1 Introduction

1.1 The problem

The area studied comprises the islands Voorne and Putten, situated in the southern part of the Dutch province of Zuid-Holland. These islands are separated by a small stream, the Bernisse (*fig. 1*). The two islands will henceforth be referred to as "Voorne-Putten". At present, Voorne-Putten is almost completely covered by clayey sediments deposited during medieval times. During the Iron Age and the Roman Period, the landscape was completely different from what we see today.

Archaeological excavations of settlement sites on Voorne-Putten dating from the Early and Middle Iron Age have been carried out by the B.O.O.R. (*Bureau voor Oudheidkundig Onderzoek van Gemeentewerken Rotterdam*; the Office for Archaeological Research of the municipality of Rotterdam) and the R.O.B. (*Rijksdienst voor Oudheidkundig Bodemonderzoek*; the State Service for Archaeology). The excavations of Early and Middle Iron Age[1] sites (ca. 750-200 BC[2]) have demonstrated that these settlements were founded on a peaty subsoil (cf. Van Trierum 1986; Van Trierum *et al.* 1988). During the Late Iron Age (200-25 BC) and Roman Period (on Voorne-Putten ca. 50-270 AD), most settlements were built on clay, but peat still constituted a predominant element in the landscape. Environments completely different from the present one lie buried below the present clay cover (see further *1.2*). Details concerning the archaeological investigations on Voorne-Putten have been included in paragraph *1.3*.

The presence of late prehistoric and protohistoric settlements in peaty environments is noteworthy. It is generally assumed that the agricultural system practised during the Iron Age was based on local subsistence, which implies that the arable and pastoral products were grown as well as consumed locally (e.g. Roymans 1983). The agricultural possibilities for these former societies in the peaty environment to the south of the Meuse estuary is one of the main questions to be addressed in the present study.

The addition of Voorne-Putten to the Roman Empire may have instigated or even imposed dramatic changes in the economic situation. According to Groenman-van Waateringe (1989), the economy of the native inhabitants was modified in phases. During the occupation, food for the Roman army had to be supplied from the hinterland. A period of integration followed, in which the production was changed qualitatively and quantitatively to meet the army's demands. The presence of the Roman army had necessitated a production by the autochthonous inhabitants above their own needs. These developments resemble those during the advent of colonialism, when the occupants also tried to pass on the costs to the native inhabitants. After a more or less consolidated period, destabilisation of the modified economy resulted from a less intense control of the Roman *Limes* and from the final withdrawal of the army.

The second main question was, therefore, whether the arrival of the Roman occupants, and the inclusion of Voorne-Putten in the Roman Empire, had any bearing upon the economic structure of the autochthonous society. This effect may have been qualitative, i.e. expressed in the species of plants cultivated and animals bred, as well as quantitative, i.e. expressed in the amounts or ratios produced.

The main approach to answer these questions is through the analysis of pollen and botanical macroremains from deposits in or related to former settlements. The excavations by the B.O.O.R. and the R.O.B. provided the solid base on which the present study could be founded. Grateful use was furthermore made of the results of archaeozoological research conducted by Dr. W. Prummel and Drs. P.J. van Mensch.

The investigations were subsidized by the Foundation for Archaeological Research, which is subsidized by the Netherlands Organization for Scientific Research (N.W.O.).

1.2 Geology

The geological development of the western part of the Netherlands during the Holocene is strongly determined by the sea. Melting of the ice caps, formed during the last glaciation, caused a rise of the sea level. This eustatic rise, relative to the earth's centre, was rapid until largest part of the ice caps had melted. Between ca. 4000 BC and 2000 BC, the relative rise of the sea level became much slower. From then on, coastal barriers were formed that could more or less withstand the rising sea level. The oldest still preserved coastal barriers were formed in the early Subboreal period (ca. 3500 BC). Subsequently, new coastal barriers were deposited to the west of the older ones and the coast shifted

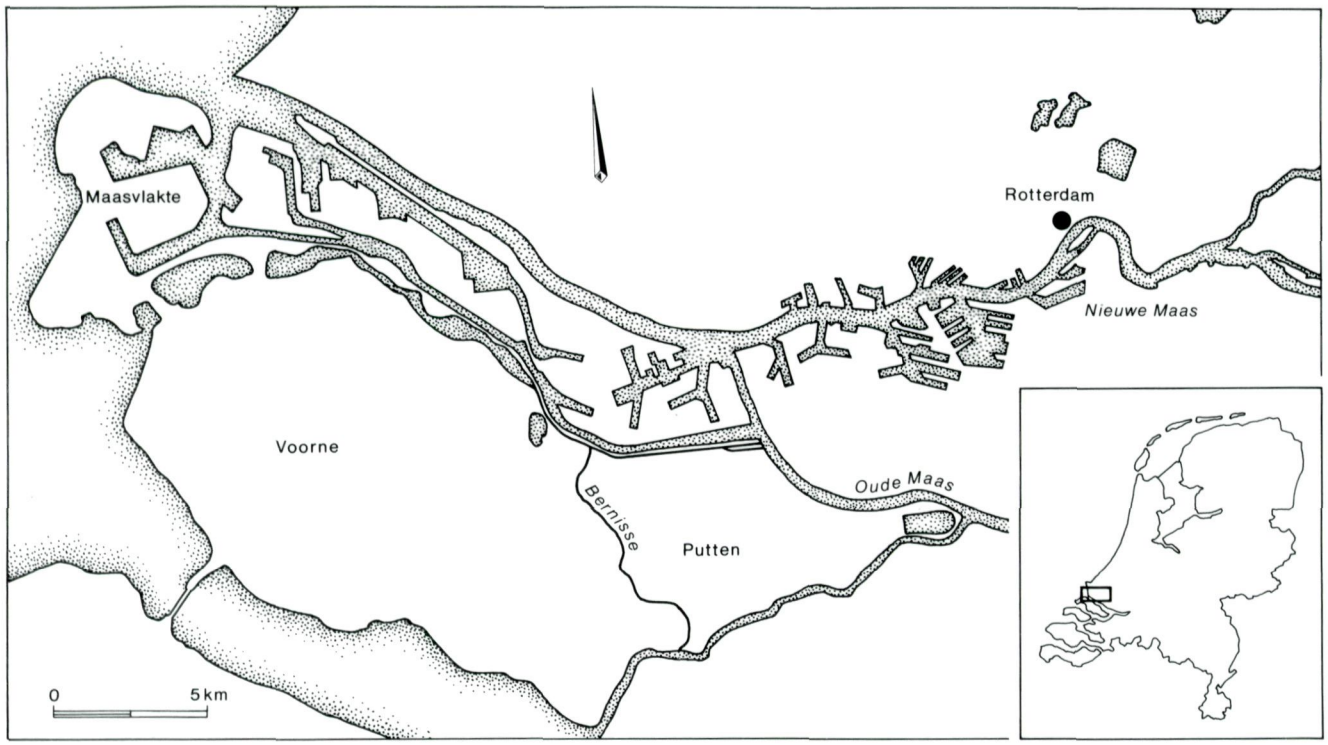

Fig. 1 Location of Voorne-Putten in the Netherlands.

in a westward direction. During Subboreal and early Subatlantic times, coastal dunes that remained uneroded could develop. These dunes were mainly formed before the start of the Christian era and are called the Older Dunes.

The westward movements of the coast line continued until ca. 1000 BC. At that time, a more or less closed coast line had developed, only intersected by some estuarine inlets, where rivers discharged into the sea. From south to north, the Scheldt, the Meuse, the Rhine and the Oer-IJ formed the largest estuaria in the Dutch west coast. Voorne and Putten were not separate islands, but instead part of a larger area between the estuaries of the Meuse and the Scheldt (see *fig. 2*).

Behind the coastal dunes, the mineral particles that were transported by rivers were deposited at times of high water levels, when the river overflowed its banks. The heavier, sandy particles are deposited immediately on the banks, clayey sediments are deposited in the hinterland further away from the river bed. Due to stagnations in the drainage, peat formation took place locally on these clayey sediments. This peat is the so-called Holland peat. In the course of the Subboreal, the frequency of inundation of the hinterland due to marine and riverine influences decreased and the area covered with peat expanded. Peat growth did not occur close to the rivers, but instead levees, consisting of clastic sediments were to be found.

Although the rise of the sea level slowed down after 4000 BC, there were periods in which the sea temporarily showed an enhanced activity. These phases of increased marine influence are called transgression phases. Transgression phases are followed by periods of decreased marine influence, the so-called regression phases. The cyclic alternation of transgressions and regressions has been described by Pons as follows (see Louwe Kooijmans 1974).

"The transgression phase begins with erosion of the older sedimentation and/or peat areas and the forming of a network of creek systems. The next phase is that of marine sedimentation, followed by the gradually silting-up of the creeks. One of the results of the vanishing of the creeks is the blocking of the drainage of the sedimentation area. Finally, in the regression phase peat growing spreads again over the whole area".

Louwe Kooijmans (1974: 59) stated that theoretically only the erosion phase constitutes the actual landward shift of the coast line (= transgression), but it is common practice to include the period of deposition of mineral sediments in the transgression phase.

The first transgression phases, in the Atlantic period, occurred during a period of a relatively rapidly rising sea level. As a result, the corresponding Calais I-III deposits cover large parts of the western Netherlands. In the Subboreal and Subatlantic periods, the sea level rose more slowly and coastal barriers formed a strong defence of the hinterland. From then on, the sedimentation of clay during trans-

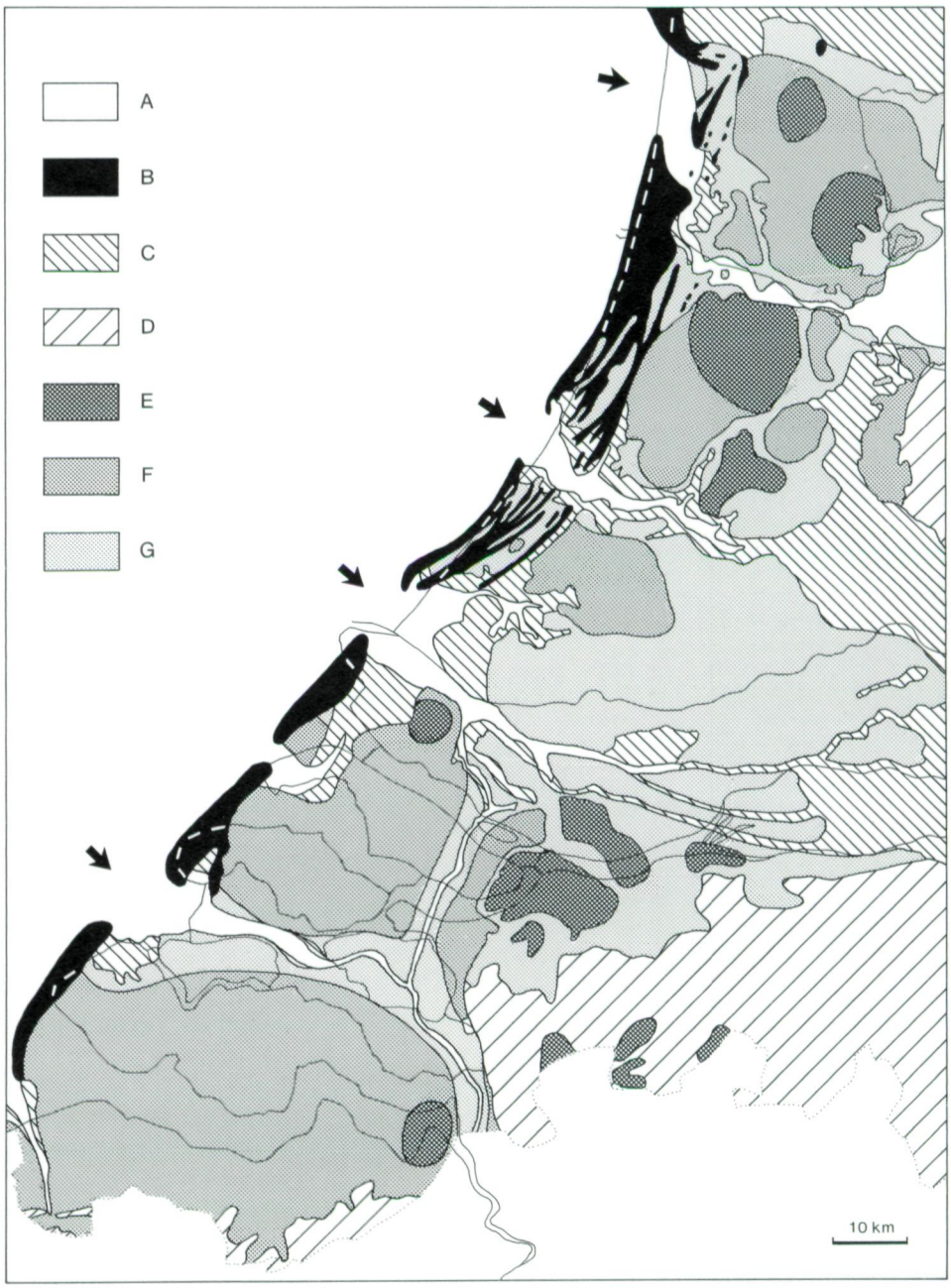

Fig. 2 Palaeo-geographical reconstruction of the western Netherlands around 2400 BP, scale 1:1,000,000 (after Zagwijn 1986; drawing W.J. Kuijper). Legend: A = water, B = coastal dunes and breaches, C = clayey sediments (marine or riverine), D = pleistocene soils, E = raised bogs, F = drained raised bogs, G = fen peats.

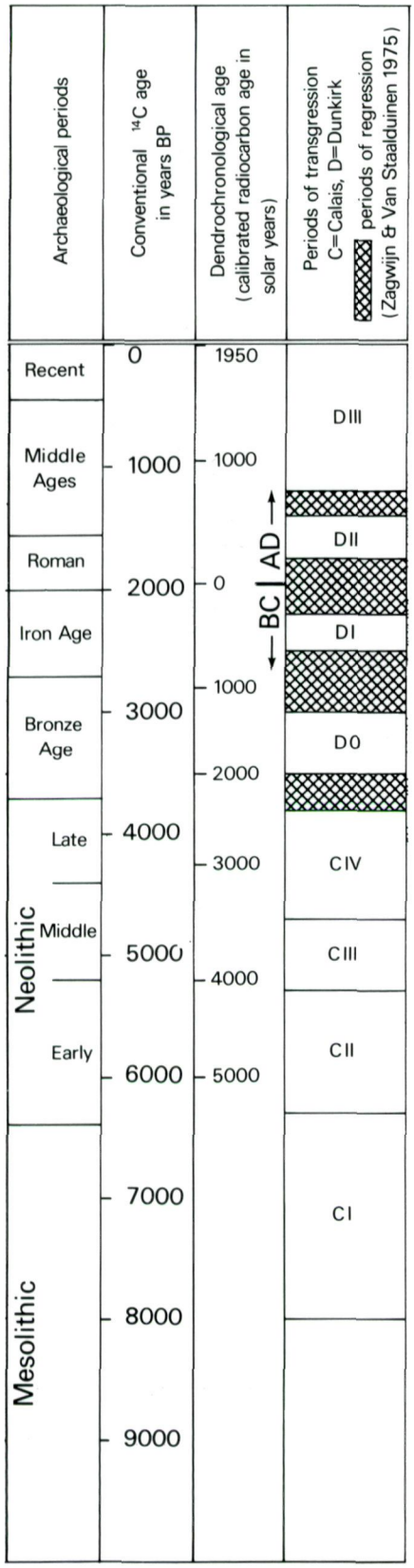

Fig. 3 Datings of transgression phases in the western part of the Netherlands (after Berendsen/ Zagwijn 1984).

gression phases (Calais IV and Dunkirk deposits) was more or less restricted to the regions behind the inlets of the rivers mentioned earlier. The transgression phases after 2000 BC are called Dunkirk transgressions. ^{14}C dates of the peaty layers below and above the mineral sediments related to transgression phases demonstrated that these Calais IV and Dunkirk deposits occurred more or less simultaneously in large parts of the western Netherlands (see *fig. 3*). Variations, mainly due to local conditions, occur as well.

The causes of the later transgression phases have been the subject of many discussions. However, to deal with this subject extensively is beyond the scope of this publication. The reader is referred to the following publications: Jelgersma *et al.* 1970; Behre *et al.* 1979; Roeleveld 1980; Van der Plassche 1982a, 1982b; Zagwijn 1986.

De Jong (1982) pointed out that the lithostratigraphic units Calais I-IV and Dunkirk 0-III indicate an event, not a time unit. They are not meant to represent chronostratigraphic units (see also the discussions in Roeleveld 1974: 51-53; Vos 1983: 8-9). All the same, the defined time span covered by these different prehistoric transgression phases in a restricted area is of great value to chronology and the application is so useful and widespread that it is followed here. The defined time intervals in which the different transgression phases took place, often allows approximate dating of settlement traces on the basis of their stratigraphic position. Unfortunately, however, the standard stratigraphy, as shown in figure 3, is rarely completely represented in one single stratigraphic column. This is due to the variable extension of the clay deposition representing the different transgression phases.

1.2.1 The geological development of Voorne-Putten during the Iron Age and the Roman Period

The geological development of Voorne-Putten during the Iron Age and the Roman Period, as part of a region situated directly to the south of the Meuse estuary, was greatly influenced by the Dunkirk transgression phases. The distribution of these Dunkirk deposits and the peat formed during late Subboreal and Subatlantic regression phases (the so-called Holland peat) on Voorne-Putten have been mapped in the framework of the geological map of the Netherlands, sheet 37 West (Van Staalduinen 1979). The eastern part of Putten was not included on this map. The corresponding sheet of the series of geological maps, 37 East, has not yet been published, but it is being prepared by De Groot. The geology of this area, with marine as well as riverine deposits, is thus complex that a distribution map of Holland peat will not be included in the geological map 37 East (Drs. Th. de Groot *pers. comm.*). The southernmost part of Voorne is absent on both 37 W and 43 W maps and a publication in the near future is not envisaged (Drs. L. van der Valk *pers. comm.*).

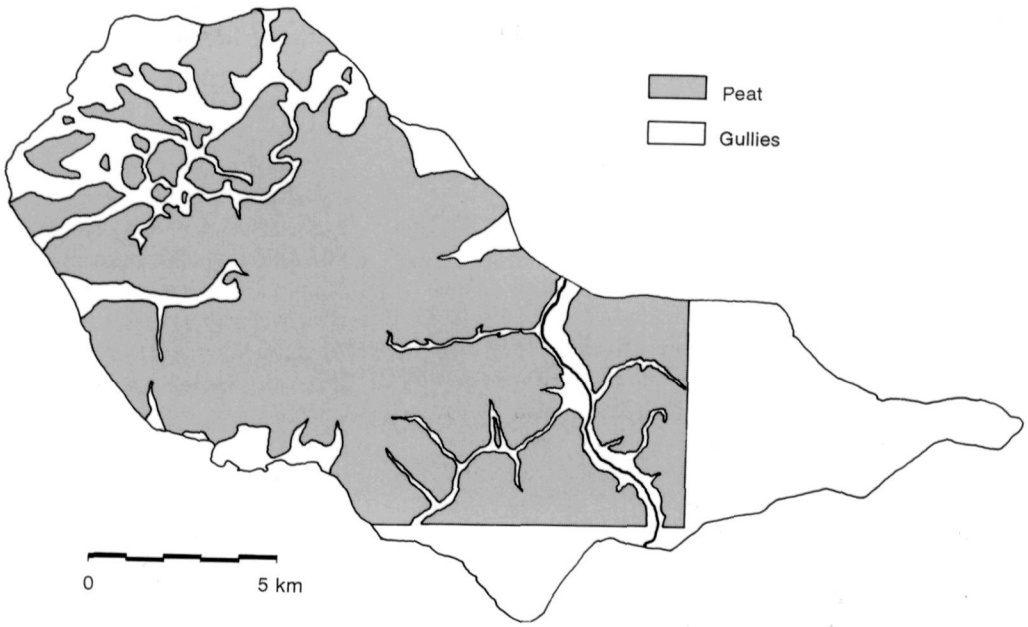

Fig. 4 Palaeo-geography of Voorne-Putten, ca. 2400 BP, scale 1:2000 (after Van Staalduinen 1979).

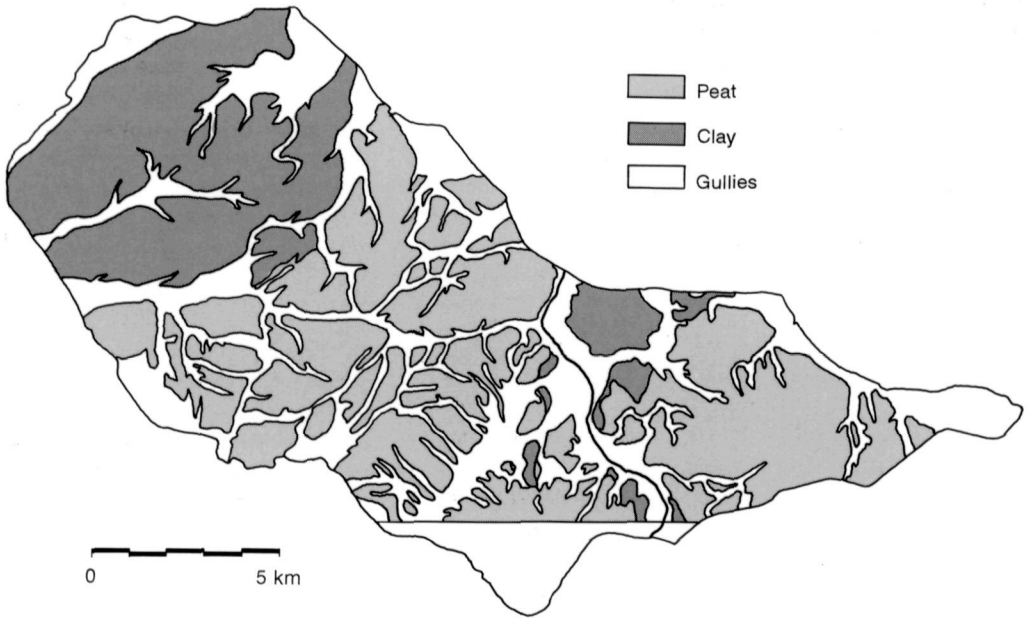

Fig. 5 Palaeo-geography of Voorne-Putten, ca. 2000 BP, scale 1:2000 (after Bloemers 1978).

During the Early Iron Age, between 750 and 500 BC, Voorne-Putten was mainly covered with Holland peat (Van Staalduinen 1979; see *fig. 4*). The predominance of peat still existed during the Middle Iron Age. However, the creek systems formed at the onset of the Dunkirk I transgression phase, around 400 BC, drained the peat over a large area. According to Zagwijn (1986), peat growth on Voorne-Putten only continued in a raised bog near Heenvliet, where peat growth persisted into the Roman Period.

The peaty sediments reach the present-day coast line. Nowadays, they are covered there by the Younger Dunes that were formed from the 12th century AD onwards. The Older Dunes, not indicated in figure 4, were situated more to the west, beyond the present coast line. They were eroded during medieval times, when the coast line of Voorne-Putten shifted eastwards during the Dunkirk III transgression phases. Further to the north, the Older Dunes have not disappeared, while in the extreme south of the Dutch coast there are also some remnants left. The orientation of these Older Dunes led Zagwijn to a reconstruction of their location on Voorne-Putten as represented in figure 2. This map shows the situation during the Dunkirk I sedimentation phase. As Zagwijn's palaeogeographical maps cover the entire Dutch territory, they do not provide the detail preferably wanted for this study.

The situation during the Late Iron Age and the Roman Period is markedly different from the conditions during the Early and Middle Iron Age as described above. The Dunkirk I transgression phase had resulted in the deposition of clayey sediments, which covered part of the peat present on Voorne-Putten. A palaeogeographical map for this period has been published by Bloemers (1978). It includes the areas of the geological maps 37 West and East, but the southernmost part of Voorne-Putten is again absent (see *fig. 5*). Zagwijn's palaeogeographical reconstruction for this period is shown in figure 6.

The Bernisse, separating Voorne and Putten, is supposed to have originated during the Dunkirk I transgression phase (Zagwijn 1986: 40). The Bernisse is assumed to have been a branch of the Scheldt. The increased marine influence during the Dunkirk I transgression phase considerably widened the Meuse estuary and formed a funnel-shaped inlet. Tacitus (Annales II) referred to this inlet as *immensum os* (immeasurable mouth). The same estuary is mentioned as *Helinium* by Plinius (Nat. Hist. IV). On the basis of toponyms and classical references, Hallewas and Van Regteren Altena (1980) pointed out that until medieval times the Meuse was the major factor in the formation of this estuary. The discharge by the Scheldt through the *Helinium*, via the Bernisse, is thought to have been of minor importance.

The extensive system of gullies indicated in figure 5 is partly filled with sediments originating from one of the medieval Dunkirk III transgression phases. However, as Van Trierum (*in press*) observed, the Roman settlement sites in the area of Nieuwenhoorn and Nieuw Helvoet are seemingly situated along these much younger Dunkirk III creeks. This is an indication that these creeks had their precursors during the Roman Period. These earlier creeks must therefore be of Dunkirk I age.

The formation of the extensive systems of creeks and gullies during the Dunkirk I transgression phase had important implications for the suitability of the peaty area for habitation. These gullies caused a natural drainage of the peat. This will have shaped an environment which was perceived as inhabitable by Iron Age man. Modderman (1952) was the first to postulate this mechanism for an Early Iron Age peat settlement in the Escamppolder just north of the *Helinium*. Hallewas and Van Regteren Altena (1979: 96) assumed the same mechanism could allow habitation of the peat area in the whole Meuse estuary during the Iron Age. The transgression of the sea was not yet at its maximum during this phase of drainage. During periods of maximum marine influence, sedimentation of Dunkirk I deposits occurred on a large scale on Voorne-Putten. The environmental conditions related to this sedimentation thus prevented habitation. Habitation in the peaty environment thus is at first facilitated by the Dunkirk I transgression phase and subsequently habitation became impossible during the maximum inundation. One can debate the question in how far environmental conditions can influence human behaviour. In this publication, it is assumed that the natural conditions do set limits, and that an area with actively growing peat must be considered uninhabitable. For the Iron Age on Voorne-Putten, this hypothesis is supported by the absence of archaeological finds in areas with peat actively growing during the Iron Age (see *1.3*). The absence of habitation traces during maximum inundation by the Dunkirk I transgression phase also illustrates the influence of natural conditions. However, as Van Heeringen (1992: 306) stated,

> "the reverse does not always apply, since it is quite possible that [potentially inhabitable] tidal deposits with no occupation remains were not colonized for some other reason".

The raising of dwelling mounds is an example of keeping an area suitable for habitation, but the influence of natural conditions upon human behaviour is evident.

Louwe Kooijmans (*in press*) suggested several other reasons that may also be of relevance to explain the inhabitation of wetlands during the Iron Age. He observed that the shift from a rigid, cattle-dominated mixed farming economy in the Bronze Age towards a more flexible type of mixed farming with a greater diversity in livestock rearing in the Iron Age was one of the factors allowing for the inhabitation of the peaty areas in the Dutch coastal region. Besides, the development of an exchange network during the

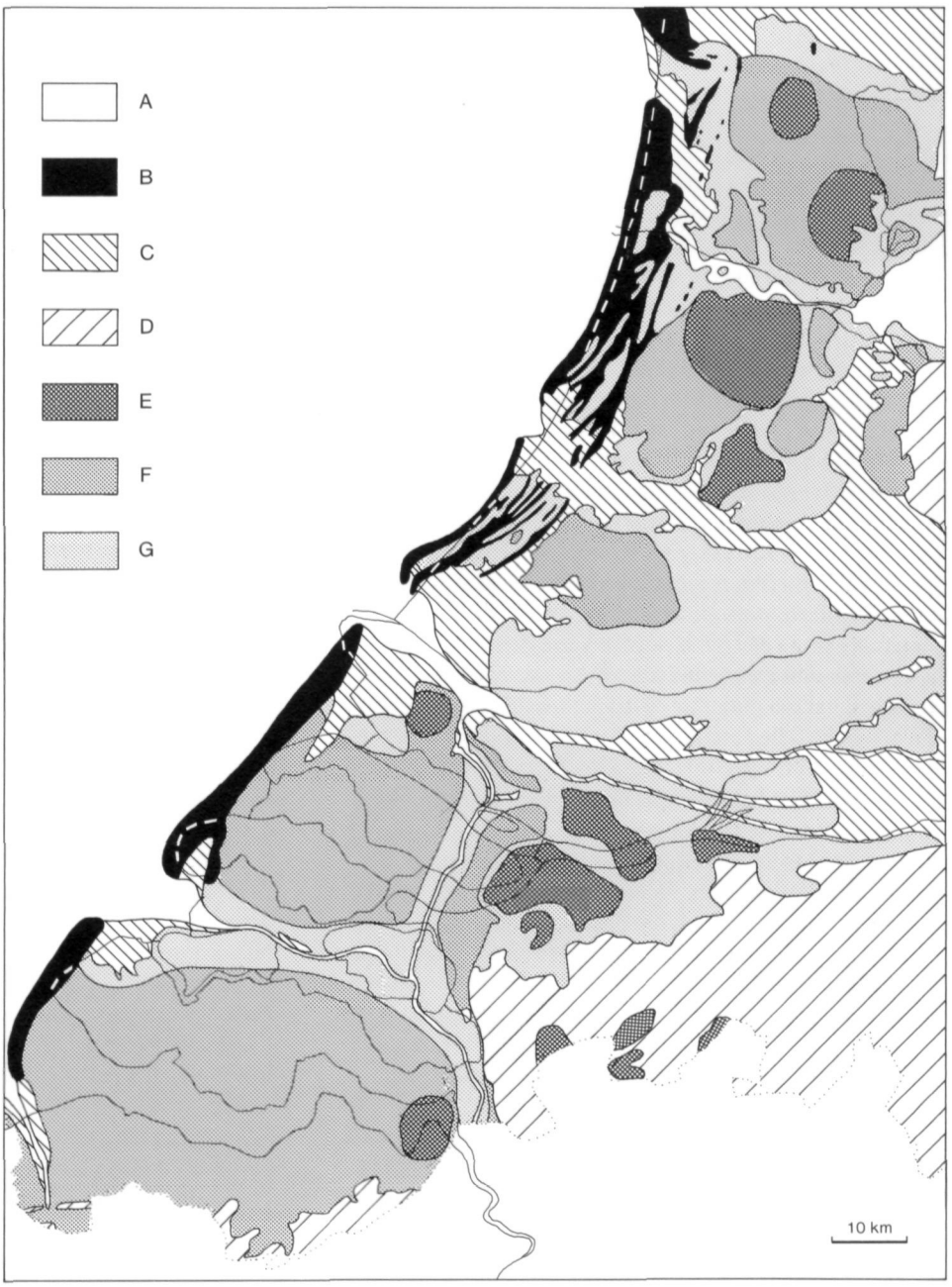

Fig. 6 Palaeo-geographical reconstruction of the western Netherlands around 2000 BP, scale 1:1,000,000 (after Zagwijn 1986; drawing W.J. Kuijper). Legend: A = water, B = coastal dunes and breaches, C = clayey sediments (marine or riverine), D = pleistocene soils, E = raised bogs, F = drained raised bogs, G = fen peats.

Iron Age may, according to him, also have facilitated inhabitation of areas less favourable for arable farming.

On top of the Dunkirk I sediments, a renewal of peat growth occurred locally, and this peat is referred to as "Roman peat" by Van Staalduinen (1979). The distribution of this "Roman peat", *sensu* Van Staalduinen, has been indicated in figure 7.

1.3 Archaeology.

The archaeological record of Voorne-Putten is largely based upon surveys and excavations performed by the B.O.O.R. The R.O.B. also conducted several excavations on Voorne-Putten. Van Trierum *et al.* (1988) and Van Trierum (*in press*) discuss the state of research.

Before the deposition of Dunkirk sediments, the area was inhabited during Neolithic times on a relatively small scale. Near Hekelingen, inhabitants established themselves on a levee (Louwe Kooijmans 1986). This inhabitation is considered non-permanent (Van Gijn 1989: 132). Near Hellevoetsluis, a fragment of a Late Neolithic flint axe was found, while near Abbenbroek a complete specimen was discovered (Van Trierum *et al.* 1988). No Bronze Age habitation is demonstrated on Voorne-Putten. Van Trierum *et al.* point to the large scale peat growth during these times as an important reason for the lack of Bronze Age habitation. Besides, the subsistence strategy of Bronze Age man may have excluded inhabitation of peaty areas (Louwe Kooijmans *in press*). This picture changes dramatically with the onset of the Iron Age.

Early Iron Age habitation is only known from the area around the Bernisse (see Döbken *et al. in press* and *fig. 8a*). The peat growth stagnated locally in the beginning of the Subatlantic, thus allowing habitation which can be dated between 725 and 525 BC (Van Trierum 1986; Van Trierum *et al.* 1988). All the Early Iron Age settlements known are situated in a peaty environment and the remains are covered with peat as well. Renewed peat growth apparently impeded further habitation. On Voorne-Putten, there is no clear connection between the Early Iron Age habitation and a trans- or regression-phase of the sea.

The next phase of human settlement on Voorne-Putten (phase 2) belongs to the Middle Iron Age. This phase dates between 425 and 200 BC (Van Trierum 1986; Van Trierum *et al.* 1988). There is a hiatus between the Early and Middle Iron Age inhabitation. The Middle Iron Age settlements are located on top of the Holland peat and are mostly covered with clayey Dunkirk I deposits. Almost all the known settlements from this period are also located in the area around the Bernisse, two Middle Iron Age settlements are known from western Voorne (cf. Döbken *et al. in press*; see *fig. 8b*).

After the deposition of Dunkirk I sediments, a third phase of Iron Age habitation on Voorne-Putten took place in the Late Iron Age. This phase can be dated to c. 200-25 BC in the area concerned. The Late Iron Age settlements do not only occur around the Bernisse, as their Early and Middle Iron Age precursors did; there is also a cluster of Late Iron Age settlements on western Voorne (see Döbken *et al. in press*; *fig. 8c*). According to Van Trierum (*in press*), the material culture of the Late Iron Age habitation is closely linked to that of the Middle Iron Age, which indicates a direct continuity, despite the separating barrier of Dunkirk I deposits. The discovery of these Late Iron Age sites disproves the assumptions of Hallewas and Van Regteren Altena (1979: 97) that the Dunkirk I sediments on Voorne-Putten were not colonized before the Roman Period.

In the northern Dutch coastal area, man defended settlements against the transgressive sea by raising dwelling mounds ("*terpen*") as early as the Middle Iron Age (Waterbolk 1979). On Voorne-Putten, however, no dwelling mounds were raised during the Iron Age. The only increase in height of the inhabited sites arose through the gradual accumulation of settlement waste.

The key position of the Dunkirk I sediments in the stratigraphy of Iron Age sites on Voorne-Putten is summarized by Van Trierum (1986), his schematic stratigraphy is given in figure 9. Van Trierum *et al.* (1988) showed a good correlation between the stratigraphic position of the sites and the pottery assemblages the sites produced. In phase 1, over 35% of the pottery is roughened, this percentages becomes less in phase 2 and nears zero in phase 3. Decoration shows the reverse trend, it increases from phase 1 to phase 2 and is most abundant in phase 3. In phase 1, the rim decoration is located on top of the rims, in phase 2 a few rims show a decoration on the outside, while in phase 3 the majority of the rims have a decoration on the outside.

A combination of stratigraphic and pottery data makes dating of a site possible. This is also the case when a site is only known from surveys and has not been excavated.

As in the Late Iron Age, habitation during the Roman Period is mainly on the Dunkirk I deposits. Apart from these settlements on clay, a few settlements on peat are also known from Voorne-Putten during the Roman Period. Both Voorne and Putten were inhabited during this period (see *fig. 8d*; Van Trierum *in press*). In view of the great differences in hand-made local pottery found on the Late Iron Age sites on the one hand and in Roman contexts on the other, Van Trierum (1986) and Van Trierum *et al.* (1988: 39-40) argued for a distinct discontinuity between the inhabitation during these periods. Van Heeringen (1992) shares this opinion. Apart from local hand-made pottery, the pottery assemblage from the Roman Period is characterized by the presence of imported wheel-turned ware. Van Trierum *et al.*, however, did not exclude the possibility that early Roman sites do not contain imported pottery, but also hand-made pottery would indicate the sites to belong to the Roman Period.

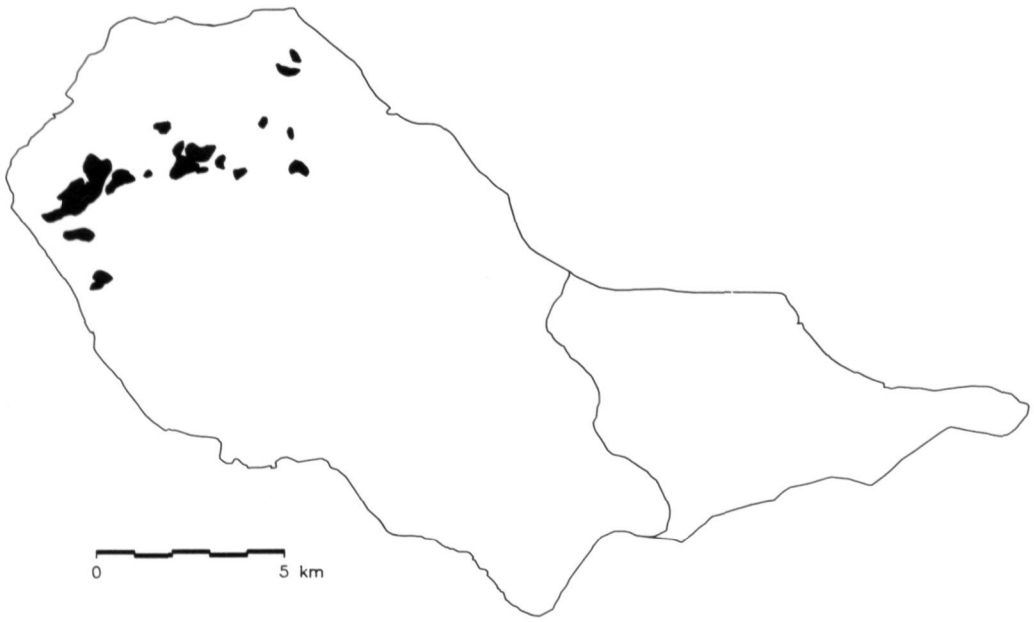

Fig. 7 Location of "Roman peat", scale 1:2000 (after Van Staalduinen 1979).

An important point is the representativity of the distribution of the sites on Voorne-Putten. The detection of sites depends upon several factors. Primarily, the accessibility of an area in pre- and protohistoric times directed where former habitation would be possible. Ideally, this factor directs the patterns on distribution maps of former habitation areas. However, other factors also influence the possibility of discovering an archaeological site in the area. One of these factors is the thickness of the medieval Dunkirk III deposits covering all traces of habitation of the Iron Age and Roman Period. The fact that these deposits are considerably thicker in the western than in the eastern part of the area, decreases the chance of retrieving pre-medieval sites on (western) Voorne. The Dunkirk III sediments not only covered traces of former habitation, the creeks belonging to this system also eroded previous deposits. Especially the banks of the Meuse were completely cleared away. Hallewas and Van Regteren Altena (1980: 193) mentioned that due to the Helinium shifting southeastwards in and after the 12th century, the northern parts of Voorne and Putten were eroded. Iron Age and Roman habitation on the levees of the Meuse can therefore not be demonstrated. Similarly, possible clastic sediments along the Bernisse dating from the Late Iron Age or the Roman Period also can no longer be observed. The widening of the existing water courses during Dunkirk III transgression(s) have eroded the earlier banks of the Bernisse too. Since the Older Dunes have also been destroyed during post-Roman transgressions, only the wetland component of the former landscape is still preserved, and the same holds true for the location of archaeological sites.

A third factor affecting the distribution of sites is the intensity of archaeological research. Excavations have only been conducted on sites that were threatened by building activities, so-called rescue excavations. Furthermore, as a result of the cover of Dunkirk III sediments in the entire area, sites are mainly discovered when intersected by ditches. The presence of these ditches thus is of influence in the distribution of sites discovered through surveys.

One may cautiously conclude that the scarceness of Early and Middle Iron Age sites on western Voorne may be artificial, especially in view of their greater stratigraphic depth.

Based on the stratigraphic record, pottery and often on ^{14}C-datings, 120 sites dating to the periods discussed here are documented[3]. Some of the Roman sites are probably not *in situ*, as they contain redeposited pottery in Dunkirk III creeks.

From the Early Iron Age (phase 1), Van Trierum *et al.* (1988) and Van Trierum (*in press*) presented seven sites, of which five are certain settlements (see *fig. 8a* and *6.6.1*). Three of these sites have been excavated and yielded remains of farmsteads. According to Van Trierum (*in press*) these sites were inhabited for a relatively short time as the farms were hardly or not at all restored or rebuilt. The settlements are located on higher terrains in the peaty landscape, in the

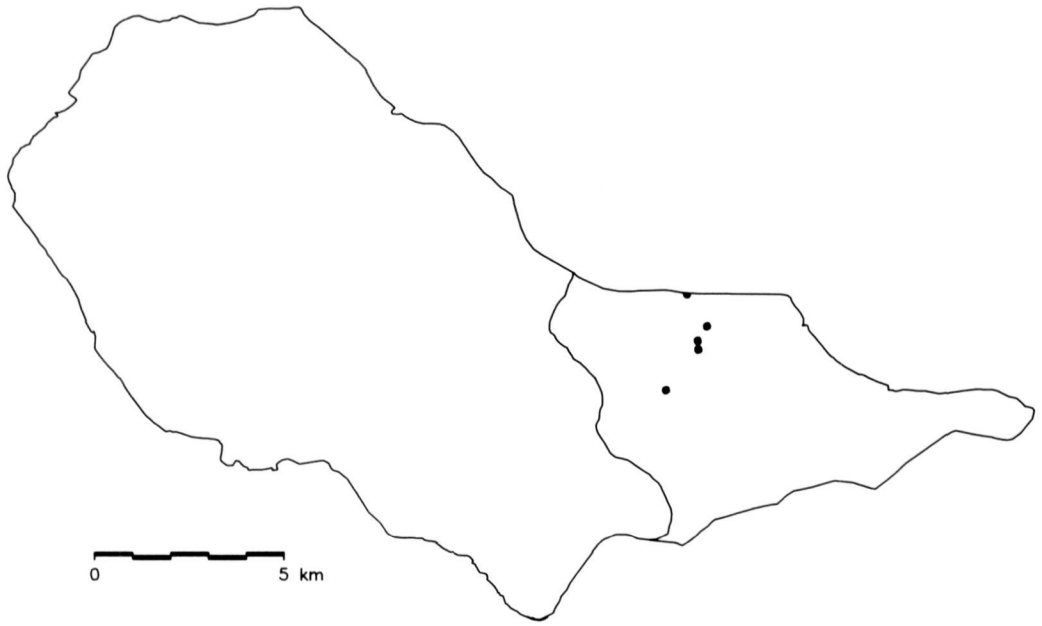

Fig. 8a Location of Early Iron Age settlements on Voorne-Putten (after Van Trierum in press).

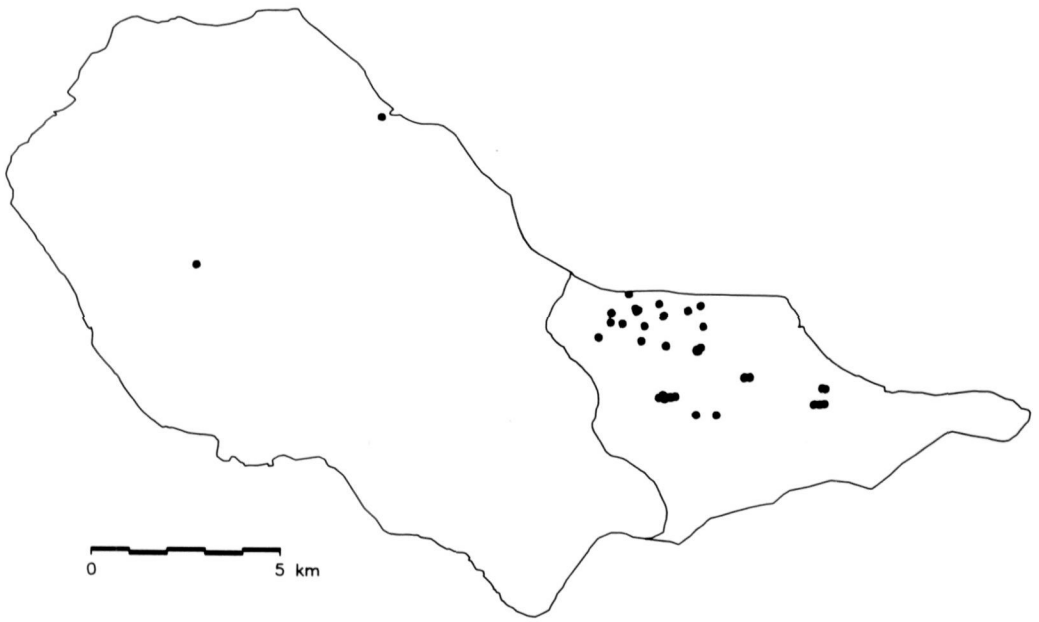

Fig. 8b Location of Middle Iron Age settlements on Voorne-Putten (after Van Trierum in press).

vicinity of small streams. The fact that the Early Iron Age settlements are covered by peat demonstrates that the drainage stagnated, probably precluding further habitation.

Figure 8b presents the distribution of the 35 settlements belonging to the Middle Iron Age (phase 2). According to Van Trierum, the Middle Iron Age sites were inhabited for a longer period in view of the thick habitation layer that developed here. Furthermore, the excavated site of Spijkenisse 17-34 showed an extension of part of the farm (see below). The Middle Iron Age sites are again located in the near vicinity of creeks.

Twenty-six settlements are known from the Late Iron Age

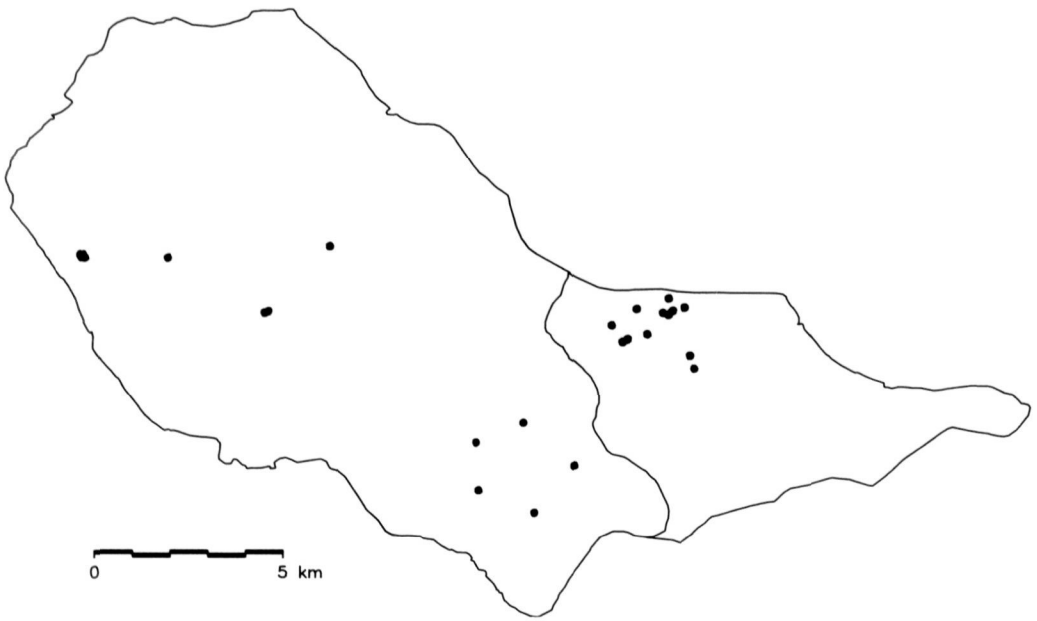

Fig. 8c Location of Late Iron Age settlements on Voorne-Putten (after Van Trierum in press).

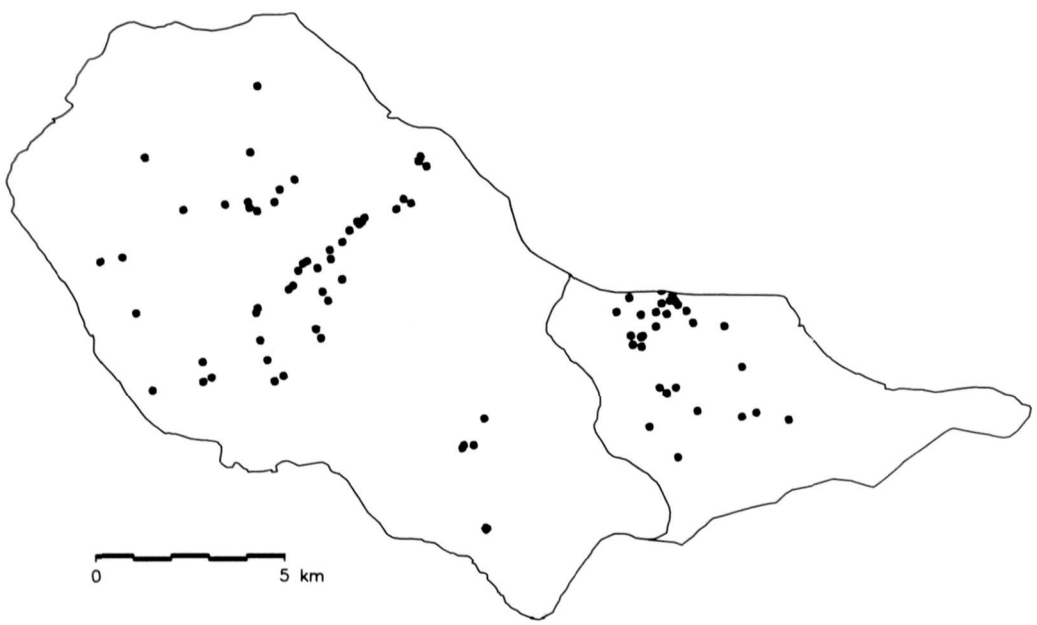

Fig. 8d Location of Roman Period settlements on Voorne-Putten (after Van Trierum in press).

(phase 3). According to Van Trierum, the Late Iron Age habitation has a greater distribution area than that of the Middle Iron Age, mainly in southwestern direction along the Bernisse. The sandier Dunkirk I sediments northeast of the Bernisse show the largest concentration of Late Iron Age habitation. A second cluster of Late Iron Age sites is located in the western part of Voorne (see *fig. 8c*). This area was very sparcely inhabited prior to the Late Iron Age (compare *fig. 8a; 8b*). The settlements in this western part of Voorne are located on peaty soils.

With the onset of the influence of the Roman Empire, drastic changes occurred in the Netherlands. After Caesar's

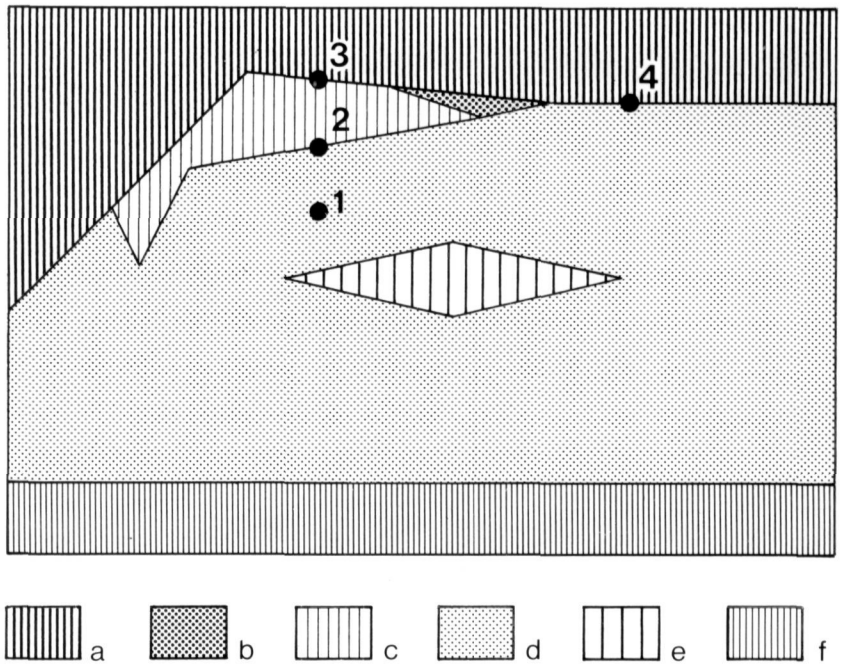

Fig. 9 The relation between stratigraphy and habitation on Voorne-Putten (after Van Trierum 1986).
1 = Early Iron Age
2 = Middle Iron Age
3 = Late Iron Age or Roman Period
4 = Middle or Late Iron Age or Roman Period
a = Dunkirk III
b = Roman Peat
c = Dunkirk I
d = Holland Peat
e = Dunkirk 0
f = Calais IV

unsuccessful attempts to conquer the northern Gallic tribes (57-52 BC), Augustus' stepson Drusus did succeed. In 12 BC the whole area of the Netherlands was occupied. For the Netherlands, this date can serve as the *caesura* between the (pre-Roman) Iron Age and the Roman Period (Willems 1986). In 47 AD the Romans, after attempting to occupy Germany up to the Elbe, withdrew when Claudius ordered Corbulo to stop his expeditions and to cease his occupation of the northern part of the Netherlands. The Older Rhine, with its estuary near Katwijk (30 km north of the Meuse estuary) was chosen as the frontier (*Limes*) of the Empire. It would last for the following four centuries. Along the *Limes*, a series of military forts (*castella*) were erected. The autochthonous settlements of this time are referred to as "native Roman".

Voorne-Putten was included in the Roman Empire from 12 BC onwards. It became part of the administrative province of *Germania Inferior*. The wars appear to have had a strongly disintegrating effect upon the native societies in the occupied area. Numerous new groups settled there, at the expense of the former inhabitants. The new inhabitants of Voorne-Putten probably were the *Sturii* (Van Es 1981; Willems 1986).

The Roman habitation on Voorne-Putten ended between c. 200 and 270 AD (Van Trierum *in press*). The gap between the Late Iron Age and the Roman Period is also apparent in the pottery remains (Van Trierum 1986; Van Trierum *et al.* 1988). The house plans also show distinct differences between the (Late) Iron Age and the Roman Period (see below).

From the Roman Period, a total of 88 settlements are known. Two Roman culverts, which served for drainage, were found as well.

Figure 8 shows the location of the settlements in the respective periods. The Iron Age sites are mainly concentrated around the small area along the Bernisse. In view of these site distributions, it is significant that the Dunkirk I deposits are limited to two separate areas. One is situated on western Voorne and the other one around the Bernisse. In the area in between an extensive area of Holland peat is present (Van Staalduinen 1979: 57). It consists of oligotrophic on top of eutrophic peat (Van Staalduinen 1979: 54). This peaty landscape is likely to have been hostile to habitation because of its wetness (cf. Bloemers 1978: 87). According to Zagwijn (1986), most of this peat growth ceased during the Roman Period. The distribution of Roman sites takes up a considerably greater territory than the Iron Age sites, including parts of the peaty area outside the Dunkirk I sedimentation area.

1.3.1 THE ARCHAEOLOGICAL SITES

Detailed information on settlement structures is available from excavated sites. Before discussing these data, some introductory remarks on former architecture seem appropriate. The remains of the farms that were excavated, had been preserved due to a high water table. As a result, parts of the wooden structure are still found. Mainly the underground remains from the construction elements are preserved. The farms usually consist of a wall and one or more rows of internal posts. It is assumed that the roof was

carried by both the central posts and the wall. In some cases, posts are situated outside the wall and probably served as roof supports as well. If one row of central posts is present, the farm is two-aisled. Two parallel rows of central posts result in a three-aisled farm. Usually, the farms can be subdivided in a living area and a part for housing domestic animals. In this part (byre or barn), partitions (stalls or bays), in each of which two head of cattle or other domesticates could have been housed, are often preserved. Both the living part and the byre are under the same roof. The living area often has wider-spaced roof supporting posts than the barn part. The internal subdivision of the excavated farms does not differ significantly from contemporary upland sites.

All excavated farms are single farmsteads, dense clusters of sites do not occur. Van Trierum (*in press*) provided most of the following details on the excavated settlements.

1.3.1.1 The Early Iron Age.

The three Early Iron Age sites excavated are Rotterdam-Hartelkanaal 10-69; Spijkenisse 17-30 and Spijkenisse 17-35. The site of Rotterdam-Hartelkanaal produced a two-aisled farm, measuring 10 x 4.5-5 m. In the southern part a byre with six stalls can be reconstructed (Van Trierum *in press*). The excavation of Spijkenisse 17-30 resulted in the discovery of a three-aisled farm of 15 x 5 m. In the southeastern part six stalls for housing livestock are present (see also Van Trierum *et al.* 1988). The location Spijkenisse 17-35 also produced a three-aisled construction, measuring at least 17 x 5 m. The full length cannot be reconstructed due to a recent ditch disturbing the site. Ten to twelve stalls are present in the northeastern part of the farm. According to Van Trierum (*in press*), all excavated Early Iron Age sites yielded relatively little settlement waste. A habitation layer could hardly or not be observed. On the site of Spijkenisse 17-30, for instance, only 6.3 kg of pottery fragments were found, which is very little for an uneroded farm. These fragments belonged to a minimum of 17 pieces of pottery, which is an indication for a relatively short time of habitation.

1.3.1.2 The Middle Iron Age.

Seven excavations on Middle Iron Age sites have been conducted to date. They are Spijkenisse 10-28, 10-46, 17-34, 17-35, 18-50 and 18-92/93 and Simonshaven 17-14. Only Spijkenisse 10-28, 17-34 and 18-50 produced parts of farms, the others yielded potsherds, posts and sometimes former ditches. The excavated Middle Iron Age farms are longer than their Early Iron Age counterparts. Spijkenisse 10-28 yielded a three-aisled farm, which measured at least 19 × ca. 5.5 m. Ten stalls were present in the eastern part of the building. This site was not sampled for botanical macroremains, as this was not yet common practice at the time of excavation. Spijkenisse 17-34 revealed the remains of a 20 m long house; the width cannot be measured due to a recent ditch, but will not have exceeded 5.5 m. In a second building phase the length was enlarged with 4 m in a northeasterly direction. The living area of this farm is 7.5 m long. The number of stalls in the barn is not known with certainty. At least three stalls can be reconstructed in the central part of the length axis, this part has a length of 5 m. Next to this part, an area of 2 m length, filled with plant material and dung on a relatively clean subsoil occurred. This area may have been a hall. The following area of 5 m length had a corduroy floor of unsplit trunks, and also contained a hearth. The function of the last area is uncertain, it may have been a work area. The site of Spijkenisse 17-34 yielded 73 kg of pottery remains, more than ten times the amount of the Early Iron Age site of Spijkenisse 17-30.

The site of Spijkenisse 18-50, excavated in 1978, only produced part of the byre of a farmstead. The width of the farm measures ca. 5.7 m, the building was probably three-aisled. Samples for botanical macroremains research were not collected.

Observations through detailed corings on settlement sites, as well as through outcropping habitation layers in intersecting ditches and through excavations demonstrated that the inhabited areas do not exceed 40-50 m in diameter (Van Trierum *in press*).

1.3.1.3 The Late Iron Age.

The only excavated complete Late Iron Age farm, unearthed at the final stage of the present research, is Rockanje 08-52 on eastern Voorne. Besides, Wind (1970) described the find of settlement waste in a section near Rockanje (site 08-06). The excavated farm of 08-52 measures 21 x 5.5 m and is three-aisled. This farm is slightly longer than the Middle Iron Age farms. Twelve stalls are present in this farmstead and the orientation is east-west. The site is located on an oligotrophic bog cushion. In the vicinity of this settlement, several other habitation sites were present on similar bog cushions. Remarkably enough, one cushion had remained uninhabited. Excavations in 1991 on this terrain revealed very interesting traces. The stratigraphy of the natural peat deposits was completely destroyed in strips of 6.5 and 13 m width to a depth of c. 30 cm. In some places, pieces of pottery and dung occurred. At either side of the strips, the natural stratigraphy was undisturbed. The boundaries between the destroyed and the undisturbed strips were very often as straight as an arrow. The widths of the disturbed and undisturbed strips was very variable, the length could not be assessed.

In view of the perfectly straight borders of the strips, a natural cause for the destruction of the stratigraphy can be ruled out. Man must have caused this phenomenon. The fact that the overlying Dunkirk I deposit is undisturbed

indicates that the disturbance must have taken place in the (Late) Iron Age.

The first explanation that comes to mind is that we are dealing with cultivated plots or gardens (see also the discussion in Van Trierum *in press*). Palynological investigations could probably offer support for this hypothesis, especially if pollen of cultivated plants are present. However, the few results obtained to date are negative, pollen of crop plants nor those of unambiguous crop weeds could be demonstrated[4]. As an alternative function for these strips has not yet been suggested, small-scale cultivation of some crops on a peaty soil must be considered a possibility.

As has been observed, the "arable fields" as well as the Late Iron Age sites near Rockanje are both covered with Dunkirk I sediments. Two ^{14}C dates from Rockanje are of interest in this respect. The peaty base of the Dunkirk I sediment on top of the site of Rockanje 08-52 has been dated at 2050 ± 30 BP (GrN-18635; see also *2.4.7*). Hallewas and Van Regteren Altena (1979) mentioned a ^{14}C date of 2060 ± 50 BP (GrN-6401) for a wooden post from the Late Iron Age site of Rockanje 08-06. There is possibly hardly any time lag between the abandonment of the settlement and the beginning of the deposition of the Dunkirk I sediments. The fact that the Late Iron Age level occurs below the Dunkirk I sediments on western Voorne contrasts with the situation along the Bernisse on Putten. In the latter case, the Late Iron Age is found on top of the Dunkirk I sediments (see *fig. 9*). As the ^{14}C dates do not indicate a difference in date between the Late Iron Age sites on Voorne and Putten, the deposition of Dunkirk I sediments in the area studied must have been asynchronous (see also Hallewas/ Van Regteren Altena 1979).

1.3.1.4 The Roman Period.

Excavations on native Roman sites in the area produced several houseplans (cf. Van Trierum *et al.* 1988; Van Trierum *in press*). In Nieuwenhoorn, dendrochronologically dated to the first and early second centuries AD (cf. Vermeeren/ Brinkkemper *in prep.*; *3.1.6*), four farms were built one above the other, all were three-aisled and measured 25-33 × 5-7.5 m. Again, there is an increase in size compared to the preceding Late Iron Age. The roof-supporting posts showed a gradual shift towards the walls, resulting in an increasingly wider central aisle. In Simonshaven, two farms on top of each other were found. The older one was the smaller (17 × 4.5 m) and was probably two-aisled. The younger and larger one (22 × 6.5 m) only revealed one heavy central roofpost in the eastern part of the building. It was probably essentially one-aisled (Van Trierum *et al.* 1988; Van Trierum *in press*). Near Rockanje II, three houseplans were found. Of one, only a corner could be excavated, making the division unclear. The second house was situated at a distance of 15 m from the first one. Two building phases could be distinguished. The older phase revealed an almost square building, which was one-aisled and measured ca. 7 × 6 m. The younger building measured ca. 16 × 7.5 m and was three-aisled. The third house was a one-aisled house with an A-frame, the corner posts standing at an angle of 66°. It measures 12 × 5.5 m. The two posts will have joined at a height of 3.7 m above the ground, thus indicating the height of the farm (Brinkkemper *et al. in press*). The native Roman farms excavated in Rockanje are relatively small.

In comparing the Iron Age sites to those of the Roman Period, some points are of great interest. Firstly, the obvious stalls in the Iron Age houseplans are absent in the Roman Period. Secondly, the excavations of the native Roman sites of Simonshaven and Rockanje have produced large granaries with heavy posts (15 and 16 posts respectively). Their floor area is 22.4 and 16 m^2. The fact that the excavation of Nieuwenhoorn 09-89 did not produce a granary is not conclusive as the trench did hardly extend beyond the house walls. In contrast, the Iron Age sites of the area did not produce a single granary. Iron Age settlements on mineral soils in the coastal area often did reveal granaries (Van Heeringen 1992: 313-318). The relevance of these differences will be further discussed in relation to the economic reconstructions (see *ch. 6*).

Apart from these clearly native, wooden Roman farmsteads, some finds in the west of Voorne indicate the possible presence of buildings in stone. Hoek (1970) reported on a written source from 1752 by Jan Kluit. He mentioned a stone-built structure found beyond the present coastline, northeast of Oostvoorne. According to Hoek, it probably concerns the remains of a Roman *castellum*. Bogaers (1974) also made plausible the presence of a Roman *castellum* in the area of the *Helinium*, largely based on graffiti on several objects.

Near Rockanje, Bogaers (1952) found tuff stone (with remarkable little mortar), blue building stones, originating from Namen, many fragments of roof tiles (*tegulae* and *imbrices*) and some round *hypocaust* tiles and *tubuli* fragments. The last two are parts of the Roman heating system. This site is dated to the latter half of the second and the first half of the third century AD. It reminds one of the finds on the excavated Roman *villa* near Rijswijk (cf. Bloemers 1978). The aforementioned excavated native Roman site of Rockanje II is situated ca. 3 km south of the site that Bogaers discussed.

notes

1 When the "Iron Age" is mentioned in this publication, it always refers to the "pre-Roman Iron Age". As Voorne-Putten was part of the Roman Empire from 12 BC onwards, this period is referred to as the "Roman Period", which corresponds to the Roman Iron Age outside the borders of the Roman Empire.

2 BC (= Before Christ) and AD refer to calendar years before and after the start of the Christian era, BP refers to uncalibrated, conventional ^{14}C datings.

3 The Maasvlakte, which consists of sand from the Meuse, artificially deposited for industrial purposes, yielded remains from a large range of archaelogical periods. These remains are not *in situ* and will be left out of consideration here.

4 Three samples have been subjected to pollen analysis. They were obtained from the disturbed layers (the "arable fields"). Despite the fact that pollen were well preserved in the uppermost two samples, crop plants, for instance Cerealia-type pollen (larger than 40 μm, with annulus diametre larger than 2 × pore diametre and a clearly bordered annulus) could not be demonstrated.