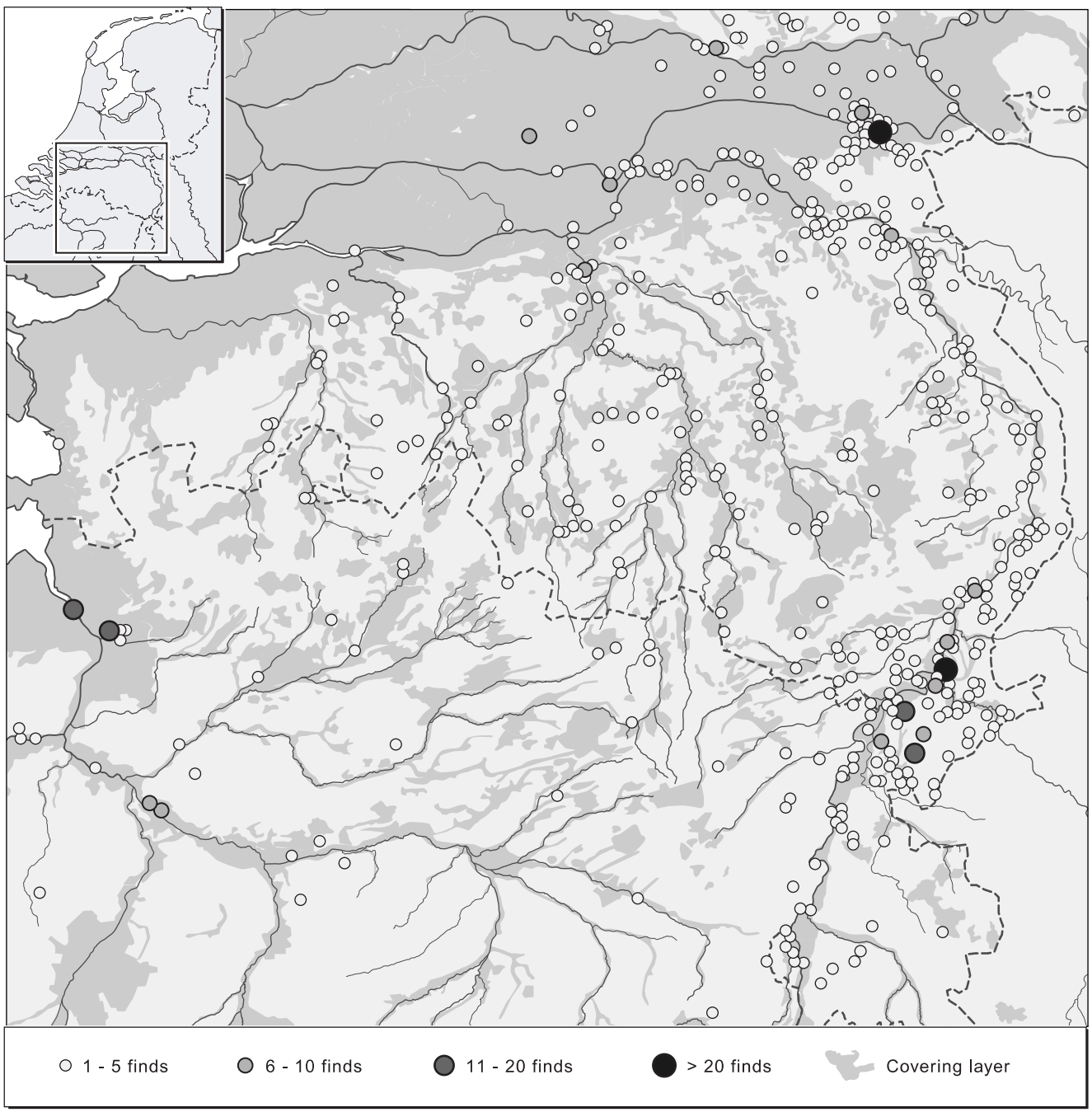

Figure 4.2 Density of metalwork finds in relation to the presence/absence of covering layers.

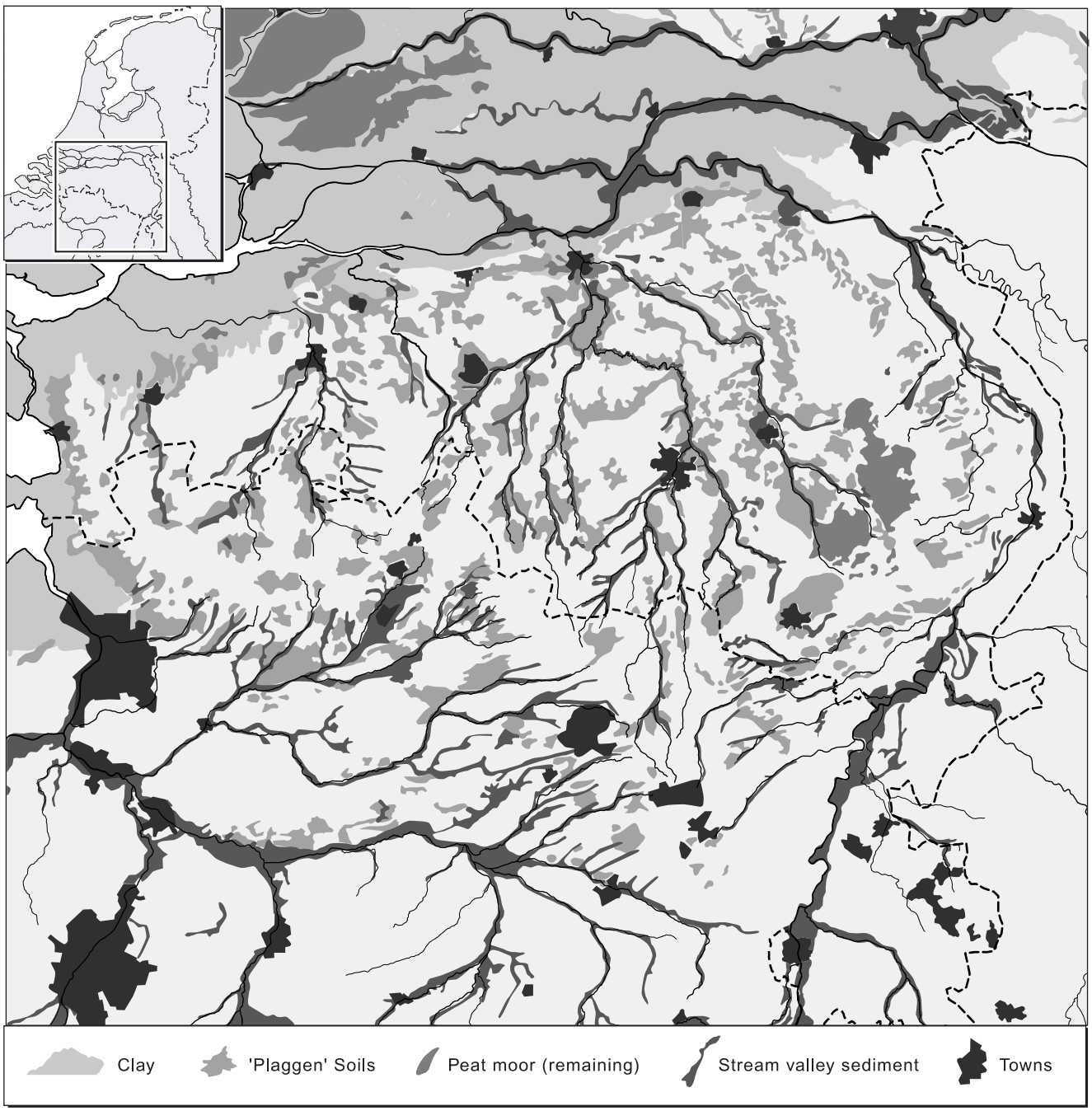

Figure 4.3 The different kinds of covering layers.

The distribution of finds shows that the majority of bronze finds was not found in the area covered by *essen* (compare fig. 4.2 to 4.3). If this happened, then this was related to archaeological excavation or digging activities. The *essen* thus seem to be an important factor in the formation of the find distribution. Indeed, only 0.1 % of the bronze finds come from the *essen* zones; the overwhelming majority has been found elsewhere.

Reclamation history

The fact that bronze axes were sometimes built into shrines in medieval castles, (Samson, south Belgium; Wielockx 1986, Hu. 122), indicates that such objects had been found long before the start of scientific archaeology. It is likely that bronze objects found by a medieval farmer were melted down, as bronze was also used and worked in the Middle Ages. In the absence of written records and collecting practices, such finds were lost without any notice. To my knowledge, C. Reuvens (1823, 219-23) has published the earliest information on what must have been finds of Bronze Age metalwork known from the study area. In Europe, bronze hoards may have been found in much earlier periods as well. The Roman author Suetonius, for example, mentions the find of twelve axes in a lake in Cantabria after lightning struck it.[8]

Although the scale and intensity of modern land use is unparalleled when compared with reclamations in earlier historic periods, it is very likely that the latter have also disturbed a considerable number of prehistoric finds. It might therefore be expected that areas that saw early reclamations are likely to have witnessed the unrecorded finds and hence loss of more deposition sites than areas that were reclaimed in periods when an active archaeological interest already existed.

The loess belt in the Dutch and Belgian province of Limburg had already been extensively reclaimed early in the medieval period. It is therefore likely that if there were many deposition sites in the reclaimed areas (the middle terrace in particular), these have been lost for archaeological research, and perhaps only stand a chance for later recovery if objects were buried deep in the ground, or if the site was covered by substantial colluvial deposits. The peaty areas near the transition of the middle to the high terrace in these same provinces, however, have not been reclaimed until the end of the late 19th and early 20th century. This was a time when the interest in archaeological finds was growing in local circles, and it became also common knowledge that such areas potentially might yield finds. Therefore it comes as no surprise that a considerable number of the bronze finds from Limburg were indeed recorded as having been recovered during these reclamations. In the Roerstreek and the nearby 'Westelijke Mijnstreek', where a considerable number of bronze finds have been made in peaty areas, such conditions existed (fig. 1.3; Van Hoof 2000, 17-22). Another locality where this is true is the 'Kempen' area in the province of Noord-Brabant (fig. 1.3;Theunissen 1999). The impression is that the most bronze-rich peats are also those regions where of old historical societies took an active interest in archaeology.

The largest peat bog, the Peel, is remarkably empty, however (fig. 4.2). Currently, this huge area has yielded just 12 Bronze Age finds.[9] It is generally thought that this emptiness is related to the industrial scale on which its reclamation took place, and the absence of active amateur archaeologists (Gerritsen 2001, 174, note 176). The latter is not entirely true: a few amateurs were actively monitoring the reclamations, most notably L.D. Keus in the 1930s. This led to the find of the Kronenberg sword (chapter 7). A structured cooperation between amateur archaeologists, a museum and labourers working in the bog did not come into being. Such a cooperation was very successful in the case of the reclamation of the peat bogs in the province of Drenthe, in the northern Netherlands. The almost industrial way in which the reclamations in the part of the peat bog situated in the province of Noord-Brabant was carried out will indeed have diminished the chances of finding artefacts. On the side situated in the province of Limburg, reclamation was small-scale and more haphazardly organized; chances of recognizing bronzes were probably higher. Nevertheless, the only two finds are from Kronenberg, which is situated at the fringes of the bog.

In general, the *essen* represent the earliest reclamations on the sandy soils that had an effect on the archaeological record. The same goes for the larger part of the loess area in southern Limburg. The land surrounding medieval cities and villages (now mostly part of the town itself) are another example of early reclaimed areas (see fig. 4.3). It is thus very likely that if there were substantial numbers of bronze deposits in these areas, these are now lost without ever being recorded. As a matter of fact, Reuvens (1823, 219-23) recorded such finds made during building activities in and around Nijmegen. The large peat areas, such as the terrace swamps, the Peel, and the marshes once bordering the ice-pushed ridges of Nijmegen-Groesbeek and Rhenen, were reclaimed in the late 19th-early 20th century. As such areas potentially stand a better chance of yielding recorded finds (dependent on the activities of local amateurs, and the type of reclamation), they are more likely to become find-rich areas. Actually, this is another mechanism apart from the better preservation circumstances that may lead to the over-representation of peat-finds in relation to dry finds (deposited in areas that became agricultural fields in the Middle Ages).

From the point of view of reclamation history, conditions for preservation of bronze deposits seem to be relatively bad

in the loess area and in the *essen* area on the sandy soils. They are favourable in the peat areas that were reclaimed in the 20th century.

Dredging and other activities in rivers and stream valleys
Special mention should be made of the activities in rivers. The numerous stream valleys in the sand and loess zones in the region have mostly been canalized since the late 19th century. This often meant that new stream channels were cut into the older fluviatile sediment of the stream valleys themselves. Such activities are known to have yielded finds of Bronze Age metalwork and flint and stone axes. Digging activities in the (former) river-beds and backswamps of the major rivers Meuse, Scheldt, Rhine and Waal, however, have in places led to high number of finds, particular in the Scheldt near Antwerpen, the Waal near Nijmegen-Millingen, and in a zone of some 15 km in the Meuse valley, from Buggenum in the north to Stevensweert in the south, and near Roermond in particular. Here, not only objects from the Bronze Age were recovered, but also from the Late Iron Age, and the Roman Period, and to a lesser extent, from the Neolithic and the early Middle Ages. The most important activity where finds were recovered is gravel and sand extraction; the deepening and straightening of the river-bed is another. A special case is the construction of harbours, which involved the excavating of entire stretches of land. This took place in connection with the development of the growing international significance of the harbour of Antwerpen (Warmenbol 1987b).

Gravel extraction was already done before 1850, but was practised on a large-scale from that time on. It has in particular been carried out in the rivers Meuse and Waal. At first in the river-bed itself and on existing gravel banks and later on in the backswamps of the river (in the Meuse this took place since 1935, both on the Dutch and on the Belgian side of the river). The huge gravel extraction lakes are a visible remnant of it. The alluvial valley of the Meuse was furthermore excavated from 1929 until in the 1940s, in order to make it navigable for large ships (Mooren 1999, 45).

Fig. 4.4 indicates the stretches that have seen severe, high intensity, and moderate, medium intensity, dredging. 'Severe' is taken here to imply intensive gravel extraction in the backswamps, deepening of the gully, and the construction of dams and side-channels, and 'moderate' is taken to mean that only two of these activities took place. In the case of 'low intensity dredging', digging activities were mainly restricted to deepening of the gully. When the rate of dredging is compared to the find distribution of dredging finds, it is clear that the stretches with the highest numbers of finds are all situated in those river stretches that have been heavily dredged. This implies that dredging activities have strongly determined the distribution of river finds. It is remarkable, however, that the western part of the rivers in the central area has hardly yielded any finds, although dredging was also very intensive here (particularly in the harbour of Rotterdam) (fig. 4.4). This need not reflect a prehistoric reality: in the Meuse valley, and in the eastern part of the central river area the river has always flowed in a relatively small narrow valley, because its bed is confined by higher terraces or ridges. More to the west, such confining ridges do not exist, and the river could shift its course much easier there. The river area is indeed much broader here than it is in the east (near Lobith and Nijmegen) or in the Meuse valley (province of Limburg). This implies that chances are higher for dredging in the eastern part, or in the Meuse valley to yield sediment of the Bronze Age river-bed, whilst they are lower in the western part.

Dredging intensity and the lateral extension of river sediment are not the only factors, however. This becomes particularly clear in the case of the stretch of the Meuse in Limburg between Maasbracht and Borgharen, which constitutes the border between Belgium and the Netherlands. Although severe gravel extraction took place on either side, only a few are known from the Belgian side, whereas 84 reliable finds are recorded for the Dutch side. This must relate to the active interest of collectors and amateur archaeologists monitoring the dredging activities on the Dutch side. Many finds recovered in the Belgian side of the Meuse are known to have been sold to dealers, without ever being recorded by archaeologists (personal communication J. Butler). An additional problem is that a systematic and thorough survey of Belgian amateur archaeologists comparable to the one done by Butler since the 1960s has not yet taken place. Such a survey was impossible to carry out within the present research. Without any doubt, we are dealing with a serious gap in the evidence.[10]

In sum, the distribution map of river finds is strongly determined by the intensity of dredging activities and their monitoring by amateurs. Another distorting factor is that dredging, by its very nature, is an excavation method that precludes any way of establishing the stratigraphical position of objects. Objects of other materials, that may have a relation to the deposited bronze objects, are therefore often not even recognized as such. It should also be realized that dependent on the size of the sieve used, many small bronzes are lost or remain unrecognised. Nevertheless, small object finds like tiny needles have been found.

Conclusion
The *essen* zones largely explain the blank spots on the find distribution map. The reclamation history of the loess zone and the lack of covering sediment may explain why this zone is poor in bronze finds, except for the find-rich peat areas that were reclaimed in the late 19th /early 20th century. The

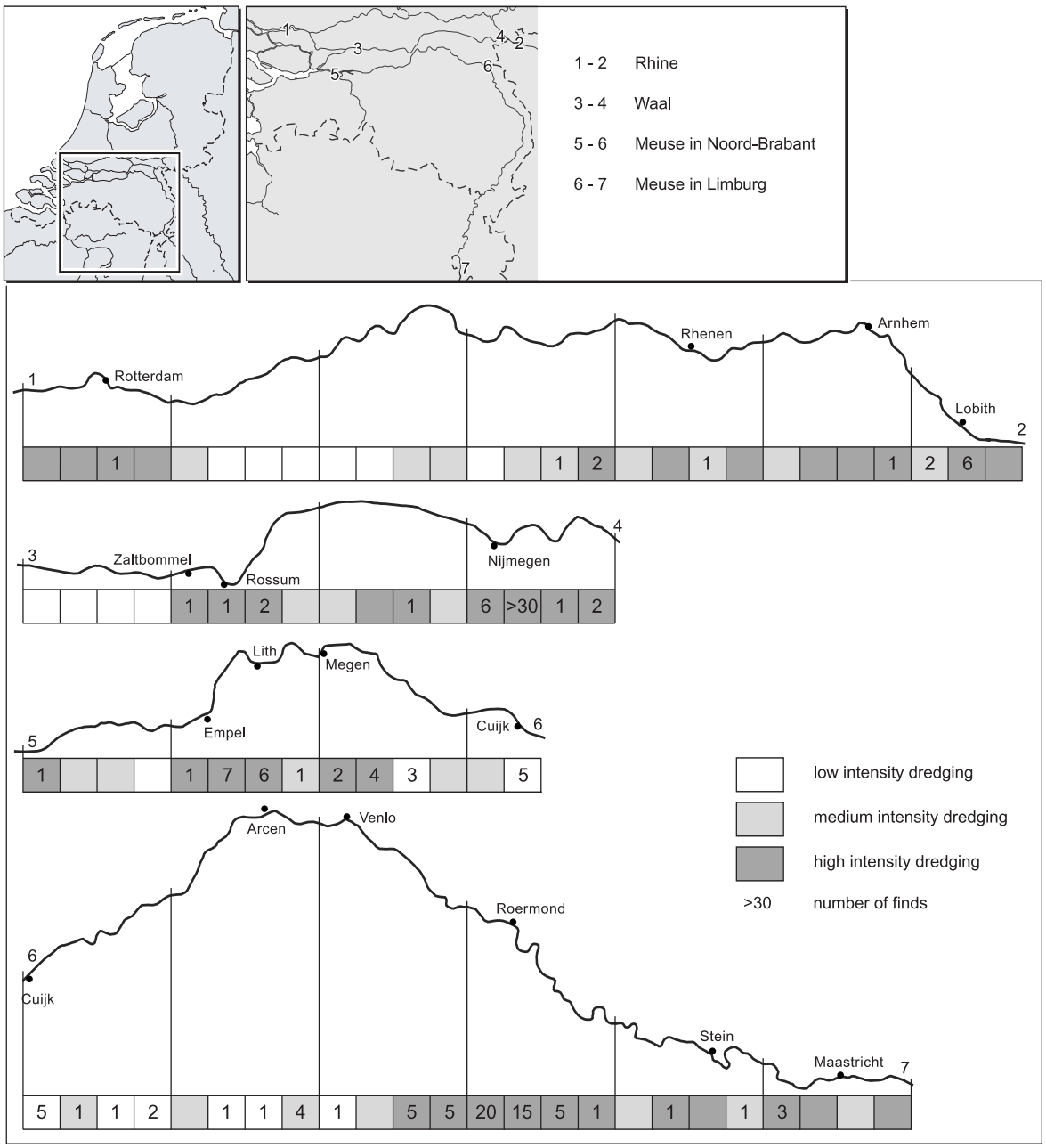

Figure 4.4 The relation between dredge finds in the major rivers and the intensity of dredging.

largest and youngest peat reclamation is that of the Peel bog. This bog, however, has hardly yielded any bronze finds. Find circumstances were generally unfavourable and they may well explain this scarcity of finds. On the other hand, the few finds recovered, among which a sword, are from an area where find circumstances were relatively better.

4.5 Explaining presence and absence of finds: research factors

Above, reference has been made several times to the crucial role of amateurs and laymen in finding bronze objects. Fokkens (1998a) has already worked out in detail how amateur finds influence and determine the existing find distribution maps in general. For the present research, their role is even more important, as amateur and laymen finds make up for 67 % of the total of finds. The following aspects are relevant:

1 The interest of the finder for metal finds, and his or her knowledge of the material. Amateurs have varying interests; some only collect flint and never pick up shards (see Fokkens 1998a, note 25). In general, amateurs and laymen have a high appreciation of metal finds, so this factor is of lesser relevance. An important factor, however, is their knowledge of the material. Small finds, in general objects like undecorated rings and needles, tend to be under-represented, as they are often believed to be modern. Even large finds, like rapiers, are often not recognized as such. The rapier from Den Dungen, for example, was considered to be a useful tool for papering rooms, something for which it also was subsequently used by the finder.
2 The use of metal-detectors. Since the 1980s, the use of metal-detectors has increased enormously. In general, this led to the finding and recognizing of more smaller objects, that formerly remained unnoticed. Most metal-detector collections I have seen indeed consist of an array of all sorts of small metal items. Unfortunately, it is not possible to map the use of metal-detectors in any detail. The central river area is known to be one of the areas in our region that is very intensively surveyed by metal-detectorists because of the high number of metal-yielding sites from the Roman Period. This makes the low numbers of Bronze Age metalwork stand out as remarkable. I know of fewer metal-detector activities from the western part of Noord-Brabant and Dutch southern Limburg, and of hardly any from the Belgian part of the region. This probably does not imply that metal-detecting does not take place there, but rather that people working there do not have much contact with archaeological authorities and amateur groups.
3 The existence of areas within the region that have witnessed a long history of amateur surveys has already been touched upon. Of these, the following micro-regions have yielded high numbers of bronze finds: the Roerstreek near Roermond, the Kempen in southeast Noord-Brabant, and the area around the city of Nijmegen.
4 The relationship between finders and archaeological authorities and museums. As already mentioned, this factor is particularly acute in the case of metal-detectorists, who are very often only known in circles that are out of touch with those authorities. This factor largely explains the considerably smaller number of recent finds from the Belgian area as opposed to the Dutch one.
5 Of great importance is the accuracy with which the finder recorded the find circumstances, or at least the locality where it was found. For 69 % of the finds, there is more information on find-spot than just the name of the municipality where it was found. This is largely due to the work of individual museums (particularly the RMO), the numerous visits paid by dr. J. Butler to the original finders and some provincial archaeologists who had close contacts with the finders. In particular, the former provincial archaeologist of Noord-Brabant, the late G. Beex, should be mentioned here.

4.6 Conclusion: which set of data is informative on selective deposition?

Having seen the impact of post-depositional disturbances, it is now necessary to evaluate the limitations and the potential of the database. I shall begin by dealing with the question whether we can read the find distribution map as indicative of differences in the rate in which ritual deposition was practised among different communities of the southern Netherlands. For most areas it has been shown that people lived there in the Bronze Age. Does the small number of bronze finds of finds in, for example, the western part of the study region imply that bronze deposition hardly took place there? Next, I shall deal with the crucial question on contexts. In which contexts should the lack of evidence on bronzes be taken as evidence of absence? In other words: on which set of data should we base our comparisons?

In what way is the find distribution map indicative of differences in the rate at which bronze deposition took place?

Although we are in no position to model the find distribution quantitatively as done by Fokkens (1998a), we can get a good impression of the impact of post-depositional processes by looking at the richest micro-regions in the study area: why are they so rich? A look at the map immediately shows that the Dutch-Belgian border has consequences for the numbers of finds outside rivers and stream valleys. In the Netherlands, we see that bronzes are fairly often found in between stream valleys (province of Noord-Brabant and Dutch Limburg). However, crossing the border, we have

hardly any evidence for such finds in Belgium. We see the same when focussing on the dredge finds. The river Meuse constitutes the Dutch-Belgian border, and is equally intensively dredged on either side. On the Belgian side, the number of finds is much lower than on the Dutch side, however. Still we are talking here about the same river, and similar processes of disturbance by dredging. The inevitable conclusion must be that it reflects the quintessential role of amateurs and the degree of contact between amateurs and 'professional' archaeologists. In the Netherlands, amateur archaeology has of old been much more organized and cooperative towards 'professional' authorities. This alone shows that our find distribution map is to an important degree the artefact of research factors.

A look at the map shows that the area with the highest number of bronze finds is the area around Nijmegen and Roermond. Both micro-regions are characterized by a combination of favourable preservation and research conditions. The major rivers in both are among the most intensively dredged ones in the entire region. Also, they are both characterized by a long-standing history of amateur surveys (since the early 19th century). Peat reclamations in the Roermond area (the Roerstreek) and the construction of new building sites in Nijmegen have received ample attention from local historical circles and/or museums.

Still, the richness of these micro-regions cannot solely be explained by such favorable conditions. Similar conditions existed for example in the Maaskant area: the river is intensively dredged and monitored by amateurs and archaeologists (Ter Schegget 1999), and the inland area has also seen intensive surveying by amateurs. The area around Oss has even witnessed the most extensive excavations ever carried out in the Netherlands.[11] The excavations have yielded evidence of many Bronze Age settlement terrains, and even traces for bronze production itself (the clay mould from Oss-Horzak; chapter 7). The use of metal-detectors is standard practice at such excavations, as illustrated by the many finds of (Roman) bronzes (Wesselingh 2000 for examples). Bronze Age metalwork is also known, but not in the quantities we know from the *Roerstreek* or Nijmegen. Within a rectangular area of 130 km^2, including most excavations in the Oss/Berghem-micro-region and the Roerstreek, only six bronze finds are recorded from Oss, but 48 from the Roerstreek.[12]

In sum: the find distribution map is to an important extent the product of post-depositional factors, but it is difficult to assess how far their impact stretches. It is clear that it is much to simple to see a find-rich micro-region as straightforwardly reflecting an exceptionally rich depositional tradition. Only for micro-regions with very favourable find conditions like Oss, Nijmegen, or Roermond, a comparison of absence or presence of bronzes may reflect a prehistoric reality. Even then a more thorough assessment of map formation processes is needed. Therefore, I shall refrain as much as possible from making such comparisons.

In which contexts does the absence of evidence indicate evidence of absence?

For the present research, the issue is not about questions like: in what way is our information on different micro-regions within the southern Netherlands comparable? Can core regions be recognized? Rather, our question is: how are we able to recognize patterns in depositional practices that are the result of selective deposition rather than selective preservation?

It was argued that there are two factors that make bronzes from wet contexts potentially better represented in the archaeological record than those from dry contexts. The first is the impact of geochemical decay, which is higher in dry contexts. The second is that dry contexts often represent those parts of the landscape that have been agricultural fields for centuries, and that the archaeological record on such contexts therefore is more biased because of ploughing. I have also presented arguments to nuance this distinction, making it clear that many bronze finds have still survived geochemical decay and ploughing on dry locations, but of course we can never know about the numbers of objects that have been ploughed out or corroded without leaving any trace. Therefore, we need better control contexts where we can be sure that the absence of certain types of bronze objects, or of bronze at all, represents a prehistoric depositional reality. Such contexts are not abundantly available, but they do exist. The following contexts can be distinguished.

1 *Barrow or urnfield graves* that have been professionally excavated. The southern Netherlands are rich in both barrows and urnfields. Some 225 barrows are known, almost all of them excavated, and some 85 urnfields.[13] Both comprise numerous graves, often containing cremation remains. On the heath areas of the sandy part of the region, many barrows and urnfields have never been levelled. Although some saw plundering or unprofessional excavation, the number of professionally excavated graves is high enough to state that they are representative of the general burial ritual. Although such contexts are dry ones, and hence potentially represent less favourable geochemical conditions, bronze objects have been found in some numbers there, particularly in urnfields (chapter 8). Even if bronze objects were badly preserved (as for example in the case of the barrow of Goirle; chapter 7), they were still recognizable as bronze items in a grave. When such barrows were excavated, this was never done with machines, and the emphasis was on finding things for dating the grave. The high number of graves excavated and the absence of bronzes in graves can thus in general be assumed to represent a prehistoric reality.

2 *Excavated settlement terrains, or other sites where there is evidence that Bronze Age activities took place*. These sites can only serve as an argument if bronze finds could potentially have been preserved there, and if systematic metal-detecting took place. Not all excavated sites meet these criteria, but the numerous recent large-scale excavations in the central river area (the Betuwe) do. As a matter of fact, bronze items have been found here repeatedly. I shall come back to the value of such sites for the present research in chapter 7.
3 *Several types of wet contexts, for example inland swamps versus rivers*. Rich wet find-contexts of different types can also be compared. In Limburg, the contrast between the find-rich inland marshes on the terraces are a context that can be compared to the rich river trajectory from the adjacent Meuse. In dredging, large objects are much easier to find than small objects like pins or ornaments however. In late 19th century manual peat-cutting, as it was practised on the terrace marshes, smaller items stand a better chance of being discovered. The reverse is not true, however: that more than ten swords have been found during dredging in the Meuse near Roermond, while only one was found in the adjacent marshes of Echt on the land (that yielded dozens of smaller bronze tools), is more likely to be explained by selective deposition, since it would be rather odd if peat-cutters overlooked an object as large as a sword.
4 G*eneral find patterns from metal-detector finds*. The last example is the most problematic one. As already said, we are badly informed about the practices of metal-detectorists. It is known, however, that many work in the Kempen area and in the central river area. In both cases, they brought numerous bronzes to light. It is quite remarkable, though, that dozens of bronze swords are known from the major rivers, but so far not one from the intensively detected areas of the central river area outside the rivers themselves and the Kempen. The implication of this is that swords apparently are absent from areas outside the rivers themselves. As our knowledge on metal-detectorists is biased, I shall not use their surveys as an argument any further, but it should be remarked that more detailed investigation of their work is badly needed.

notes

1 These comprise Butler 1963 (general survey); 1987 (French and British imports); 1990 (Early Bronze Age and Middle Bronze Age hoards); 1995/1996 (flat and flanged axes) and Butler/Steegstra 1997/1998 (palstaves). In a number of publications Warmenbol published the finds recovered in and around the city of Antwerpen (1983; 1984a, b; 1987a, b, d; 1991).

2 For the Late Neolithic B and Early Bronze Age, there are sufficient metallurgical analyses to differentiate between copper and bronze objects. For the later periods such analyses are lacking. In line with what has been observed for most parts of Europe at this time, it is assumed that these are all bronze alloys.

3 It should be remarked here that only a sample of urnfield bronzes has been studied. The total number of urnfield bronzes stored in museums and amateur collections is as yet unknown (chapter 9). Since most metalwork finds from urnfield context are incomplete, it is difficult to assess how one should qunatify these finds (in this case every fragment was considered to represent one individual object).

4 Verlaeckt (1996) was concerned with the accuracy with which the original find spot could be retrieved. ‘Found in the river Waal at De Winseling near Nijmegen’ would in his approach rank higher than ‘found in the river Waal near Nijmegen’. For the present research, however, both inform us of the fact that an object was found in a river near Nijmegen’. Depending on the reliability of this, and whether the spot was originally wet, they both inform us on objects deposited in rivers. For my purposes, the more detailed find information is welcome, but not vital.

5 This category both includes very old find reports (for example, the discovery of the Wageningen hoard in the 1840s) and modern metal-detectorist surveys. What matters here is the reliability of the report, and what I see as uniting these examples is that in both cases no clear commercial intentions seem to have influenced the find report. This contrary to what might be expected in the case of antique dealers. There is no compelling reason to see an old layman’s find report as less reliable than a recent one.

6 The same goes for the colluvial deposits on the loess belt in southern Limburg, and the driftsand sediment in Noord-Brabant. On a regional scale, however, their impact is limited. For that reason, drift-sand areas and colluvial deposits are not included on the maps here.

7 For example, the socketed axe found during the excavations on Nijmegen-Kops Plateau was deposited in the dry sediment of an ice-pushed ridge. Apart from green oxidation of the surface, the axe was in excellent condition. Geochemical processes, however, can lead to differentiated preservation of objects of other materials that may have been deposited with the metal object. In peat bogs, wooden or leather objects are preserved, whereas porous stones and the coarse-tempered Middle Bronze Age pottery will fall apart under such conditions (Fokkens 1998a, 69). In dry conditions, such stone objects and such pottery stand a much better chance of preservation, whereas the organic objects will dissappear without a trace.

8 Suetonius: life of Galba, in: *The lives of the Caesars, book VII: VIII*. ‘ Non multo post in Cantabriae lacum fulmen decidit repertaeque sunt duodecim secures, haud ambiguum summae imperii signum’ (Not long after this lightning struck a lake of Cantabria and twelve axes were found there, an unmistakable token of supreme power). Translated by J.C. Rolfe, in Loeb Classical Library 38.

9 The Rosnoën-like sword from Kronenberg, a spearhead now lost from the same area, a palstave and a socketed axe from Volkel, a palstave provenanced ‘Peel’ and, less reliable, a spearhead from Liessel. The Late Bronze Age Deurne hoard (3 objects; chapter 8) and the ornament and palstave from Deurne-Klein Kasteel are located on the fringes of the Peel bog (chapter 7).

10 The precise methods of dredging used also have consequences. The way in which the sediment is sieved is vital. On modern, large ships the processing of sediment can take place at such a high speed that it is almost impossible to detect artefacts among it. Many smaller dredging ships have a system of conveyor belts where sediment can relatively easily be sorted out for artefacts.

11 Fokkens 1996; Fokkens/Jansen 2002; Schinkel 1998; Wesselingh 2000.

12 A north-south/west-east oriented rectangular area was chosen, including the most intensively surveyed/excavated areas within the micro-regions. For Oss, the coordinates of the north-west corner are 160/425, the south-east corner 170/412. For the Roerstreek, the corners have the following coordinates 190/350 and 200/337.

13 Barrows: Theunissen 1999, 47 plus newly discovered barrows. Urnfields: Roymans 1991.