

A crowded peat area: observations in Vlaardingen-West and the Iron Age habitation of southern Midden-Delfland

The discovery of dozens of settlement sites in a small area in Vlaardingen-West serves as the starting-point for a calculation of the Iron Age population density in the peat area adjacent to the northern bank of the Meuse estuary. It appears that, during the 3rd-2nd century BC, this region was certainly no less intensively inhabited than any other ecological zone in the Netherlands. Some microregions probably contained 4-5 farmsteads, that is 25-35 persons, per km². This outcome creates a picture of well-drained raised bogs which were attractive living areas for communities with a mixed farming economy.

1. Introduction

In the triangle between the towns of Delft, Rotterdam and Maassluis lies the 'green zone' of Midden-Delfland (fig. 1). Since 1987 a land redevelopment programme has been, and continues to be, carried out in this buffer area. This entails activities such as the planting of forests, the construction of lakes and other recreational schemes, as well as the construction of roads, parcellation works, *etc.* Less conspicuous, but equally threatening in the case of archaeological sites with organic materials, is the lowering of the groundwater table.

In 1981, when the redevelopment programme was still in its planning phase, E.J. Bult was charged to make an inventory and evaluate the findspots in the area to be developed. By means of a field survey, the number of findspots known was increased from 75 to 316 within one year (Bult 1983). Most of these findspots could be classified as habitation sites, dating from the Iron Age, the Roman period and the Late Middle Ages. Other findspots only produced isolated finds from these same periods. Most of the 27 possible, probable and certain sites from the Iron Age were located on peat in the southern sector of the area, called Lickebaert. After a supplementary prospection on threatened, potentially valuable sites (Van der Gaauw 1988), the decision was made to investigate only a selection of sites. The Committee for the Reconstruction of Midden-Delfland guaranteed the finances for the archaeological fieldwork.¹

A significant detail was the agreement that fieldwork would also include watching briefs on the ground work of the development activities as they progressed. This was

especially meant to ensure that observations were made and finds collected at sites which would not be excavated.

In 1988 the financed excavation programme started in the Foppenspolder, municipality of Maasland (Abbink 1989). From 1989 on, the ground works were also followed.

This article gives a preliminary overview of the unexpected results of the archaeological observations in a recreation area in Vlaardingen-West. The Iron Age findspots are then subsequently reviewed separately. These serve as a starting point for a tentative calculation of the population density in the peat area during this period.

First of all, in order to gain a better understanding of the make up of the former landscape, a brief description of the geological evolution and stratigraphy of the area in question will be given. Together with the information on the nature of the ground works, the geological data enable the reader to get an impression of the find circumstances and the possibilities for observing remains dating from the Neolithic up to recent times.

2. Geology

2.1 CALAIS IV - DUNKIRK 0

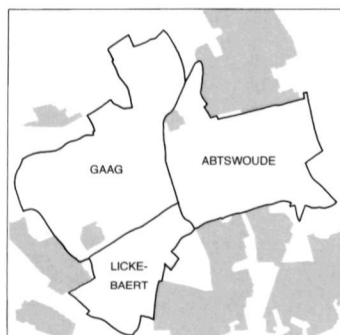
The north-western half of Midden-Delfland is dominated by mud-flat deposits, which for a substantial part lie on top of Dunkirk 0 channel deposits. In the remaining part of the region these elements are also represented, but there peat predominates at or just below the surface. Most Iron Age settlements have been discovered in the southern part of this peat area, in the municipalities of Maasland, Vlaardingen and Schiedam. This peat extends beyond the boundaries of Midden-Delfland, into the predominantly built-up areas of the latter two municipalities. This region will subsequently be referred to as 'the southern peat area'. It broadly covers a strip of 5 km along the northern bank of the Nieuwe Waterweg, the former Meuse estuary.

The general archaeological-geological picture of Midden-Delfland has been filled in by Hallewas and Van Regteren Altena (1979), Bult (1983) and — especially for the Iron Age — Van Heeringen (1992). The large number of observations made during the recent excavation and the ground work programmes have further improved the knowledge of the southern peat area considerably,

Figure 1a. Midden-Delfland with polder-division.



Figure 1b. The sub-regions of Midden-Delfland.



especially in Vlaardingen-West. In addition, borings have also contributed to this knowledge.²

The landscape of which the area shown in figure 2 forms the core, is dominated by Holland peat. During the transgression period Calais IVa, a tidal creek meandered through the swampy landscape from the north to the Meuse estuary. In 1958 the eponymous site of the Vlaardingen Culture was discovered on its high levees, in the now built-up part of Vlaardingen-West (for geology see esp. Van Regteren Altena *et al.* 1962, 23 ff.). During the recent construction of the golf-course Schinkelshoek, this creek was cut at several places. Another Vlaardingen Culture settlement came to light on one of the levees, only 0.6 m below the modern surface (fig. 2, location A). Other locations along the creek produced isolated finds of the same age (Van den Broeke *et al.* 1992; Heinsbroek 1992; Moree 1991).

A clay deposit ascribed to the Calais IVb period hardly exceeds the aforementioned creek. The growth of the Holland peat in Midden-Delfland was only really interrupted again during the Dunkirk 0 transgression period.

Starting from the Meuse estuary the peat was eroded by a maze of channels and creeks. They were filled up with sand, silt and clay. The area in Vlaardingen-West appeared to contain a system of massive and smaller creeks dating to the same Dunkirk 0 period. Because of the scale of an earlier geological/pedological survey, the majority of these do not appear on the map (fig. 2).

A significant feature of the Dunkirk 0 period was that the filling of the Calais creek in Vlaardingen-West, then in a state of advanced peat growth, was recut. Subsequently, both this creek and the majority of the new channels and creeks were silted up, completely or nearly completely, during this same transgression period. In addition, two clay layers were deposited over extensive areas of the southern peat region, usually separated by some dm of reed peat.³ In the study area of Vlaardingen-West and its northerly surroundings, the youngest of these two clay layers, usually 1-2 dm thick, is present within a depth of 1 m below the surface. C14 dates of *c.* 2960 BP from the southern peat area indicate that the development of reed peat upon this

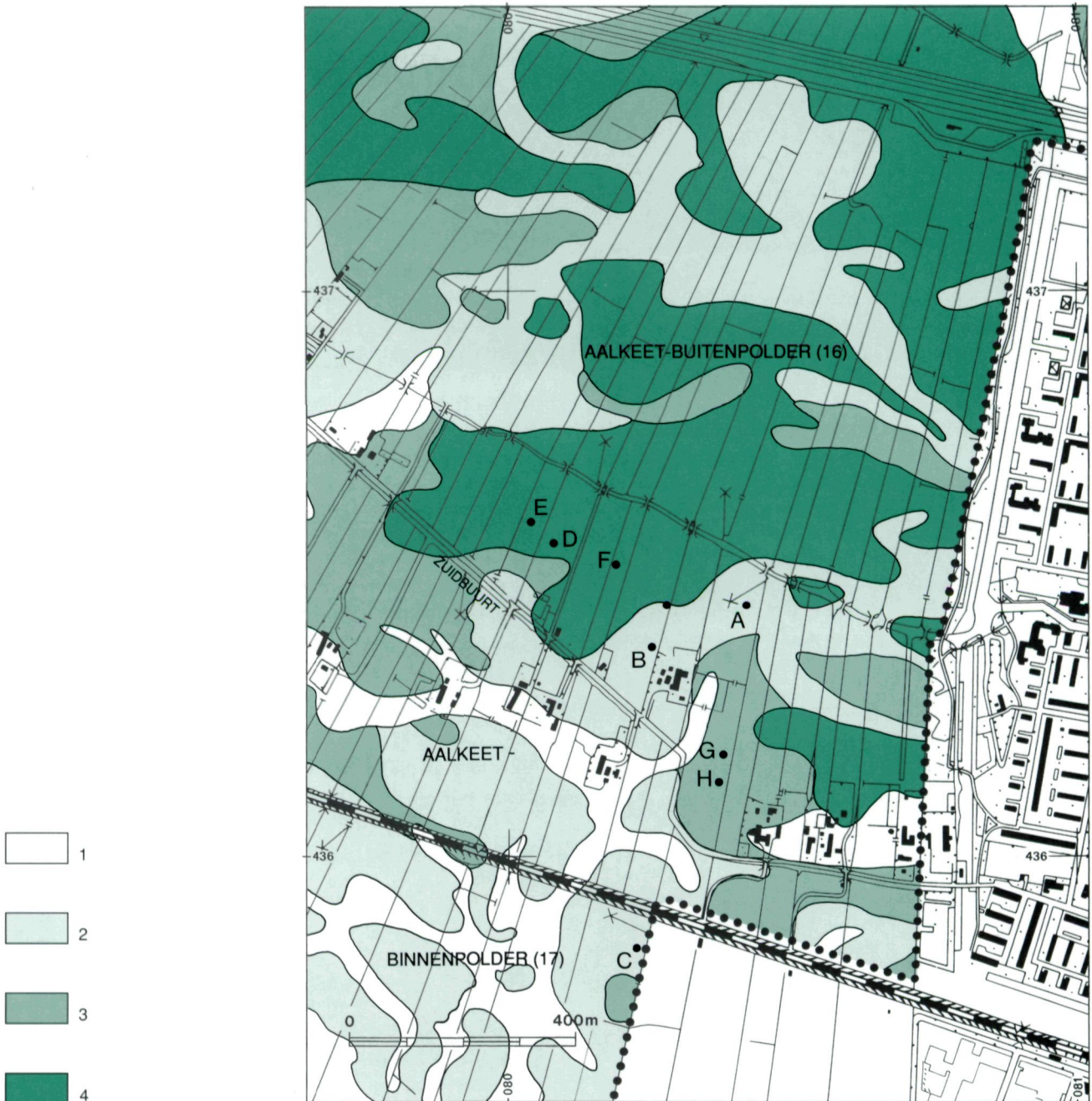


Figure 2. Geological and topographical situation in the study area of Vlaardingen-West around 1982, according to soil map scale 1:10.000 in Pleijter 1982 and archaeological map on geo-genetical basis scale 1:10.000 (documentation E.J. Bult; cf. Bult 1983, map-appendices). Characters indicate locations referred to in the text.

- 1: channel deposits (sandy clay; Dunkirk 0/I), usually with clay cover (Dunkirk I/III)
- 2: creek deposits and mud-flat deposits (heavy clay; Dunkirk 0/I/III, locally Calais IV), thickness more than 80 cm; locally interrupted by peat layer(s)
- 3: mud-flat deposits (Dunkirk I/III), thickness 30/40 – 80 cm, lying on peat
- 4: mud-flat deposits (Dunkirk I/III), thickness <30/40 cm, lying on peat

clay started around 1200 BC (Abbink this volume; Van den Broeke 1992a, note 7; Heinsbroek 1993b). The age of the older Dunkirk 0 clay layer is not yet known.

2.2 AFTER DUNKIRK 0

The subsequent development of the Holland peat gradually resulted in the formation of oligotrophic peat in a large part of Midden-Delfland. These raised bogs, viz. their highest points, were inhabited for the first time in the Early Iron Age. This probably happened in the second half of the 7th century BC. The general opinion is that occupation had become possible due to renewed formation of creeks within the peat area, which improved its natural drainage (*cf.* Van Heeringen 1992, 306). For the concomitant Dunkirk I deposits there are, however, no dates before c. 200 BC for either side of the Meuse estuary.⁴

Except for the Gantel, just north of Midden-Delfland, no notably large channels were formed during the Dunkirk I transgression period, only watercourses of lesser stature. Alternatively, the water and the sediments used the residual channel and creek beds of Dunkirk 0 origin. This was also the case in the study area (*cf.* Heinsbroek 1993a, 1993b).

In the southern part of the Krabbeplas area (fig. 6b), only one creek could be determined to have been flowing during the Iron Age habitation period. A large wooden object, with a C14 date of 2275 ± 35 BP, was discovered lying against its western bank (location B in fig. 2, fig. 4).⁵ This creek was probably connected with the nearby channel and creek system which dominates the Aalkeet-Binnenpolder (fig. 2). This system, too, or at least its greater part, was then open, or reopened.⁶

The mud-flat deposits of Dunkirk I in the southern part of the Aalkeet-Binnenpolder are about 5 dm thick, but wedge out completely at a short distance to the north. In the Krabbeplas area the remains of Early Iron Age date lie on top of the Holland peat bed, at the same level as remains from later Iron Age and Roman period phases (fig. 3, sites 16.75 and 16.42). This also holds for a single medieval findspot, dated to the 11th century (fig. 2, location F).⁷ Only locally have one or more Dunkirk I clay layers been deposited, no more than 1 dm thick.

The clay layer covering Vlaardingeng-West and its surroundings dates from the 12th century. In the area depicted in figure 2, the whole layer was probably deposited around AD 1134 (Dunkirk IIIb1; Bult 1983, 19, 1986, 119 ff.). This date was confirmed during the field observations. Apart from the aforementioned 11th century findspot on peat below the clay cover, two sites were discovered along the Zuidbuurt lying on the spur of a Dunkirk 0/I channel ridge (fig. 2, locations G and H). Pottery from the first half of the 12th century, and possibly from the last quarter of the 11th century (det. E.J. Bult),

was found in humic clay (oxidised peat?) below the upper clay level. In the southern part of the Aalkeet-Binnenpolder the clay cover has a thickness of about 0.5 m. It wedges out in a northerly direction. Near motorway A 20 its thickness reduces to only 0.2-0.3 m.

When describing the geological developments, two processes have remained undiscussed. They represent the effects of water and water management on peat. The youngest process is the compaction and oxidation of the Holland peat that has occurred since the Middle Ages. The peat bed has been much thicker than we perceive nowadays. The fact that the remains from the Early Iron Age are found at the same level as those from the Roman period, does not reflect the original situation. In the Middle Iron Age as well as in the Late Iron Age and after the Early Roman period, considerable peat growth took place in Midden-Delfland (Van Heeringen 1992, fig. 60, group 1). However, local layers of peat, of at best 1 dm thick, are the only demonstrable remains of this process.

The 'decapitation' of the peat bed must be ascribed to the drainage systems which started with the medieval reclamations of the area (*cf.* Bult 1986). The digging of drainage canals and parcellation ditches led to compaction and oxidation in particular. The living proof of this is to be seen in the Vlietlanden, the only part of Midden-Delfland which has not been made into a polder (fig. 1a). It is also the only terrain with peat growth still going on. Probably since the 16th century, its surface has lain at 40 cm below NAP, the reservoir level (*boezempeil*). The surrounding polders lie about 2 m lower. The compaction and oxidation of the peat, moreover, have given way to an inversion of the relief. Because of this, the surface of Midden-Delfland is veined with many channel and creek ridges.

The fact that, despite peat oxidation, a lot of organic settlement remains from the Iron Age have still been preserved, is principally a result of the second geological process to be dealt with. This process could be described in detail after the excavations in Maasland-Foppenspolder (Abbink 1989 and this volume). Therefore, only a brief explanation suffices here.

2.3 DISRUPTION AND INTRUSION CLAY

After, or still during, the Iron Age habitation, which can be traced into the 2nd century BC, drastic geological disturbances did take place. The settlements in the greater part of the southern peat area were under water, or at least affected by a rising groundwater table. On many spots the upper part of the peat bed was torn loose, faulted and lifted, along with everything standing and lying upon it. Other plots of the peat bed were crumbled, folded or otherwise disrupted.

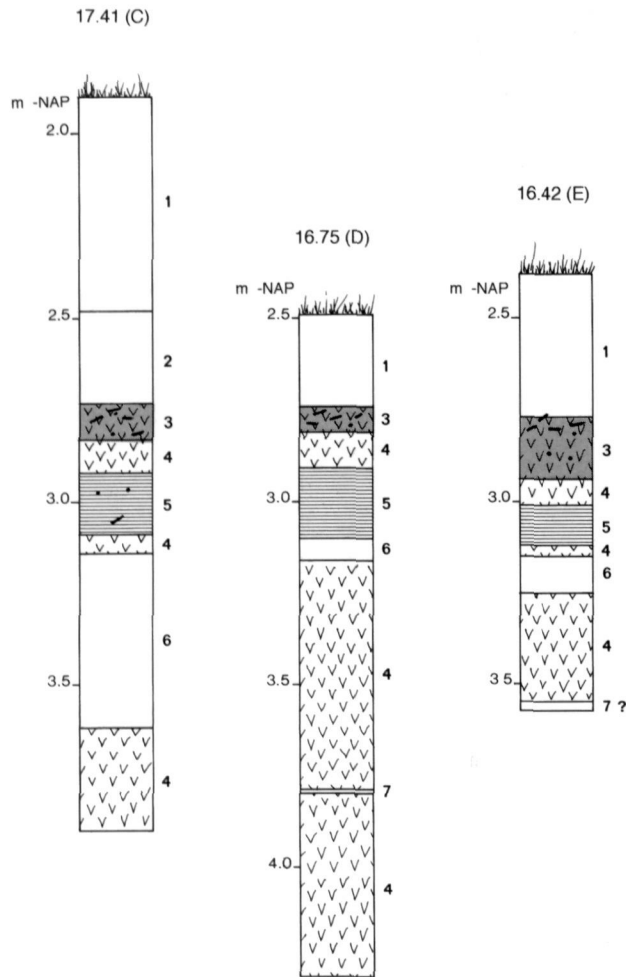


Figure 3. The stratigraphical position of the archaeological remains at some findspots in Vlaardingen-West. Dates of the findspots: 17.41: c. 350 BC; 16.75: c. 600 BC; 16.42: c. 100 AD.
 1: mud-flat deposits, Dunkirk III
 2: mud-flat deposits, Dunkirk I
 3: Holland peat, decomposed; with habitation remains
 4: Holland peat, raw
 5: intrusion clay; with habitation remains
 6: mud-flat deposits Dunkirk 0, late phase (17.41: transition from creek filling to mud-flat deposits)
 7: clay (Dunkirk 0?/intrusion clay?)

After the retreat of the water, the peat 'islands' sunk again. The earlier events, however, betray themselves very clearly by the presence of layers of heavy clay and lenticular deposits between the upper and lower part of the peat bed (fig. 4). These must have been deposited under calm conditions. This intrusion clay usually has the following combination of features:

- sharp transitions to the peat at both the lower and upper edges of the clay layer; sometimes the intrusion clay has been deposited between an older clay layer and the peat above (cf. fig. 3, site 16.75);
- a local irregular course through the profile, occasionally even cutting diagonally through older clay layers;
- changing thickness, ramification;
- absence of plant roots;
- laminated appearance;
- very humic and polluted with twigs, lumps of peat and, at former settlement locations, archaeological materials; these objects, up to the size of beams, have come to rest at a level below the settlement surface due to faulting, turning and erosion from beneath (cf. fig. 3, site 17.41).

Almost everywhere in Vlaardingen-West and its wider surroundings, the peat bed contains deposits of intrusion clay. The dating of these disturbing processes is still problematical. It appears that not only Iron Age settlement sites have suffered, but also several sites from the Roman period (Abbink/Frank 1991b; Ter Brugge 1992b). The rate of disturbance seems, however, to be generally more intense on Iron Age sites. This indicates that we do not have to reckon with a unique event, but with repeated processes, occurring at intervals of possibly decades or even centuries.

Despite the absence of cover deposits from the Dunkirk I transgression period in the greater part of Vlaardingen-West, there thus positively seems to have been lateral clay deposition from the creeks at that time, but in the form of intrusion clay. On one occasion, the origin of such a deposition has been 'caught'. Starting from a creek that lay open during this period, a clay layer wedged into the peat (fig. 5; for location see fig. 2:I). At the intrusion point a groove-decorated Iron Age sherd lay in the intrusion clay (findspot 16.93).

It is still unclear when the processes took place which affected settlements of the Roman period. The latest sites that demonstrably suffered, date from the end of the 1st century AD. There are, however, hardly any younger findspots from the Roman period known on peat.⁸

3. The archaeological investigations in Vlaardingen-West

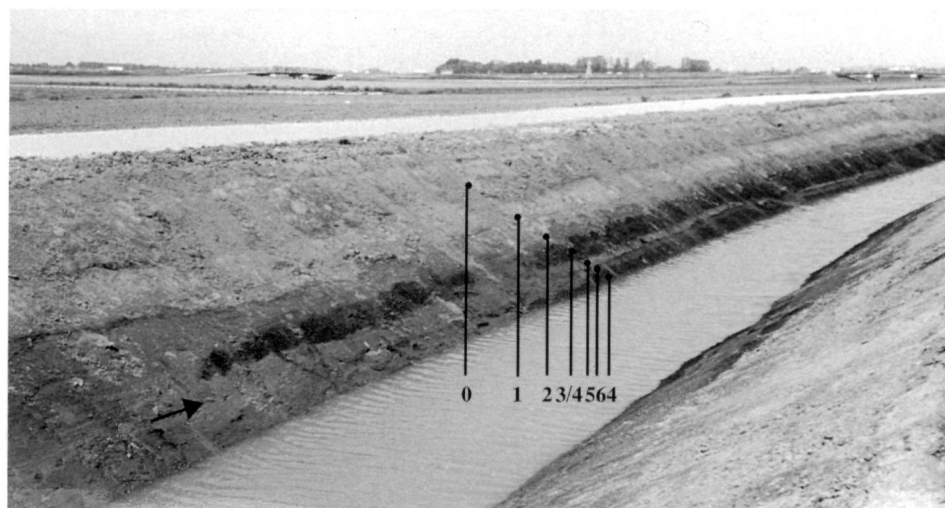
3.1 INTRODUCTION

The original intention of archaeological investigations accompanying the ground work was, that they would lead to supplementary observations and the collection of finds from findspots which had been registered by Bult, but which were not selected for excavation. In practice, however, more new findspots were struck upon than those already registered. Despite its opportunistic nature, this

Figure 4. Overview of the Krabbeplass area in a northern direction, May 1990. The lower part shows 'patches' of intrusion clay in the Holland peat. Its local presence results from the whimsical course of these clay layers, as can be seen in the section behind (1). The habitation remains of Iron Age site 16.76 were found here. Lying on the right (2) an object made of part of a hollowed out tree trunk protrudes from the section. The object rests against the bank of a creek, which was open in the Middle Iron Age (findspot 16.80). The clay covering the Holland peat has been removed from the area behind this section.



Figure 5. Western ditch-slope bordering the golf-course Schinkelshoek, showing a layer of intrusion clay, originating from a channel. This clay has entered the peat (arrow). The upper layer of soil (0) was recently deposited for the development of the golf-course. See figure 3 for the remaining legend.



aspect of the archaeological research in Midden-Delfland produces information of a qualitatively different nature than that from the regular excavation programme. It creates the possibility for:

- the (local) determination of the ratio between the number of sites registered during the earlier field survey and the real number of sites present, in other words: an evaluation of the effectiveness of the survey;
- a tentative determination of the population density in certain micro-regions.

The area of Vlaardingen-West forms the best study area in this respect. Here, in the Aalkeet-Buitenpolder, a recreation area was constructed between 1987 and 1991, the Krabbeplass forming its core (fig. 6b). In the northern part of the Krabbeplass area occasional observations were made by

members of the local archaeological working group Helinium and other interested persons. In 1987, moreover, an excavation was carried out by this group in cooperation with the IPL (Abbink 1988; Ter Brugge 1992b).

From 1989 on, the development works in the southern part of the Krabbeplass area could be intensively accompanied by the present author, helped by several volunteers.⁹

Because the clay cover was mechanically removed, the top of the Holland peat was laid bare. From the foregoing geological description it can be inferred that, at this level, remains from the Early Iron Age up to c. AD 1134 could be documented. In a zone directly east of the southern part of the Krabbeplass this level was reached by ploughing before plantation, which resulted in a comparable findspot density.

The intensive archaeological accompaniment could be continued during the construction of the golf-course Schinkelshoek (fig. 6b). Here the digging of ditches and ornamental water features gave opportunities for archaeological observations. Other discoveries were made while a gas main was being laid, to the north and east of both recreational areas.

In the Aalkeet-Binnenpolder, too, some findspots came to light in the same period. Between the Zuidbuurt and the railway-track many hectares of land were surveyed after ploughing to a depth of *c.* 40 cm. This preceded forest plantation. This ploughing primarily affected the Dunkirk III clay cover; the underlying Dunkirk I deposits were at best only locally affected. Since the Iron Age habitation probably ended before the deposition of the Dunkirk I sediments, only findspots of the Roman period and the Middle Ages might be expected here.

The digging of ditches and borings during the construction of a mud-basin south of the railway-track also led to discoveries (Van den Broeke/Van Zijverden 1993; Heinsbroek 1993a).¹⁰ This basin is only partly covered in figures 6 and 7.¹¹

Until the commencement of the development programme, all the areas described above comprised grazing land and farmsteads.

3.2 RESULTS

The results of the archaeological accompaniment exceeded by far the expectations (figs. 6a, 6b).¹² The discovery of a Middle Neolithic Vlaardingens Culture settlement on a creek levee came fully unexpected, as well as the discovery (by playing children) of a human skeleton from the Middle Bronze Age (Van den Broeke *et al.* 1992, Van den Broeke 1992a resp.).¹³

Concerning the Iron Age and Roman period, the quantity of findspots in particular came as a surprise. Whereas E.J. Bult discovered five Iron Age sites by surveying the ditches, another 22 could be added afterwards. Moreover, the prevailing idea that the peat area of Midden-Delfland had scarcely been inhabited after the Iron Age, appeared to be fallacious: the area outlined in figure 6 produced 16 sites from the Roman period¹⁴, primarily dating from the 1st and the beginning of the 2nd century AD. In addition, some dozens of findspots with isolated finds from both the Iron Age and the Roman period must be mentioned here.¹⁵

The comparisons presented above do not yet allow an objective evaluation of the effectiveness of surveying in grassland. Such a comparison is only expedient in a continuous, unbroken terrain where the maximum possibilities would exist for making observations. A plot of

12 ha in the south-western part of the Krabbeplas area meets this requirement. Here so many groundworks were executed and observations made that, at best, only a few sites from the Iron Age and Roman period can have remained undetected.¹⁶

During the construction of the southern part of the Krabbeplas (an area of more than 6 ha) even almost ideal observation opportunities existed (see above). Both the top of the peat and the underlying intrusion clay gave opportunity to discover mobilia and house remains.

On these 12 ha of land Bult had discovered two sites, both dating to the Iron Age, by surveying ditch-banks (on average, one every 50 m). During the ground works 12 more sites were added, in addition to 6 from the Roman period. Of these last sites 4 were found on the same location as Iron Age remains. In one case this was at an Iron Age site already discovered by Bult (16.24). By merely counting locations, 15 new ones were discovered on the 12 ha plot. This means that during the earlier survey, at least 88% (15/17) of the locations remained undiscovered in the grassland, although it was only covered with a clay layer no more than some decimetres thick.

The modest increase of late medieval sites (6 sites added) can be ascribed to a changed settlement pattern in combination with dissimilar observation opportunities with regard to that period. The late medieval sites primarily lie on or near some east-west oriented channel ridges. The effect is a ribbon-like pattern of medieval house sites, for a great part lying on eye-catching, individual dwelling-mounds (small terps), some of which are still inhabited today. When surveying, Bult had already collected many 12th century and later finds at or just below the surface, which was essentially formed in the 12th century.

As a result of the overwhelming mass of newly-discovered findspots, only a restricted number of sites could be excavated (see Abbink 1988, 1989 [16.32]; Abbink/Frank 1991a, 1991b; Van den Broeke *et al.* 1992). On most of the other findspots the investigations had to be restricted to borings and the collection of finds on the (temporary) surface.

3.3 THE IRON AGE FINDSPOTS

The study of the Iron Age habitation of Midden-Delfland forms part of the research programme of the Institute of Prehistory (see especially Abbink 1993). Within that framework we will now concentrate on the Iron Age data from the aforementioned area, to estimate the population density of the southern peat area during that period. For that reason several basic data are presented in table 1. Besides the observations and finds of the recent archaeological



Figure 6a. Distribution of the sites in Vlaardingen-West after the field survey of Bult in 1982. For legend see figure 6b.



Figure 6b. Distribution of the sites after development works in 1992. Locations of isolated finds not mapped. Star: Middle Bronze Age human skeleton.

- | | | |
|--------------------|--------------------|----------------------|
| ◆ Middle Neolithic | ▲ Roman period | ◻ water (pond, lake) |
| ● Iron Age | ■ Late Middle Ages | ▨ not redeveloped |

investigations the findspots recorded by Bult have also been included. All findspots are indicated in figure 7. Several categories in table 1 deserve an explanation:

Find circumstances

This category primarily has importance for the interpretation of the nature of the findspot. If a modest number of finds has been brought to light on a spot that has only been exposed by profiles or borings, its interpretation as a settlement site is still thought legitimate.

At locations where, after the field observations, a more thorough investigation (viz. including machinery and an excavation-team) has taken place, other observation categories have not been specified.

Position of finds

Finds have generally been collected on top of the Holland peat¹⁷ and from within the intrusion clay below. Fissured occupation layers sloping down into the peat, which are regularly met in excavation trenches, have not been entered separately. They represent former occupation on Holland peat.

Features and finds

For this column categories have been selected which are thought to be the best indicators of settlements. The characteristic hearths (clayey to sandy patches, usually interlarded with layers of charcoal and furnished with a sherd-pavement) play an important part. For that reason they have been entered quantitatively. The same holds for the pottery sherds, entered on the basis of a preliminary inventarisation. The number of potsherds from a findspot have been considered together with the findings and the opportunities for observation, in order to determine the nature of the smaller find assemblages.

At several Iron Age findspots some Roman period pottery (both native and Roman) has been found, as well as late medieval or still later pottery. Considering the find circumstances and the stratigraphic position of these latter remains, this is not at all remarkable. For that reason they have not been entered in table 1. On the other hand, where native-Roman looking pottery seems to be present in significant quantities, intermingled with Iron Age pottery, this has been mentioned separately. It will be self-evident that we cannot be sure in every case that the other categories of finds and features stem exclusively from the Iron Age.

Type of findspot

In principle, an Iron Age settlement, apart from containing one or several farmsteads, may have included pits, field ditches and surrounding parcellation ditches. At least, such a layout of the settlement has been established

for Roman period sites on clay in Midden-Delfland (Van Londen 1992a, 1992b, 1992c) and in a northerly direction, at Rijswijk for example (Bloemers 1978). On peat, on the other hand, pits, ditches *etc.* can only be recognised when deep features have been filled up with clay before oxidation of the peat occurred (*cf.* Van Trierum 1992, fig. 35-2). In other cases we may only expect to retrieve find concentrations as a relict of dug features which were afterwards filled with rubbish. In practice, concentrations of finds in the peat area of Midden-Delfland appear to be restricted to the farmsteads themselves. The majority of finds even stem from the interiors of the farmhouses. Outside these areas, the find density visibly falls off.¹⁸ For this reason we have assumed that, in cases of restricted observation opportunities, even small find concentrations *without visible building-remains* derive from a dwelling place, or at least indicate one in the close vicinity.

Period

Even with small assemblages of finds it is relatively easy to discriminate between pottery from an early Iron Age occupation phase and a later one (see below). This is due to fast developments in the spheres of pottery temper and decoration (fig. 8), as well as to an occupation hiatus. The same features allow a rather sharp distinction between Iron Age pottery and pottery from the Roman period, even if the latter does not include imported Roman pottery. Only the recurring weathering of sherds provides difficulties in determination.

4. The Iron Age habitation

4.1 TOWARDS A MODEL FOR DENSITY CALCULATION

At the end of the 1950's it became clear for the first time that, in the coastal zone, not only the higher, mineral grounds had been occupied in the Iron Age, but also the peat area behind the dune belt. Especially as a result of the intensive investigations carried out on both sides of the Meuse in recent years, it appears that living on peat certainly brought with it some drawbacks: repeated inundations, subsidence and faulting of the living space, a restricted crop assortment and more chance of livestock diseases (see esp. Abbink 1993 this volume; Brinkkemper 1993; Van Heeringen 1992, 303 ff.; Van Trierum 1992; Van Wijngaarden-Bakker 1988). This raises the question of whether the peat area offered advantages which counterbalanced these drawbacks.

Another possibility is that the peat area functioned as a buffer zone in times of insufficient means of subsistence in the surrounding ecological zones, be it due to population growth or by other causes. In the case of the dune belt one may think of factors such as dehydration, sand-drift or scarcity of wood.

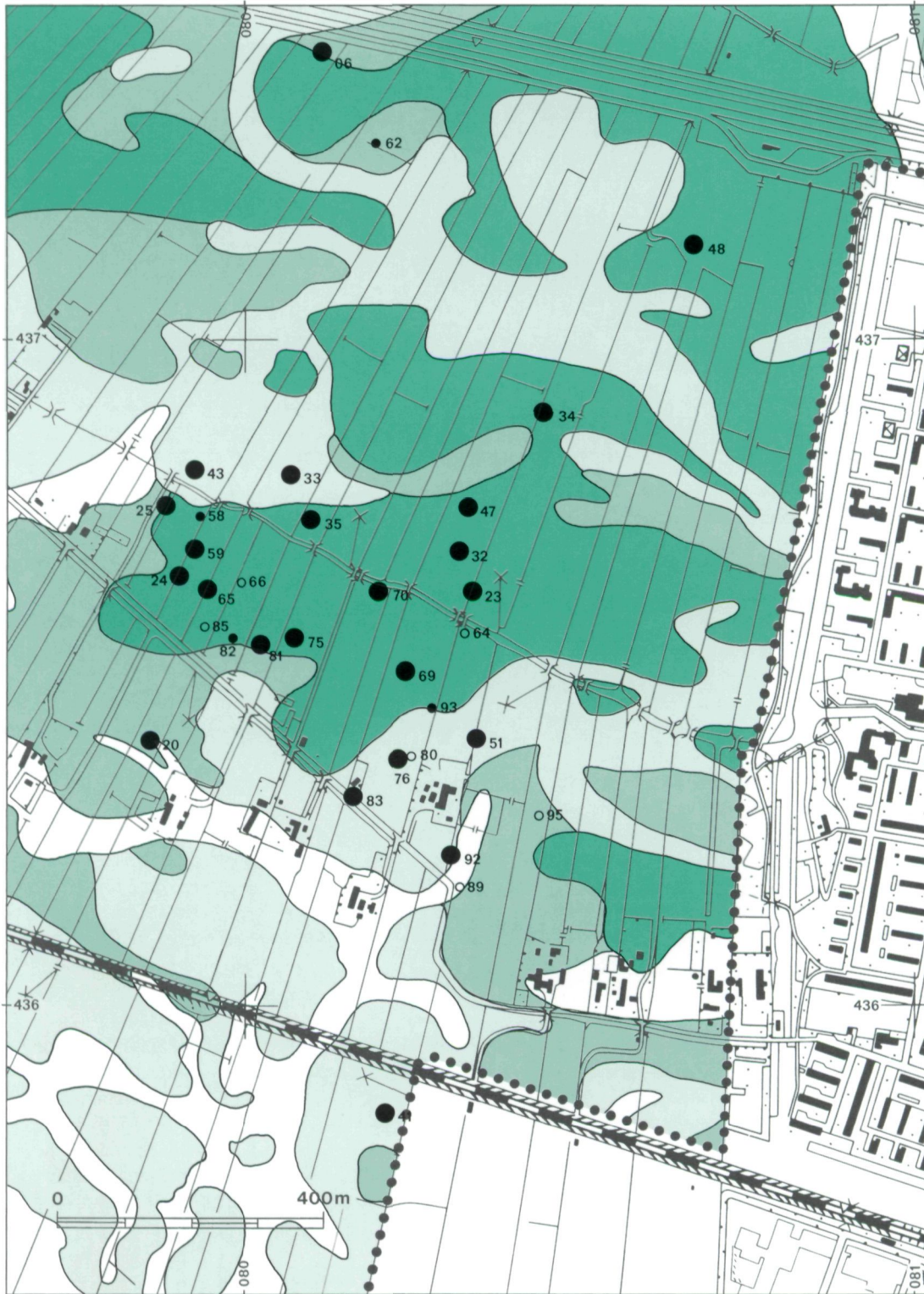


Figure 7. The Iron Age findspots in Vlaardingen-West, plotted on a geological map (for legend see fig. 2).

- certain or probable settlement site ● possible settlement site ○ isolated finds (?)

findspot	coordinates	find circumstances		position of finds	features and finds 1987-1992								type of findspot			period	note	references	
		1987-1992	survey Bult 1981-1982		top of peat intrusion	creek fill	unknown	hearth (n)	wood	charcoal	pottery (n)*	loam	bone/antler	stone	other finds				certain/probable site	possible site	isolated finds (?)
16.06	80.10/437.43	x	x	x	1	.	+	267	+	+	+	+	+	x	.	.	.	x	
16.23	80.35/436.62	x	x	.	.	.	x
16.24	79.91/436.65	x	.	?	.	.	.	.	.	.	.	.	.	x	.	.	.	x
16.25	79.88/436.75	x	.	.	.	.	.	6	.	.	.	.	.	x	.	.	.	x
16.32	80.32/436.69	.	.	.	2	+	+	>3000	+	+	+	+	+	x	.	.	.	x	
16.33	80.05/436.80	.	.	.	2?	+	+	4628	+	+	+	+	+	x	.	.	.	x	
16.34	80.45/436.90	.	.	.	.	.	.	75	+	+	+	+	+	x	.	.	.	x
16.35	80.10/436.72	.	.	.	.	.	.	16	.	.	.	.	.	x	.	.	.	x
16.43	79.92/436.80	.	.	?	.	.	.	21	.	.	.	.	.	x	.	.	.	x
16.47	80.34/436.75	.	.	?	.	.	.	>6	.	.	.	.	.	x	.	.	.	?
16.48	80.67/437.16	.	.	.	1?	.	.	>100	.	.	.	.	.	x	.	.	.	x
16.51	80.36/436.41	.	.	.	.	.	.	>800	+	+	+	+	+	x	.	.	.	x
16.58	79.94/436.72	.	.	.	.	.	.	18*	.	.	.	.	.	x	.	.	.	?
16.59	79.93/436.69	.	.	.	.	.	.	>4000	+	+	+	+	+	x	.	.	.	x
16.62	80.19/437.29	.	.	.	.	.	.	13*	.	.	.	.	.	x	.	.	.	x
16.64	80.33/436.57	.	x	.	.	.	.	2	.	.	.	.	.	x	.	.	.	?
16.65	79.95/436.63	.	.	.	1?	+	+	40*	+	+	+	+	+	x	.	.	.	?	
16.66	80.00/436.63	.	.	.	.	.	.	8	.	.	.	.	.	x	.	.	.	x
16.69	80.25/436.51	.	.	.	.	.	.	384	.	+	+	+	+	x	.	.	.	x
16.70	80.21/436.63	.	.	.	.	.	.	.	.	.	.	.	.	x	.	.	.	x
16.75	80.07/436.56	.	.	.	.	.	.	68	.	+	+	+	+	x	.	.	.	x
16.76	80.23/436.38	.	.	.	.	.	.	869	+	+	+	+	+	x	.	.	.	x
16.80	80.25/436.39	.	.	.	2?	+	+	1207	+	+	+	+	+	x	.	.	.	x	
16.81	80.03/436.54	.	.	.	.	.	.	32	.	+	+	+	+	x	.	.	.	x
16.82	79.98/436.55	.	.	.	.	.	.	16	.	.	.	.	.	x	.	.	.	x
16.83	80.18/436.32	.	x	.	.	.	.	10	.	.	.	.	.	x	.	.	.	x
16.85	79.94/436.57	.	x	.	.	.	.	12	.	.	.	.	.	x	.	.	.	?
16.89	80.33/436.18	.	x	.	.	.	.	506*	.	.	.	.	.	x	.	.	.	x
16.92	80.32/436.23	.	.	.	.	.	.	16	.	.	.	.	.	x	.	.	.	x
16.93	80.29/436.45	.	.	.	.	.	.	24	+	+	+	+	+	x	.	.	.	x
16.95	80.45/436.29	.	.	.	.	.	.	2	.	.	.	.	.	x	.	.	.	x
17.20	79.87/436.39	x	.	.	.	.	.	3	.	.	.	.	.	x	.	.	.	?
17.41	80.23/435.84	.	.	.	.	.	.	3	.	.	.	.	.	x	.	.	.	x
		.	.	.	.	.	.	209	.	+	+	+	+	x	.	.	.	x

Table 1. (opposite) Summary of the Iron Age finds in Vlaardingen-West (cf. fig. 7). * = Roman native pottery included.

a. The finds discovered by Bult on this location, which have been published by Van Heeringen (1992), no doubt derive from a Middle or Late Iron Age site. The settlement that was excavated here in 1990, however, dates from the Roman period (Abbink/Frank 1991b). Because the original findspot (ditch) formed the eastern limit of the native-Roman settlement excavation, it may be supposed that the older settlement was situated on the other side of the ditch. **b.** In addition, floor remains and ashes were identified. **c.** This site was certainly inhabited in the 1st century AD after an earlier occupation on the same spot. A C14 sample taken from a hearth foundation consisting of twigs gave 2265 ± 25 BP (GrN-20569). **d.** Findspot 16.60 was later joined to this site. **e.** Animal dung observed within the intrusion clay. **f.** Pottery from the intrusion clay definitely dating to the Iron Age; the hearth is probably also of the same date. **g.** Two find concentrations with an interspace of some 20 m. **h.** Number of pottery sherds corrected with regard to Van den Broeke 1991, 333. **i.** Found in dug-out soil deriving from the creek fill, or from covering or adjacent deposits: upper part of human cranium (sub-adult; det. M.L.P. Hoogland, Archaeological Centre Leiden). C14 date: 2190 ± 60 BP (GrA-799). **j.** Displaced finds from the Iron Age and Roman period.]

Before being able to answer the question why the peat area was colonised, we should at least have an impression of the population density in the relative regions. The first steps in this direction have been taken by Van Heeringen (1992, 311 ff.). His estimations did, however, start with the assumption that the documented sites rendered a complete coverage of the habitation.

For a calculation of the population density in the peat area north of the Meuse estuary, the recently obtained data from Vlaardingen-West create a better starting-point. This especially holds for the aforementioned area of 12 ha, which will henceforth be referred to as 'Krabbeplas-south'.

The fact that only one of the encompassing sites has been adequately investigated (16.59; cf. Abbink/Frank 1991a), however, makes it difficult to state all elements in the calculations as exactly as desired. A particularly obscure element is the number of buildings or building phases (i.e. the complete rebuilding of a farmstead) present on one site. In total, four elements have to be taken into consideration:

1. the overall length of the habitation;
2. the number of farmsteads on a site;
3. the lifespan of a farmstead;
4. the number of inhabitants of a farmstead.

4.1.1 *Length of the habitation*

If the total of twelve certain and probable sites would have to be distributed evenly over the eight centuries of the Iron Age, the result would be an extremely thin population scatter. On the contrary, however, the evidence suggests that a varying pattern of presence can be outlined. This holds for the whole peat area directly north of the Meuse estuary. By this area we mean not only a great part of Midden-Delfland, but also the adjoining south-eastern region, which now for the most part lies in the outskirts of Vlaardingen and Schiedam.

No more than three sites date from the first colonisation phase of the peat area, between c. 650 and 550 BC. One of these early sites lies at Krabbeplas-south (16.75).¹⁹ There then follows an occupation hiatus of some two centuries, just like in the other peat areas of the western Netherlands. This hiatus coincides with a phase of wetter conditions and peat growth. It is remarkable that only a few habitation traces from the dune belt are known from this same time span (Van Heeringen 1992, 303 ff.).

Apart from the three Early Iron Age sites, all datable findspots on the peat north of the Meuse estuary can be ascribed to a time span of two and a half centuries at most. The earliest one in this series is site 17.41, lying in the Aalkeet-Binnenpolder (fig. 7). Its pottery shows some characteristics which distinguish it from the other pottery assemblages of reasonable size from this second occupation phase (fig. 8): a substantial proportion of roughened

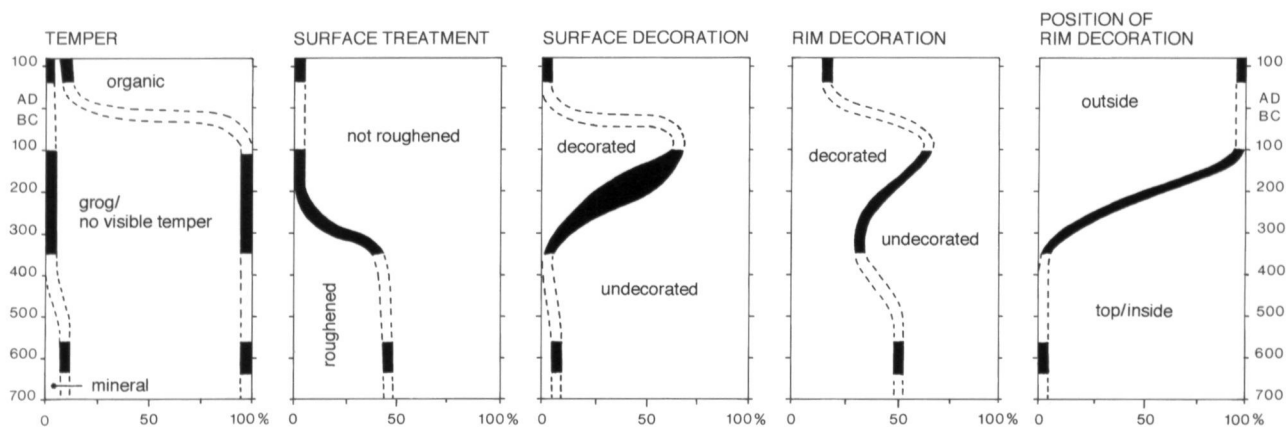


Figure 8. Schematic representation of the developments in the frequency distributions of some pottery characteristics in the peat area of southern Midden-Delfland and immediate surroundings. Based on sherd counts (Van Heeringen 1992 and author's documentation). The suggested continuity in pottery traditions around the 1st century BC is strictly hypothetical.

(*bismeten*) pottery, a low percentage of wall decoration, and the absence of decoration on the outer side of the rim.

The absolute date must provisionally be determined by means of comparable pottery from Spijkensisse (findspot 10-28), in the peat area south of the Meuse estuary (Van Trierum 1986, esp. fig. 30: 1-16). For this (single phase?) settlement three C14 dates are available (Van Trierum 1992, 61). After calibration²⁰, the combined dates point to the middle of the 4th century BC. The C14 date of 2220 ± 25 BP (GrN-20531) from a charred branch from site 17.41 itself gives a timespan of *c.* 370-200 cal. BC. The supposed date around 350 BC fits within this range, but can not be corroborated by this outcome.

The high degree of similarity between Middle and Late Iron Age pottery on both sides of the Meuse estuary was good reason for Van Heeringen (1992) to ascribe the pottery of both areas to the same regional (Broekpolder) style group. Therefore the date of about 350 BC for Spijkensisse 10-28 is here adopted as the start of the second occupation phase of the peat area north of the Meuse estuary.

The other findspots produced pottery with later characteristics. The C14 dates (about thirty) which have been obtained for sites around Maasland and Vlaardingen cover a short timespan. They vary between 2280 ± 35 BP and 2120 ± 20 BP.²¹ This last date is based on wood from a farmstead, from which a second wood sample gave a C14 date of 2130 ± 25 BP.²² For this last site a date somewhere in the 2nd century BC is most probable, but even the first half of the 1st century BC lies within the range of possibilities. The pottery from this site belongs with the younger assemblages of the peat area.

For the time being, some pottery assemblages from Schiedam may be considered to be the youngest ones in the

peat area, namely those with the highest proportion of wall and rim decoration, and which, moreover, have rim decoration almost always placed on the outer edge of the rim (Van Heeringen 1992, esp. 37-Oost-1, -4, -5, -11). However, due to the lack of absolute dates this statement cannot yet be verified.²³ It is still conceivable that not chronological, but regional cultural differences within the peat area (and the Broekpolder style group) resulted in the observed variations between Late Iron Age pottery assemblages.

The youngest Iron Age settlements in the peat area need not be dated later than *c.* 100 BC. We may point at drastic changes in pottery characteristics before the end of the 1st century AD, which theoretically need a considerable lapse of time. The many sites from the 1st century AD which have been recovered in Vlaardingen-West show pottery with almost exclusively organic temper instead of grog; moreover, decoration is very uncommon (fig. 8).

It is still unclear where people lived during the period between. Wetter environmental conditions are seen as the impetus for a depopulation of the peat area north of the Meuse estuary around 100 BC or, at the utmost, half a century later (Van Heeringen 1992, 309). This possibly forced the communities onto the levees of the river Meuse for one or two centuries. Later erosion of the levees, however, precludes the testing of this hypothesis.²⁴

Considering the state of affairs in the 1st century BC, when the southern half of the Netherlands suffered from Caesars's Gallic War and experienced ethnic shifts, one is justified to oppose the explanation of discontinuities in pottery characteristics in terms of local cultural drift. Instead of an evolution of the pottery within the original population (outside the archaeological field of view), we should consider a sudden break in the pottery tradition. It is

quite reasonable to suppose that in the 1st century AD a population with a new ethnic signature was also present in the peat area north of the Meuse estuary. In any case, the native Roman pottery in the area between Meuse and Rhine shows a distinct Frisian stamp (Taayke 1990, 177), although this area is known as the living area of the Cananefates, for which tribe Roman literary sources suggest an eastern origin (summarised in Bloemers 1978, 75 ff.).

Looking at the Early Roman native pottery from Vlaardingen-West, we should, in our opinion, reckon with at least a considerable contribution by descendants of the original Iron Age population (*cf.* Fontijn 1994). Also considering the given C14 dates, we therefore propose a time lapse of more than one century between the latest Iron Age and the earliest known native Roman pottery.

The foregoing discussion makes clear that in order to calculate the Iron Age population density, we should have in mind two phases of occupation. The one site from Krabbeplass-south which belongs to the early phase (around 600 BC) can hardly be used for such calculations. Therefore, these will have to be restricted to the second occupation phase. For this phase two and a half centuries at most may be reserved, namely from 350 to 150/100 BC. The pottery from those findspots in table 1 which could not be specified within the Iron Age, seems, at least for the greater part, to belong to this occupation phase.

4.1.2 *The number of farmhouses on a site*

It is difficult to establish how many farmhouses stood on the sites of Krabbeplass-south, be it contemporaneously or at different stages. During the investigations in the Foppenspolder, in 1988/1989, the image of solitary farms which had previously been held, was completely undermined: in an area of no more than 80 × 40 m, the remains of at least six farmhouses came to light (Abbink 1989). That these six were certainly not all in use contemporaneously does not affect our point, since we are primarily trying to calculate the total number of houses during the second occupation phase. The observed clustering of houses appears not to be restricted to the Foppenspolder. On the contrary, in the south of Midden-Delfland it seems to be the rule rather than an exception.²⁵

At most findspots in Krabbeplass-south it could not be determined if there had been more than one farmstead on the find location, owing to the find circumstances. However, at the location which could be investigated most thoroughly (16.59), at least two farmhouses or building phases were represented, just as at site 16.32 elsewhere in the Krabbeplass-area (Abbink this volume). The observations at site 16.69 also raise the assumption of the presence of more than one farmhouse. The presence of

more than one hearth at a site (16.33 and 16.76), is, however, alone not sufficient to suppose more than one farm.

Backed by the findings from well-investigated sites in Midden-Delfland, an average number of houses or building phases of 1.5 per site for model A can be stated, and 2 for model B (tab. 2).

4.1.3 *The lifespan of a farmhouse*

Assuming that people inhabited a farmhouse until it needed replacement, it would be useful to be able to calculate its average lifespan. The wood species used for the structure are, in our case, the most relevant clues. The wood-species from several Iron Age farmhouses in the southern peat area of Midden-Delfland have been determined (Koot/Vermeeren this volume). One appears to have predominantly used the, less durable, wood of alder (*Alnus*) and ash (*Fraxinus excelsior*), whereas durable material, notably oak, has not yet been demonstrated to have functioned as building-material. For alder and ash under moist conditions, above groundwater table, an average use-life of less than five years is proposed (*cf.* Bakels 1978, tab. 6). During British field tests with stakes of 5 × 5 cm, alder and ash lasted for 4 and 4-6 years respectively when placed in loam soil (Purslow 1976). The author, however, states that the average use-life would be in direct proportion to the thickness of the stakes.

Apart from the diameter of the posts being a variable factor when determining durability, the prehistoric practice seems to legitimate a readjustment of use-life in an upward direction. For instance, for the early phase of the Bronze Age settlement of Bovenkarspel a succession of at least 25 generations during some six centuries could be established, following the intersecting house-plans. This results in an average maximum lifespan of 24 years for a farmhouse on the clay grounds. Here too, wood of the lowest durability class seems to have been predominantly used, willow and alder especially. The modal diameters of the posts are between 11 and 21 cm (IJzereef/Van Regteren Altena 1991, 74-76).

Compared with Bovenkarspel, the farmhouses in the peat area are characterised by a lower average diameter of the posts. A thickness of more than 12 cm is rare (*cf.* Koot/Vermeeren this volume).

The repeated discovery of farmhouses which have subsided in the peat, a process which must have started during habitation (Abbink this volume), will have shortened the lifespan of these houses. For a native Roman farmhouse in Nieuwenhoorn (Voorne-Putten) it has been ascertained that it was rebuilt three times after its erection, probably as a corollary of the formation of a fault on the spot. Dendrochronological research has shown that the first three

habitation phases lasted 6, 21 and 23 years respectively (Van Trierum 1992, 88). Several species of wood were utilised for the wall-posts, mostly oak and elm, but also alder, willow and maple. The posts supporting the cross-beams of the first phase were made of maple and elm (average diameter 13.9 cm), for the later ones predominantly oak had been used (Brinkkemper/Vermeeren 1992, 112). Therefore, the length of the use-lives may primarily reflect the kinds of wood which had been used for the structure.

An argument of a completely different nature for a longer lifespan of the farmhouses is supported by the large amounts of pottery found on many sites in the peat area. The house-sites which have been investigated most thoroughly, produced in every case many tens of kilograms.

For the Iron Age house in the Assendelver Polders with most traces of repair, Therkorn estimated a maximum lifespan of 35 years. The largest quantity of pottery was collected from this farmhouse, the weight of which was 261 kg (Therkorn 1987, 219).

The values of 8 and 12 years for the farmhouse lifespan in model A and B respectively, do not then seem to be exorbitant in the light of the foregoing facts.²⁶

4.1.4 *The number of farmstead inhabitants*

The modal household at least comprised a core family with several children. Possibly also one or two members of an older generation completed the household. For later prehistory one usually reckons with an average number of 6-8 persons.²⁷

4.2 MODELLING

For the models A and B in table 2 values are presented which lead respectively to a low and a high number for population density. Only the 11 probable and certain settlement sites from the Middle and Late Iron Age in the extensively surveyed area Krabbeplass-south have been taken into account to form the starting-point for the calculations. Extrapolated to 1 km² this would mean 92 sites. By way of precaution, only 80 sites are entered here.

For determining the number of house-generations (b/d), we assume an occupation period between 350 and 100 BC in model A; with model B the chronological limit has been set at 150 BC.

The number of farmhouses at any one moment can be calculated with the formula $y = a \times c / (b/d)$. The outcome of *c. 4 and 10 farmsteads per km² imply that around one farmstead lay c. 25 ha and 10 ha of land respectively.*

In view of these facts it may be argued that a population of 23 persons per km² (model A) is a lower limit indeed. This is because two more findspots have been classified as possible settlements at Krabbeplass-south, some findspots with isolated finds may also represent sites, and some plots

have remained covered with clay and thus could not be surveyed. Moreover, an occupation period of 250 years is probably too high an estimate for the peat area of Vlaardingen and Maasland.

On the other hand, we must reckon that a density of 77 persons (model B) would be among the impossibilities. The economic carrying capacity of the area would have been insufficient. Prummel calculated the need for land for agriculture and livestock with regard to the contemporaneous inhabitants of the peat area of Voorne-Putten, at the other side of the Meuse estuary (Prummel 1989).²⁸ The minimum requirement of 16.5 ha land per (small) farmstead would allow a coverage of maximally 6 farmsteads, or 36 persons, per km². Brinkkemper (1993, 150 ff.) arrives at a minimum requirement of 31 ha of pastures and 5 ha of arable land for a farmstead with 10 stalls and 6 inhabitants in the same region. This would mean a maximum of no more than 3 farms per km², if one assumes that arable land and pastures all lay around the farmstead. None of these calculations even considers the extra spatial requirements, such as for the farmyard and coppice woodland (*cf.* Fokkens 1991, 157).

Knowing that the raised bog area contained dispersed swampy locations and that creeks crossed the landscape, the surface area suited for an agricultural economy is still more restricted.²⁹ Therefore, we will certainly have to reckon with an outcome closer to model A than to model B. It is, however, quite conceivable that the inhabitants used land outside the immediate surroundings of the settlement, arable land as well as pastures. In this case one should think of the levees of the river Meuse (now washed away), only 2-3 km away, and of the coastal plain (transhumance; *cf.* Brandt/Van Gijn 1986). How representative, then, is the picture sketched above on the basis of an area encompassing no more than 12 ha?

4.3 RULE OR EXCEPTION?

There are arguments to state that at least several parts of the peat area contained some tens of persons per km².

In the first place, on the 12 ha of Krabbeplass-south no settlement of a village nature was discovered. On the contrary, the landscape comprised dispersed settlements with one or two, at most three, contemporaneous farmsteads. This settlement pattern obviously continues beyond Krabbeplass-south. Although the observations were less systematic there, the many findspots that were discovered nonetheless, assure us that at least the 1 km² that figures in table 2 has been covered. This area was more strongly dominated by peat than the geological data suggest (fig. 7). The stretches of clay that cross the peat are, in fact, composed repeatedly of: a Dunkirk 0 creek fill, a younger peat layer resting on it (with intrusion clay and archaeological remains), and a cover of Dunkirk III clay (*cf.* fig. 7 with tab. 1, column stratigraphic position).

Figure 9. Palaeogeographical map of the area north of the Meuse estuary; rectangle: figs. 2/6/7. After Van Heeringen 1988.

- a: beach barriers
 b: Holland peat
 c: Dunkirk I channel deposits
 d: Dunkirk I mud-flat deposits
 e: findspot Middle and/or Late Iron Age
 Age
 f: area not mapped

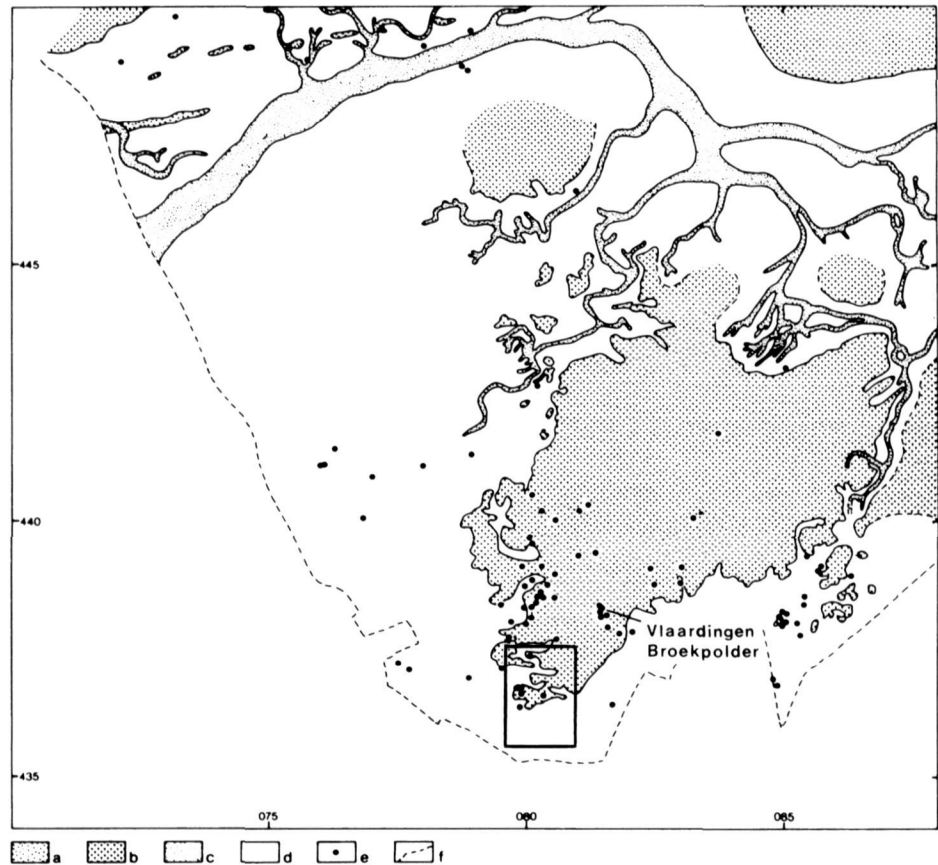


Table 2. Two models for calculating population density in Vlaardingen-West during the Middle and Late Iron Age.

	A	B
a. number of sites per km ²	80	80
b. length of habitation (in years)	250	200
c. number of farmhouses on a site	1.5	2.0
d. lifespan of a farmhouse (in years)	8	12
e. number of farmhouse inhabitants	6	8
y. number of farms at any one moment per km ²	3.8	9.6
z. number of persons per km ²	23	77

In the second place, at a distance of 1 km in both a northerly and north-easterly direction from the Krabbeplas, clusters of Iron Age findspots were also discovered, even under conditions of observation much less favourable than those in Vlaardingen-West. These clusters are in the north of the Aalkeet-Buitenpolder and in the Broekpolder (fig. 9). As a consequence of the aforementioned and of still more recent discoveries during land development works, a practically uninterrupted series of settlement sites on peat

can be traced along a stretch of 4 km, from Vlaardingen-West into the Duifpolder.

From all these facts we can conclude that the peat area north of the Meuse estuary was densely occupied during at least two centuries of the Iron Age. Because remains from before 300 BC appear to be relatively scarce, between 300 and 150/100 BC certain micro-regions must have been optimally occupied.³⁰ We may reckon with 4-5 farmsteads per km², that is 25-35 persons. Although we do not know the relative proportions of the spatially not very demanding arable farming and the much more extensive livestock keeping, we must assume that part of the agricultural grounds lay outside the densely inhabited areas.

A population density of 25-35 persons during the 3rd and 2nd century BC by far exceeds the calculations made for other parts of the Netherlands, especially for the sandy areas. For those regions the calculated densities vary between 1.5 and 5 persons per km² (e.g. Harsema 1980, 32; Kooi 1979, 174; Slofstra 1991, 149; Verlinde 1987, 326). These figures are almost invariably based upon settlement and urnfield data from the Late Bronze Age and the Early Iron Age. Data for the later periods are scarce. However, in

the micro-region that is covered by the excavations at Oss-Ussen, along the Meuse in the province of North-Brabant, there are strong indications that the population density was considerably higher in the Late Iron Age compared with the Early and Middle Iron Age, amounting to a minimum of 18 persons per km² (Schinkel 1994, 264).

4.4 THE PEAT AREA AS A WHOLE

Van Heeringen assumes an inhabited peat area of 12 × 4 km on the northern side of the Meuse estuary in the Middle Iron Age. All known findspots are ascribed to one single century, that being the 3rd century BC. Stating a use-life of 25-50 years for a farmstead, he arrives at 60 to 190 contemporaneous inhabitants for the whole region during the Middle Iron Age (Van Heeringen 1992, 315).

If we, on the other hand, reckon with the use-life of 8-12 (model A/B) and if we date the sites concerned between 350 and 150 BC, this would result in only 10-23 contemporaneous inhabitants in the whole peat area during the two mentioned centuries.

In order to arrive at a more realistic estimate, now that the observations in Vlaardingen-West have been made, we can make a feed-back to the systematic survey of Bult. Within the 1 km² area of the Aalkeet-Buitenpolder, Bult discovered four Iron Age sites (fig. 6a). Even these few sites form a relative cluster among the total of 22 possible to certain Iron Age sites which he discovered in the surveyed parts of the peat and peat/clay area (Bult 1983, tab. 13). After a reappraisal of findspots with isolated finds³¹, these make up 14% of the sites discovered. They lie in an area which comprises hardly more than 3% of the indicated part of Midden-Delfland: 100 ha of the 3258 ha of peat and clay/peat in the triangle Aalkeet-Buitenpolder/Woudse Polder/Akkerdijkse Polder (fig. 1a).

If these four sites likewise contained 14% of the population, and if we — according to our calculations — assume these 14% to be 25-35 individuals, then the population as a whole theoretically counted 179-250 individuals. After correction for the parts of the peat and clay/peat area which have not been surveyed by Bult³², and after adding substantial margins, as a 'remedy' against the extrapolations from a small area, we arrive at 160-300 individuals for the peat and clay/peat area of Midden-Delfland.

The distribution of the sites over this area is, however, very imbalanced (fig. 9). In fact they are almost completely concentrated in a belt of 14 km² in the southern half of the area (south of coordinate 441). For a peat area of 5 km² bordering Midden-Delfland on the eastern side, in the municipality of Vlaardingen, this same average density may be assumed (*cf.* Bult 1983, Map-appendix 1). This means that between *c.* 350 and 100 BC, a zone of 19 km² was inhabited by a population which on average comprised

roughly 200-400 people, figures which indicate the presence of a self-sustaining group in both a social and reproductive respect. Other average values for this area then are (on the basis of model A) per km²: *c.* 10-20 individuals, 2-3 farmsteads and *c.* 30-50 ha land around each farmstead.

In an area of about 5 km² even further eastwards, now in the built-up part of Schiedam, we can ascribe even higher densities, but only in the 2nd century BC; in earlier times the area was uninhabited (see note 30).

The northern part of the peat area of Midden-Delfland, lying more than 6 km away from the Meuse, seems only to have been very sparsely occupied. The hydrological situation may account for this fact, at least for an important part. In this northern area the peat bog will have been drained to a lesser extent than near the creek mouths along the Meuse.

5. Some conclusions

Because other parts of the coastal peat area must also have been occupied during the Iron Age (Assendelver Polders, Voorne-Putten, Walcheren), we cannot help but conclude that the peat formed an economically coveted landscape instead of a buffer zone during periods of overpopulation in bordering zones, for instance in the dune belt (*cf.* Abbink 1993). The impressive work of Van Heeringen on the Iron Age of the Western Netherlands gives no indications of overpopulation either (Van Heeringen 1992, esp. fig. 74).

Although the area south of the Meuse estuary (Voorne-Putten) has also produced some clusters of farmsteads from the Middle and Late Iron Age (Van Trierum 1992, figs 6, 68), we must estimate the overall population density to be lower than in the peat zone bordering the northern banks of the river (see also Brinkkemper 1993, 145). As an important explanatory factor we may consider the nature of the habitat. Voorne-Putten seems to have comprised fewer oligotrophic peatbogs and more fen-peat than Midden-Delfland (*cf.* Brinkkemper 1993, 32). The peat area around the Oer-IJ estuary, which for a great part lies within the Assendelver Polders, does not give the impression of a dense occupation (Van Heeringen 1992, 314-317).

All data indicate that people moved into the peat area of Midden-Delfland as soon as this had become inhabitable (again) by natural drainage. The area was probably left only when a minimal subsistence was no longer feasible (after submerging?). Around 600 BC the peat area of Midden-Delfland was, for a short period, inhabited by only a few dispersed, pioneering farmers. In a second phase there must have been moments, between 350 and 100 BC, when some microregions on raised bogs knew densities of some 25-35 persons per km². It remains, however, an open question as to whether the presence of mineral grounds (creek and

channel fillings, levees) was an essential factor in attracting communities with a mixed farming economy.

Apparently the inhabitants took into account that by dwelling on peat they regularly had to take measures against subsiding and faulting floors, and that one also had to accept the other miseries which living in a swampy landscape brought with it for human beings and animals. The current ecological investigations will particularly have to address the question as to what benefits the peat area had to offer on the positive side of the balance.³³

notes

1 The Institute of Prehistory of the University of Leiden (IPL) and the Institute of Pre- and Protohistoric Archaeology of the University of Amsterdam (IPP) are both involved in excavating settlements which will be partly or completely destroyed by the subsequent development programme. The activities of the IPL concentrate on the Iron Age habitation, whereas the IPP mainly focuses on the Roman period. The State Service for Archaeological Investigations in the Netherlands (ROB) has undertaken some rescue excavations at several late medieval sites.

The bulk of the archaeological work is financed by the parties concerned in the development works, these being the Government Service for Land and Water Use (*Landinrichtingsdienst*), the Department of Outdoor Recreation of the Ministry of Agriculture, Nature Management and Fisheries, the Midden-Delfland Recreation Authority (*Recreatieschap Midden-Delfland*) and the Union of Delfland Drainage Districts (*Hoogheemraadschap Delfland*). The Province of Zuid-Holland has also made a substantial financial contribution.

2 Particularly borings done by P.G. Heinsbroek (see Heinsbroek 1991, 1993a, 1993b).

3 Cf. Abbink 1989, fig. 7, layers 2 and 4; Heinsbroek 1993b, fig. 3.

4 The repeatedly quoted C14 date of 2645 ± 65 BP from Lodderland has been described by its author as a *terminus post quem* for the deposits (Van Staalduin 1979, 60). See also Van Trierum 1992, 19.

5 GrN-18641. For further information about the object see Van den Broeke 1991, 333.

6 Close to the intrusion point of the channel under discussion from the Meuse estuary, in the Aalkeet-Binnenpolder, Mr P.G. Heinsbroek established by means of borings that in a channel deposit of probably Dunkirk 0 age, a new watercourse had been formed during the Dunkirk I transgression period, or a still existing residual bed had been recut. This watercourse was filled up almost completely during this same transgression period. During boring, a groove-decorated Iron Age sherd was brought to light from the bottom of the fill (3.20 m below surface); pottery sherds were also found at a higher level (0.4-1.0 m below the surface), lying in and along a narrow residual bed in the almost completed creekdeposits (Van den Broeke/Van Zijverden 1993, findspot 17.40; Heinsbroek 1993a). This last-mentioned pottery is almost certainly native-Roman (all sherds contain organic temper). These creek deposits

and the adjoining mud-flat deposits are then obviously of Dunkirk I date. The clay layer covering the finds consists of Dunkirk IIIb deposits.

7 Findspot 16.67. This concerns sherds of one or more handmade globular pots of hard fabric and fine temper, as well as sherds of early wheel-turned ceramics of globular pot fabric (det. E.J. Bult). The fact that medieval findspots on peat are scarce in Vlaardingen-West must be related to a different choice of settlement location during the Middle Ages (see below).

8 A site with pottery from the 2nd and/or 3rd century AD (det. M. Brouwer) also contained a sherd of native fabric in the intrusion clay below the settlement level. This sherd does, however, seem to be of older date, possibly stemming from the Iron Age site which was discovered some tens of metres away in an easterly direction (fig. 7, no. 16.62).

9 Here should be mentioned — with thanks — the names of Ms J. Mostert, J.P. ter Brugge, O. Dorenbos, P.G. Heinsbroek, L.A. Kaal and A. Uleman. Their observations, which were put in writing in many cases, have found their way into this article. I was happy to receive much administrative assistance from Ms J. Schreurs-Verwer.

10 The surveying of dozens of deepened field drains in this terrain in 1993 did not produce new sites.

11 The indicated Iron Age site 17.41 is, however, the most southern findspot known from this period on the northern bank of the Meuse.

12 Most of the preliminary notes on the discoveries in this area can be found in 'Archeologische Kroniek van Zuid-Holland' published in volumes 1988-1992 of the magazine *Holland*.

13 After the appearance of the last-mentioned publication, the Centre of Isotope Research (CIO) in Groningen did a second C14 measurement on the skeleton. The outcome of 3080 ± 40 BP (GrN-19619) supports the first result, which gave 3060 ± 40 BP (GrN-18960). I would hereby like to thank Dr. J. van der Plicht for his attention.

14 Sites containing remains of both periods have been entered twice.

15 A complete list, based upon the documentation compiled by the present author, can be found in Ter Brugge/Moree 1993.

16 These 12 ha cover the area between the southern bank of the Krabbeplass and the watercourse (Poeldijksche Wetering) that separates the small southern part of the Krabbeplass from the large northern part, as well as the adjacent strip which contains sites 16.33, 16.35 and 16.43 (figs 6, 7).

17 Especially in borings also sometimes pottery (grit) appeared to be present above the Holland peat, up to a decimetre in the covering clay. Particles of charcoal were present at a still higher level. This latter material will have been displaced during inundations. In the case of the vertical displacement of pottery, bioturbation should be thought of as the primary cause.

18 During the excavations in the Foppenpolder (Abbink 1989) and in the Duifpolder (Koot 1993) trial trenches were dug outside the

- dwelling places. Leaving floor remains in the Foppenpolder which have been displaced by post-depositional processes out of consideration, only the Duifpolder produced a find-concentration outside the dwelling-places. This one lay in a nearby creek filling, a situation comparable with findspots 16.76 and 16.80 in Vlaardingen-West. For equally restricted find distributions on dwelling places on peat see also Van Trierum 1992, figures 29-32, 42, 60, 62, 74.
- 19 For a first communication, see Van den Broeke 1991, 333. The other sites are Vlaardingen-Holierhoekse Polder (Van Heeringen 1992, 37-Oost-34) and Maasland-Foppenpolder. On the latter site most settlement remains date from a younger Iron Age habitation phase (Abbink 1989).
- 20 Stuiver/Pearson 1993, incorporated in the computer calibration program CAL15 from the Centre for Isotope Research (CIO), Groningen.
- 21 Except for a date of 2320 BP with the considerable standard deviation of 70 years for 37-Oost-22, Vlaardingen-Broekpolder (Van Heeringen 1992, tab. 47). The pottery of this site can be placed in a late phase of the second occupation period.
- 22 Nos. GrN-19603 and -19602 respectively. See for this site Abbink 1990, 337; Fontijn 1995. The site (16.10) lies some 500 m north of the Krabbeplas.
- 23 Van Heeringen considers the whole group of sites in Schiedam to be younger than those in a more westerly direction (Vlaardingen, Maasland), in a region which is thought to have been abandoned after around 200 BC. All the same, there is no good reason for this hypothesis. In the first place, C14 results of all three dated settlements from the Schiedam group are inconsistent (Van Heeringen 1992, 254-257, esp. note 35). In the second place there are strong similarities between some pottery assemblages in both regions. These assemblages are, however, artificially severed in figure 43. Moreover, the aforementioned C14 dates for site MD 16.10 imply that the peat area of Vlaardingen and Maasland was still occupied in the 2nd century BC (see also Fontijn 1995).
- 24 Here should certainly be mentioned a settlement site, possibly dating from the 1st century BC, which has recently been excavated in the centre of Vlaardingen. It lies on a creek fill which was deposited during Dunkirk 0 or I (Ter Brugge 1992a; Fontijn 1994).
- 25 See also below (16.32 and 16.59); Van Heeringen 1992, 316 (Vlaardingen-Broekpolder) and Koot 1993 (Maasland-Duifpolder).
- 26 These guesses will possibly be superfluous within some years, considering the development of dendrochronological curves on the basis of ash.
- 27 E.g. Fokkens 1991, 155; Harsema 1980, 26; Prummel 1989, 255. Brinkkemper (1993, 146) uses the low numbers of 4 and 6 persons for the Iron Age habitation of Vorne-Putten.
- 28 The data concerning stable length, which is an important factor in the calculations, are still unknown for the peat area of Midden-Delfland during this period. The well-preserved long farmstead of Vlaardingen-Broekpolder probably comprises more than one building phase (Van Heeringen 1992, 316). Considering the total farmstead length, there is, however, no need to suppose essential differences in comparison with Vorne-Putten.
- 29 Although wetlands are renowned for their wealth of game and fish, it is certain that hunting, fowling and fishing did not play an important part in the economy of the peat areas of the Western Netherlands (Brinkkemper/Van Wijngaarden-Bakker in prep.; IJzereef *et al.* 1992). The watery elements in the landscape can, therefore, be left out of consideration when calculating subsistence requirements. For a reconstruction of the landscape of southern Midden-Delfland see Koot/Vermeeren this volume.
- 30 This may have resulted in an extension of the habitation in an easterly direction, to the peat area of Schiedam, for which area only area only 2nd century BC dates have been given (Van Heeringen 1992, fig. 44). Considering the aforementioned C14 dates for site 16.10 in the Aalkeet-Buitenpolder, there is, however, no need to assume a complete shift of habitation (in one move) from the peat area around Maasland and Vlaardingen to that of Schiedam around 200 BC, as has been suggested by Van Heeringen (Van Heeringen 1992, 309, 317, fig. 44; see also Fontijn 1995).
- 31 In the peat and clay/peat area 13 locations with isolated finds have also been discovered. Looking back, we may suppose that at least half of these (= 7 locations) represent settlements. None of these lay within the aforementioned part of the Aalkeet-Buitenpolder. The Iron Age findspots that were known at the start of the field survey in the peat and clay/peat area, are so low in numbers (2 sites and 1 location with isolated finds) that they hardly affect the sampling nature of the field survey.
- 32 Apart from the 3258 ha surveyed in the peat and clay/peat area, 918 ha (22%) remained uncovered for several reasons (Bult 1983, appendix 7). The area in question in the Aalkeet-Buitenpolder has been completely covered by the surveys (documentation E.J. Bult). The number of inhabitants outside this area can, therefore, be multiplied by 1,28 (100/78).
- 33 When preparing the text, I benefitted greatly from the information and/or remarks of Ms A.A. Abbink (IPL), J.P. ter Brugge (Mun. of Vlaardingen), P.G. Heinsbroek (Vlaardingen), C. Koot (IPL), Ms H. van Londen (IPP), and M. Verbruggen (IPL) and (other) members of the section 'Metal Ages' of the IPL. For the determination of Roman finds from Vlaardingen-West I would like to thank Ms M. Brouwer and Ms M. Kleiterp (RMO), for those of medieval finds, E.J. Bult (Mun. of Delft). My 'wrestling' with table 1 was kindly taken over by Ms M. Wanders (IPL). All illustrations are by H.A. de Lorm (IPL). The recent (digitalized) topographical map of Vlaardingen-West, which underlays several figures, was kindly produced by A. Krijgsman (Mun. of Vlaardingen). The English text was corrected by Ms K. Waugh.

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