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Man and environment in the marsh area of Schleswig–Holstein from Roman until late Medieval times

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Abstract

Reconstruction of coastal development, environment and settlement history is one of the main objectives of coastal archaeology in Schleswig–Holstein. The fieldwork program concentrated until 1975 on the excavation of dwelling mounds, and after that on the reconstruction of the landscape and settlement history of large areas. Cultural elements of the coastal area were mapped in several surveys integrating archaeological, geological and palaeobotanical aspects on the island of Sylt (Archsum project), in the North Frisian tidal flats (Norderhever project), on the Eiderstedt peninsula, and in Dithmarschen.

According to this kind of research, environmental changes dominated the settlement history and settlement pattern in the 1st millennium AD. Archaeological finds and excavations indicate that the earliest coastal settlements were founded in the salt marshes of Schleswig–Holstein in the early Roman period. In Dithmarschen as well as in the southern part of Eiderstedt the river marshes and salt marshes were densely populated during this period. In the 1st and 2nd century AD the inhabitation of the area took place in a phase of lowering of the sea level. The settlements were erected on the natural surface of the coastal marshland, preferably on elevated areas. Thereafter, a rising sea level and intensified flooding led to the abandonment of some settlements. At other localities the inhabitants protected themselves against the storm surges by the construction of dwelling mounds, so-called *Wurten*. The first phase of inhabitation of the coastal marshland ended at about AD 450. A second phase of inhabitation of the coastal marshes began in the middle or late 7th century AD. It started with new settlements on the natural land surface of the marshland and was followed by a second phase of *Wurt* construction.

The present-day North Frisian tidal flat area was covered with extended peat bogs and could not be inhabited before high Medieval times. Starting with this period the natural landscape changed to a cultural landscape. Cooperatives of peasants and the parishes played an important role in this process. Dikes were built and deep seated areas were drained and cultivated. In the late Middle Ages catastrophic storm floods had terrible effects: the sea destroyed large parts of the North Frisian *Utlände*. Remnants of this period like *Warften*, dikes, field pattern, and churches, are still visible in the present-day tidal flats. The unfavourable combination of human activities (peat cutting for salt production) and natural geological processes was responsible for the catastrophic floods of late Medieval times.

Cultural monuments of this evolution are still preserved in the coastal landscape. The protection of the Cultural Heritage is of high value for the future.

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1. Previous work and new research

In contrast to other landscapes, the development of environment and the history of settlement and economy in the salt marshes were dominated for a long time by nature, more particular by the changing impact of the sea. The wetland landscape was significantly modified during the late Holocene as a result of the rising sea level (Ehlers, 1988). The transformation of the coastal landscape, economy and settlement from the first inhabita-

tion of the marshes 2000 years ago until these days is a fascinating topic. The many questions dealing with this theme, such as coastal changes, man and environment, economics, mobility and stability of settlements can only be pointed out by interdisciplinary research. Archaeological investigations in the coastal area of the North Sea in north-western Germany have been focused on the historical evolution of the environment and human settlements in the wetlands. Mainly on the basis of mapping and archaeological surveys of dwelling mounds (*Wurten*, *Warften*), dikes, and archaeological finds, consistent studies on settlement archaeology, paleobotanic remains, historical geology and historical

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geography of different marsh areas were carried out (Kossack et al., 1984). Excavations on the *Wurten* and of dikes illustrate the interdependence of prehistoric settlements on the landscape development, which in turn was affected by the sea. These studies elucidate to which extent man has modified the landscape since the high Medieval period by diking, draining and colonization of swamp areas and peat lands.

The landscape at the North Sea coast of Schleswig–Holstein, which comprises Dithmarschen, Eiderstedt and North Frisia (Fig. 1), consists predominantly of Quaternary glacial and postglacial deposits. The landscape development and settlement history of the salt marshes in Schleswig–Holstein has been well established in the last 50 years (Tables 1 and 2). Initially, Bantelmann (1955, 1957/1958, 1975) excavated *Wurten* of the Roman period and early Medieval times, including Toting and Elisenhof in Eiderstedt, and Ostermoor in Dithmarschen (Fig. 1). Between 1975 and 1979, high and late Medieval *Warften* have been excavated during the “Norderhever-Project” on the North Frisian Islands of Föhr and Pellworm and the so-called *Hallig*-islands, relics of former coastal marshland

which occur in the present-day tidal flats around the tidal channel of the Norderhever (Müller-Wille et al., 1988). Based on the results of these excavations and on geological investigations (Hoffmann, 1988) as well as mapping of the cultural heritage the history of the landscape was described (Müller-Wille et al., 1988; Vollmer et al., 2001).

The settlement research and mapping of cultural heritage was continued in Eiderstedt and Dithmarschen (Meier, 2001a, b). Based on these results, excavations of settlements which stem from the Roman period have been carried out in Dithmarschen, such as Tiebensee (Meier, 2001a), Haferwisch (Meier, 2001a), and Süderbusenwurth (Meier, 2001c) as well as from early Medieval times such as Wellinghusen (Meier, 2001a) and Hassenbüttel (Meier, 2001a). Additionally, *Warften* and dikes from high and late Medieval times have been excavated in Eiderstedt (Fig. 1) between 1989 and 2002 (Meier, 2001a).

2. Landscape development

The North Sea coast of Schleswig–Holstein extends from the estuary of the river Elbe in the south as far as the Danish border in the north and includes the counties of Dithmarschen and North Frisia. The eastern border of the coastal region is formed by a hilly landscape, the so called “*Geest*”, which consists of Pleistocene deposits of the Saalian glacial period (Fig. 1). During the rise of the sea level the North Sea reached the Pleistocene deposits at about 6500 years ago, formed erosional cliffs and caused a longshore transport of the reworked material (Hoffmann et al., 1997). Since 4500 years ago beach ridges developed. Cut off from the sea by these sand barriers, extended areas of the present-day eastward part of the North Frisian tidal flats were covered with peat bogs. Sandy marine sediments were deposited on the seaward side of the beach ridges, and a tidal flat and first salt marshes developed at about 2500 years ago (Hoffmann, 1988).

Since 10,000 years ago the natural environment of the landscape of Dithmarschen was woodland with lakes and some bays which extended far inland. This environment provided good resources for hunter-gatherer groups. Sites such as Fedderingen (Lübke, 1991; Arnold, 2000) indicate that the coastal areas were used for fishing, hunting and flint search from the hunter-gatherers during the Mesolithic period. Near Ecklack a pot of the late Mesolithic Ertebölle-Ellerbek culture was found, which was covered with 3 m of sediments. This find indicates that possibly the settlement was inundated in the late Mesolithic period.

During the Neolithic period the forest on the Pleistocene areas were partly cleared by the first farmers. Numerous graves of the Neolithic and Bronze Age occur

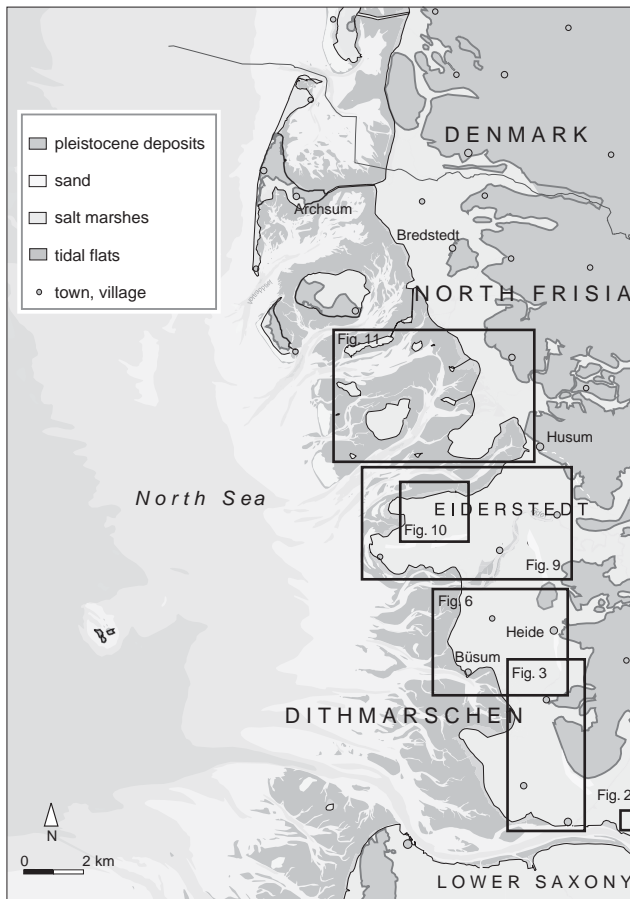


Fig. 1. North Sea coast of Schleswig–Holstein, Germany, with position of the detailed maps. Design: D. Meier.

Table 1
Larger archaeological excavations in the salt marshes of Schleswig–Holstein

Settlement	Location	Time interval	Publication
Hodorf	Stör marsh	Roman period	Haarnagel (1937)
Ostermoor	Dithmarschen	Roman period	Bantelmann (1957/1958)
Süderbusenwurth	Dithmarschen	Roman period	Meier (2001c)
Tiebensee	Dithmarschen	Roman period	Meier (2001a)
Haferwisch	Dithmarschen	Roman period	Meier (2001a)
Tofting	Eiderstedt	Roman period	Bantelmann (1955)
Wellinghusen	Dithmarschen	Early Medieval times	Meier (2001a)
Hassenbüttel	Dithmarschen	Early Medieval times	Meier (2001a)
Elisenhof	Eiderstedt	Early Medieval times	Bantelmann (1975)
Welt	Eiderstedt	Early Medieval times	Meier (1997)
Lütjenbüttel	Dithmarschen	High and late Medieval times	Unpubl. report (Meier)
Norderbusenwurth	Dithmarschen	High and late Medieval times	Unpubl. report (Meier)
Hundorf	Eiderstedt	High and late Medieval times	Meier (2001a)
Norderhever-Project	North Frisia	High and late Medieval and early Modern times	Müller-Wille et al. (1988)
Dike and Location		Time	Publication
St. Johannis Koog	Eiderstedt	High and late Medieval times	Meier (2001a)
Osterhever	Eiderstedt	High and late Medieval times	Meier (2001a)
Dikes on the islands of North Frisia		Early Medieval times, High and late Medieval times	Kühn and Panten (1989)

Table 2
Main results of the *Wurt* excavations in Schleswig–Holstein

Excavation	Period	Dendro-chronological dates	Results
Hodorf	Roman		Single farm yard in a river marsh
Ostermoor	Roman		Ground settlement in a river marsh
Süderbusenwurth	Roman	AD 50–150	<i>Wurt</i> ; larger excavation with well-documented phases
Tiebensee	Roman		Ground settlement with well-documented phases
Haferwisch	Roman	AD 140–168	<i>Wurt</i>
Tofting	Roman		Large village <i>Wurt</i>
Wellinghusen	Early Medieval	AD 691–820	Large village <i>Wurt</i> with well-documented phases
Hassenbüttel	Early Medieval		Large village <i>Wurt</i> with well-documented phases
Elisenhof	Early Medieval		Large village <i>Wurt</i> with well-documented phases and settlement structure
Welt	Early Medieval		Excavation at the edge of the early Medieval <i>Wurt</i>
Lütjenbüttel	High and late Medieval		<i>Wurt</i> , parts of houses
Norderbusenwurth	High and late Medieval		Farm yard as ground level settlement
Hundorf	High and late Medieval		<i>Wurt</i> with well-documented phases

around Albersdorf (Arnold, 2000). From other places, only flint artefacts are known, and no remnants of houses have been found up to now in the former woodlands on the moraine landscape, the peat covered valleys or the coastal marshes. From the pre-Roman period a number of urn graves were excavated in Dithmarschen (Hingst, 1983) which indicate that the promontories of the moraine landscape into the peat covered valleys and the coastal marshes were densely populated at that time.

To the north of the estuary of the Eider River the peninsula of Eiderstedt separates the coastal areas of Dithmarschen and North Frisia (Fig. 1). In the western

part of Eiderstedt east west and north-west south-east trending sandy barrier systems are present (Figs. 1 and 9). These systems probably consist of eroded Pleistocene material which stems from a pre-existing island which may have existed in the present-day Süderoog Sand and Heverstrom areas. The barrier systems of Tholendorf, Garding, and St. Peter are partly covered with dunes. The rise of the long Garding barrier system has protected the hinterland from the influence of the sea since about 2800 BP. To the south of the beach ridges, salt marshes developed since 2500 BP, and to the north peat was formed. When the sea destroyed parts of the North Frisian barrier coast, the north-western part of

Eiderstedt was inundated and younger clay sediments were deposited on the top of the pre-Roman peat, and salt marshes developed at about AD 1000 (Meier, 2001a, b).

The coastal area of North Frisia extends from the peninsula of Eiderstedt in the south as far as the German–Danish border in the north (Fig. 1). Towards the east Pleistocene moraines and melt-water deposits border the coastal lowlands. The islands of Sylt, Föhr, and Amrum which have cores of Pleistocene and locally Tertiary deposits as well as some sandy shoals protect the tidal flat areas towards the west. Large tidal channels divided the tidal flats in subunits. Two larger marsh islands, Pellworm and Nordstrand, exist in the southern part of the North Frisian tidal flat area. Smaller islands, the so-called *Halligen*, are relics of former coastal marshland. At about 4500 years ago the Pleistocene cores and beach ridges formed a graded coastline in the western part of the North Frisian tidal flat area. The eastern part of the area was sheltered from the sea and covered by peat bogs. Many flint artefacts from this area indicate that the peat-covered land was used by hunters and gatherers during the Neolithic and Bronze Age (Harck, 1980). Megalithic graves and flint material are concentrated on the Pleistocene cores of the North Frisian Islands Sylt, Amrum, and Föhr. From the beach ridges in Eiderstedt and Dithmarschen, artefacts also are known from this time. The landscape changed totally since late Medieval times, when storm floods destroyed large parts of these barrier systems and inundated the cultivated land (Hoffmann, 1988). Geological investigations (Hoffmann, 1988) of the coastal Holocene deposits in the North Frisian tidal flats demonstrated that the extent of flooding of this area in the 14th century was influenced by the pre-Holocene relief and by the spatial extension of different facies units of the Holocene deposits.

3. Man and environment

The land use in the undiked marshes reveals a close correlation between topography, settlement, and agriculture. Near to the coast meandering tidal channels formed a landscape with irregular parcelling, which were first inhabited in Roman and early Medieval times. The tidal channels and rivers were used as transport routes between the sea and the hinterland. The salt marshes represent a particular settlement area with very specific ecological conditions. Before diking, which started in the high Medieval times, the extent of salt marshes was much wider than today. Because of their good soils, the salt marshes played an important role in agriculture. In prehistoric times the grassland areas, that were necessary for grazing of cattle, existed naturally in the salt meadows. Whether arable farming was practised under

these extreme ecological conditions has to be proved individually for each settlement. Farming was carried out on a small scale only and was restricted to the natural levees of the tidal channels.

The settlement pattern of the period between prehistoric times and AD 1000 was totally dependent on the influence of the sea. The natural coastal environment comprising salt marshes, freshwater lakes, swamps and bogs as well as beach ridges controlled the economy of human habitation. Since prehistoric times the settlements in the salt marshes were mostly ground settlements (*Flachsiedlungen*) or artificial mounds, called "*Wurten*" in Dithmarschen or "*Warften*" in North Frisia ("terpen" or "wierden" in the Netherlands). As stated by Behre (1988) the presence of prehistoric ground settlements in the clay district of the coastal marshland indicate that in the past the rise of the Holocene sea level was interrupted by periods of standstill or even of lowering of the water level. *Wurten* with their artificially raised settlement levels indicate a larger endangering by storm floods. The height of the different settlement phases above NN (German Ordnance Datum) can be dated. There are variations in the size and the construction of the *Wurten*. Smaller ones were erected only for individual farm houses "*Hauswurten*"; larger ones were built for villages "*Dorfwurten*". The larger *Wurten* of the 1st millennium AD had been raised in the course of longer periods of time and their internal structure shows a series of settling horizons. Above the remnants of older houses, new buildings were erected. Dung and thin clay layers separate the different settling horizons. In contrast, the *Warften*, which were erected since high Medieval times, were raised to a considerable height above the marsh surface. Typical examples of this type are the *Warften* on the *Halligen* in the North Frisia tidal flat area.

The dung layers in the *Wurten* often preserved plant remains, so that the paleoecological conditions can be reconstructed in detail. The position above mean high water of the farm land around the settlements can thus be determined (Behre, 1976). However, the positions of the particular settlements were different, as is shown by the plant communities that have been recorded in different marsh settlements.

4. The first step into the salt marshes: settlements in the Roman period (AD 0–400)

A major event in the settlement history was the inhabitation of the salt marshes and river marshes, which had gradually silted up and had become habitable as the relative sea-level rise slowed down. The seaward part of the wetlands with a low elevation relative to the sea level was generally within the reach of salt water and therefore consists of salt marshes and estuaries where

marine clay and silt are deposited. In Dithmarschen, the seaward part of the salt marshes was silted up to a slightly higher level than the landward parts with peat bogs.

The oldest finds in the salt marsh area of Schleswig–Holstein can be traced back to the older Roman period. During a period of regression at about the birth of Christ, for the first time settlements could be built on the elevated banks along the river Stör (Fig. 2) as well as in the sea marsh areas of Dithmarschen, the southern part of Eiderstedt, and in the Wiedingharde north-west of Bredstedt in North Frisia (Fig. 1).

The marsh area of the river Elbe is one of the wetland areas of Schleswig–Holstein which remained unscreened in a modern systematic manner. Therefore the research results obtained from this area are more than 60 years old. The settlement of the Roman period in the river marshes adapted themselves strictly to the natural conditions: the high riverbanks, tidal-channel-inversion ridges, and the peat zone behind. Archaeological finds, borings and excavations in the Stör marsh have pointed out, that the high river banks were densely populated in the 1st and 2nd century AD. The low lying peat zone gave no possibilities for cattle grazing. The settlements occupied the uppermost parts of the elevated levees which were still forested at that time. These highest parts of the riverbank forests were destroyed by human activities and were not able to regain their territory in later occupation phases because the area was used as grazing grounds and fields. A typical example of a river marsh settlement is Hodorf (Fig. 2), which was excavated in 1935 by Haarnagel (1940). In the excavation, a stable-house of a ground settlement of the 2nd

century AD was unearthed. At the end of the 2nd century AD a *Wurt* was erected at this location, which was subsequently raised until the end of the settlement during the 4th century AD. Possibly at the end or after the phase of habitation the marsh area was flooded.

The settlement of Ostermoor in Dithmarschen is another example of a settlement in a river marsh (Fig. 2). The excavated group of four long stable houses of the 1st and 2nd century AD was situated in a line near a tidal channel on elevated clay deposits of the Elbe river marsh (Bantelmann, 1957/1958). The landward part of the river marsh was covered with peat. The settlement was abandoned after 150 to 200 years because the possibilities for cattle grazing were rather limited. New archaeological, palaeobotanical and geological investigations in the coastal area of Dithmarschen, based on mapping of the cultural heritage, have shown the relationship between settlements and environment from Roman to Medieval times (Meier, 2001a, b). The old salt marshes of Dithmarschen, were first occupied with permanent settlements in the 1st century AD. Previously the salt marshes were possibly used as posture for cattle. The settlements on the Pleistocene sandy soils in Dithmarschen are not well documented. However, mapping of archaeological finds in similar landscapes—like in South West Jutland—have pointed out a high density of settlements at the edge of the moraine areas (Stumann Hansen et al., 1987). Typical settlement pattern on the Pleistocene areas indicate the use of two different environments: the peat covered valleys and the wood areas with clay and sandy soils.

The earliest settlements in the salt marsh are located in long north-south oriented lines, partly on marsh

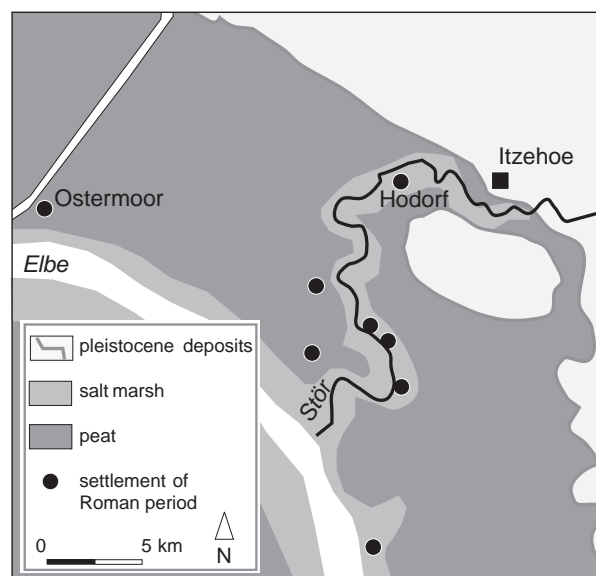


Fig. 2. Stör marsh with settlements of the Roman period (position of the map see Fig. 1).

ridges or other natural elevations. An example of this is a group of large *Wurten* which extends close to the Medieval dike over the old coastal marshes of Dithmarschen (Fig. 3). As indicated by radiocarbon dates from Darrenwurth and Trennewurth and by archaeological finds from Ostermehghusen, some of these *Wurten* were founded in the Roman period. As archaeological and geological investigations have shown, the landward part of the marshland was partly covered with peat. Only small settlements existed on higher sandy ground along the tidal channels. Remains of the peat were documented under some of the *Wurten* of the high Medieval period (Meier, 2001c). The peat in Westerbüttel (KI-3980) south west from Marne (Fig. 3) dates between 1160 ± 35 BP (AD 780–790) and 1140 ± 40 BP (AD 780–985). Peat samples from Volsmenhusen

(KI-3981), also southwest from Marne, date from 1340 ± 50 BP (AD 670–780).

Süderbusenwurth is one of the oldest settlements in the salt marshes. A number of dendrochronological dates give a good overview about the different phases of *Wurt* construction (Figs. 3–5). Larger excavations between 1998 and 2002 have pointed out the existence of *Wurten* with stable houses on a higher ground (+1.50 m NN) near a tidal channel (Meier, 2001c). The salt marshes around the settlement reach only a height of +0.80 m NN. Storm flood layers were documented on the higher parts of the channel bank as well as on dung layers at the edge of the settlement. Therefore storm floods forced the settlers to erect first dwelling mounds at about AD 50 as well as to raise the entire settlement with clay after AD 150. The excavated *Hofwurt* (Figs. 4 and 5), which

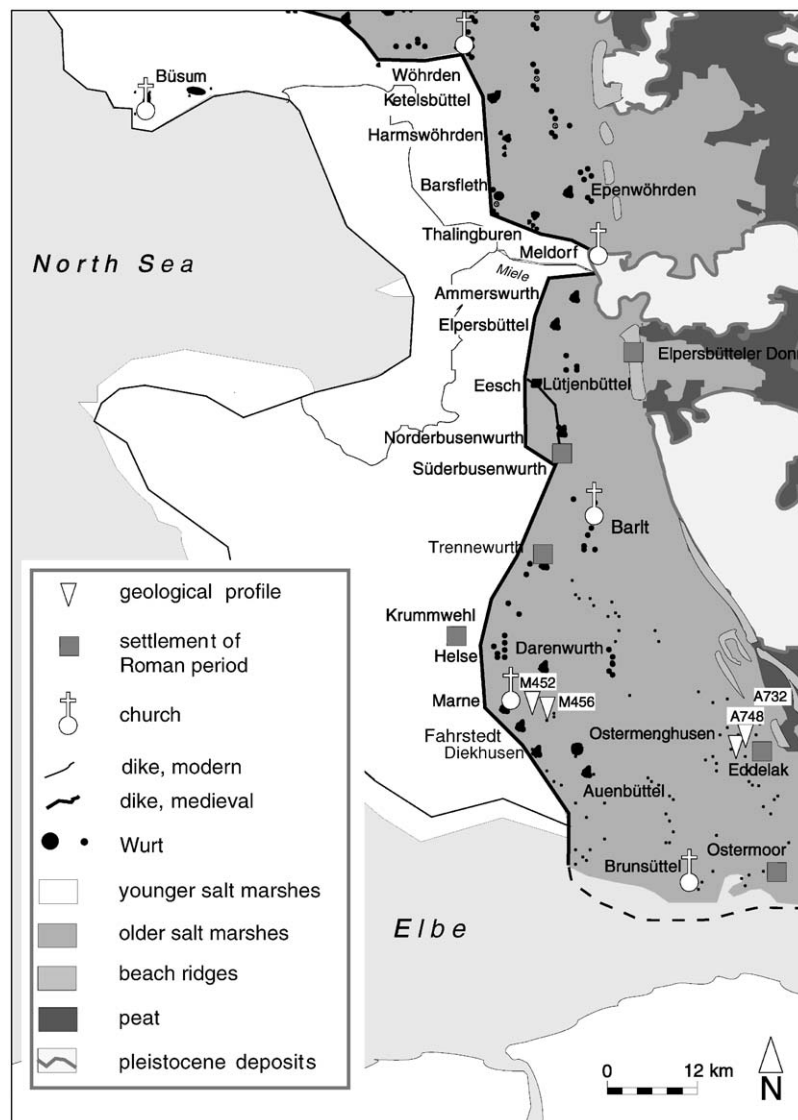


Fig. 3. Southern part of Dithmarschen with *Wurten* of Roman and Medieval times and medieval sea dikes (position of the map see Fig. 1). Design: D. Meier.

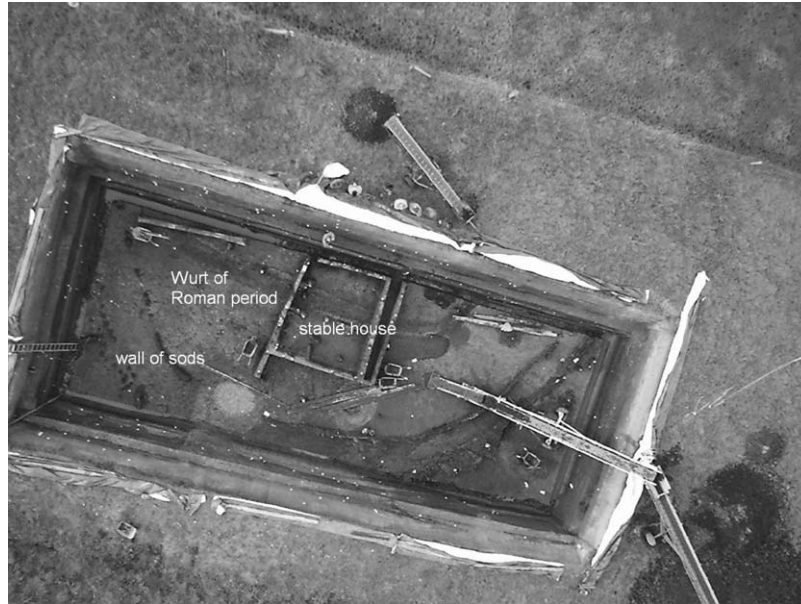


Fig. 4. Süderbusenwirth, Dithmarschen. Air photo of the excavation of the *Wurt* of the Roman period. Photo: D. Meier.



Fig. 5. Süderbusenwirth, Dithmarschen. Excavation of the *Wurt* of the Roman period. Photo: D. Meier.

was raised with dung and clay, was surrounded by a wall of clay sods. At the end of the 3rd century the settlement was abandoned, probably because the low-lying marshland was often inundated. The animal bone analysis from this settlement pointed out that 50% of the animals were cows and 40% sheep (Witt, 2001).

In the northern salt marshes of Dithmarschen, small settlements are arranged along two lines about 2000 to 4000 m to the west of the edge of the Pleistocene hinterland (Figs. 1 and 6). Archaeological excavations have demonstrated the existence of a ground settlement in Tiebensee at a level of +1.00 to +1.30 m NN (Meier,

2001a). Possibly four to six long houses with living quarters and stable boxes for 20 cattle, about 5 m wide and 20 m long, were built on flat sod mounds. The nearby salt marshes provided a good base for grazing cattle. The house places were raised a little in the 2nd and 3rd century. Possibly on account of a higher water level, the settlers abandoned the site somewhat later. Radiocarbon analysis of a peat collected to the north of Tiebensee in Hemme (KI-2105) yielded an age of 1790 ± 55 BP (AD 40–380). This gives evidence that peat bogs expanded over the landward part of the salt marshes during the late Roman period.

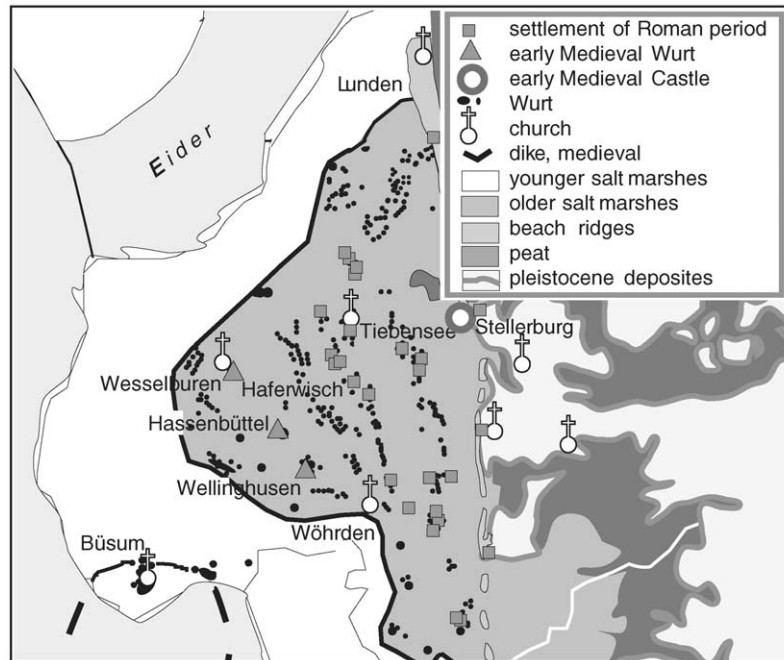


Fig. 6. Northern part of Dithmarschen with *Wurten* of Roman and Medieval times and medieval sea dike (position of the map see Fig. 1). Design: D. Meier.

Therefore new settlements were erected in a zone further to the west in an area close to the coastline. Various settlements were built near Hafervisch, about 2 km to the west of Tiebensee at a level of only +0.5 m NN. Investigations documented artificial raising of the *Wurten* after AD 140 (Fig. 6). In the excavation parts of badly preserved houses, the grave of a dog, different types of wells, and water basins were documented. In the course of the 3rd and 4th century AD the *Wurt* became larger and higher before the settlement was abandoned at the end of the 4th century AD (Meier, 2001a). Another group of settlements of the Roman period is known from the peninsula of Eiderstedt (Figs. 1 and 9). A series of sand ridges is characteristic of this area and was important for the landscape development and the habitation of the present-day peninsula. These ridges running from west to east were formed 3100 years BP and consist of sand and gravel which have been eroded by the sea and transported south-eastwards by wind and currents (Menke, 1988). The formation of the sand ridges favoured the deposition of sediments in the adjacent areas and, beginning in the middle of the first millennium BC, salt marshes developed on these deposits. Salt marshes existed mainly in the zone to the south of the sand ridges along the river Eider. The areas to the north of the ridges were protected from direct marine influences by sandy spits and shoals as well as by outcropping Pleistocene deposits which still existed at that time to the north-west of the area and became gradually swampy. Relics of peat bogs are still

present in the northern part of the peninsula at a depth of -1 m NN (Meier, 2001a, b).

Habitation of the high marshes along the meandering river Eider did not begin until the 1st or 2nd century AD. The stagnation of the sea-level rise or the lowering of the storm surge level along large sections of the German North Sea coast permitted the construction of ground level settlements on the riverbanks. However, because of the renewed rise of the sea level the yards soon had to be raised. The development of large *Dorfwurten* indicates that the Eider estuary played a more important role for transport and economic systems. Such *Dorfwurten* were founded on the northern bank of the estuary in the Roman period. At that time the estuary was smaller than today. The *Dorfwurten* Hemmerwurth and Flehderwurth which are located on the southern bank of the estuary possibly existed at the same time. The best known example of an excavated *Dorfwurt* is Tofting (Bantelmann, 1955). Tofting, populated from the 2nd to the 5th century AD, was established in a salt meadow area on a high riverbank at an elevation of +1.45 m NN (Fig. 9). The environmental conditions in the coastal marsh became increasingly salty during the 3rd and 4th century AD (Behre, 1976). Three house places with long, west east oriented stable houses were excavated (Bantelmann, 1955). Walls of clay sods protected the wickerwork walls of the houses. After a house was abandoned, small layers of dung and clay sods were packed up and a new building was erected nearly at the same site. The house

emplacement I was raised in the 2nd century from +1.83 to +2.45 m NN, the house emplacement II in the 3rd century from +2.60 to +2.82 m NN. House emplacement III reached a height of +3.65 m NN in the 4th century and of +4.08 m NN in the 5th century. The marshes in the shelter of the high banks of the river Eider were protected against flooding from the sea, but these swampy wetland areas were settled only temporarily. Other settlements existed on the sand ridges of Eiderstedt, where dead people were buried in urn fields (Bantelmann, 1970).

The marsh areas of Dithmarschen and Eiderstedt were densely populated until the 3rd and 4th century (Hoffmann et al., 1997; Meier, 1996, 2001a, b). Thereafter, as indicated by the settlements in the marshlands as well as by the cremation places, on the beach ridges in Eiderstedt and on the Pleistocene deposits in the hinterland of Dithmarschen, the area was abandoned. The last finds of Tofting date in the Migration period, possibly in the 5th or 6th century. A hoard with precious metals from the 6th century in Eiderstedt is the last sign of human inhabitation (Müller-Wille, 1986). The end of this phase of habitation in the marshes along the German North Sea coast may be the result of climatic deterioration. There is no doubt, that groups of Angles and Saxons migrated to England, but the question is how large these groups were. Too little is known about the pattern of habitation during the time of AD 400–700 in Schleswig–Holstein.

5. From anonymity to history: settlements of the early Medieval period (AD 700–1000)

Favourable natural conditions permitted the renewed inhabitation of the salt marshes in Schleswig–Holstein from the middle of the 7th and the 8th century onwards. The height of the storm-flood level at the time of new inhabitation must have been somewhat lower than before, so that ground level settlements were erected in the salt marshes on the elevated banks of tidal creeks. These favourable conditions were only of short duration, because new *Wurten* had to be built since the 9th century. Botanical investigations of some of these settlements demonstrate that extremely halophytic conditions existed in the area at both sides of the river Eider and in Dithmarschen during early Medieval times. The *Wurten* were surrounded by salt marsh vegetation (Behre, 1976). In the early Medieval period the clay marshes on the North Sea coast became part of the cultural maritime landscape. The only medieval inhabitation of the wetlands in Schleswig–Holstein is connected with Saxonian and Frisian tribes. In the Gesta of Adam von Bremen, Tedmarsgoi is described as one of three Saxonian tribes which lived in the north of the river Elbe: “*Transalbianorum Saxonum populi sunt tres.*

Primi ad oceanum sunt Tedmarsgoi, et eorum ecclesia mater in Melindorp”. The written sources mention, that Charlemagne conquered the area northward of the river Elbe as far as the river Eider (*Northalbingien*) in AD 798. Three Saxon castles are known, the Bökelnburg and Kuden in the south and the Stellerburg in the north of Dithmarschen. They protected this area against enemies. The inhabitation of the coastal area to the north of the river Eider in the 8th century AD was often explained as a result of Frisian immigration. However, historical references give no direct information about such an interaction. In the course of this phase of occupation of the marshland, which began not before the middle of the 7th century, the so-called young marine marshes with their extended salt meadows were populated.

The coastal area of Dithmarschen is one of the regions with the highest population density in early Medieval times (Figs. 3 and 6). In southern Dithmarschen the *Wurten* of this period occur in the same area as the settlements of the Roman times. In the northern part the early Medieval *Wurten* were founded in the region located to the west of the old settlements, because after AD 400 bogs had spread over the inner part of the salt marshes. Peat underlying the medieval *Wurt* in Jarrenwisch (KI-3797), 4 km north east of Wellinghusen (Fig. 6) and westward of the Roman settlement yielded an age of 102050 BP (AD 970–1160). Thus it is younger than the peat in Hemme (KI 2105: 1790 ± 55 BP; AD 40–380).

Dorfwurten of early Medieval times, located in a long line from the mouth of the river Elbe to the river Eider, belong to the largest and highest in Schleswig–Holstein. The largest among them have a diameter of more 250 m and reach heights of up to +6.20 m NN. The first excavation of a *Wurt* of early Medieval times started in 1883 at Fahrstedt (Fig. 3) near Marne (Hartmann, 1883).

The best example of a *Wurt* of early Medieval times with a series of occupation layers is Wellinghusen near Wöhrden (Figs. 6 and 7). In 1994 extensive excavations unearthed a settlement erected at an elevation of +1.80 m NN on a marsh area along a tidal channel (Meier, 2001a). Relics of *Phragmites* collected from the marsh surface below the settlement (KI-3936) yielded an age of 1440 ± 40 BP (AD 555–660). The salt marshes around the settlement reached a height of 1.00 m above sea level. With +1.59 m NN the present-day mean high water at Büsum is much higher than in early Medieval times. The partly excavated houses of the ground settlement, which possibly included living quarters and stables, were built on flat sod mounds surrounded by trenches. One of these houses was erected in AD 691. Increasing influences of storm surges apparently forced the settlers to raise their farmyards between AD 764 and 820 to +3 m NN, using manure carefully covered with clay sods. One of these stable houses was excavated. The

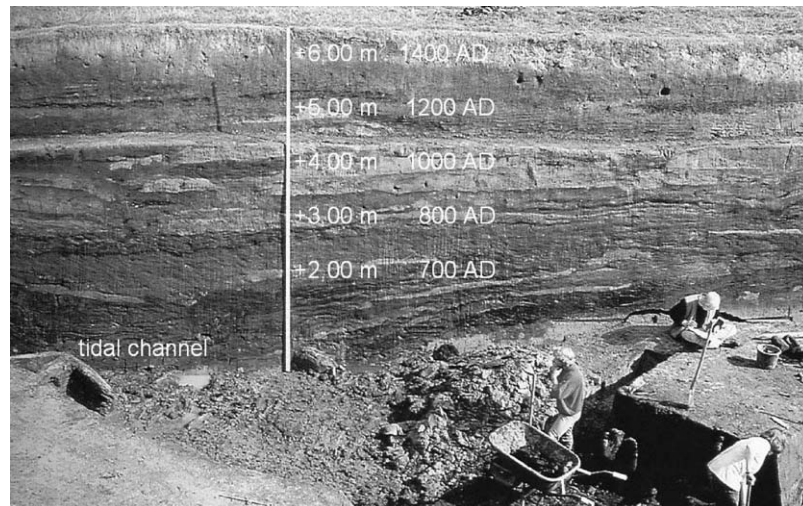


Fig. 7. Wellinghusen, Dithmarschen. Profile of the early Medieval *Wurt*. Photo: D. Meier.

tidal channel was filled with dung in the course of the extension of the *Hauswurten*. A bridge across this creek was rebuilt at about 785. The individual *Hauswurten* were consolidated to form one large *Dorfwurt* during a phase of further expansion of the settlement which attained an elevation of +3.80 to +4.00 m NN, in the 10th century. The settlement was abandoned in late Medieval times. Four-row barley (*Hordeum vulgare*), flax (*Linum usitatissimum*) and very little cultivated oat (*Avena*) were cultivated around the early Medieval *Wurt* (Kroll, 2001). The economy of the settlement was rural, and more cows than sheep and horses grazed in the salt marshes (Witt, 2001).

The 10th century saw the beginning of an increase in habitation which resulted in the founding of new *Wurten*. One example is the village *Wurt* of Hassenbüttel (Figs. 6 and 8) 2000 m northward from Wellinghusen (Hoffmann et al., 1997; Meier, 1998, 2001a). The living conditions in the deep seated and often inundated marsh with a height of +0.80 m NN required the raising of the *Wurten* with layers of clay and dung. The earliest dwelling mounds, which reached a height of +2.00 m NN, were raised on a sediment layer that covered a pre-existing ploughed field. On the top of one of the later *Wurten*, which reach a height of +3.00 m NN, a large three aisled stable house was built in the 10th to 11th century. Also, small buildings of this period with walls made of sods are recorded. Investigations of the bone material indicate that more sheep were kept in Hassenbüttel than in Wellinghusen (Witt, 2001).

The habitation of the wetlands to the north of the river Eider in the 8th century AD was often attributed to Frisian immigration. This cannot be proven, however, because historical sources are not available and archaeological arguments for a specifically Frisian material culture are hard to define. A number of early Medieval

settlements and burials are known from Eiderstedt, including larger *Wurten* on the banks of the river Eider, and smaller settlements and cemeteries on the sandy beach ridges (Bantelmann, 1970; Meier 2001b). The landward part of the marshes and the northern part of the Eiderstedt peninsula were not favourable for settlement because parts of these boggy marshes were often inundated. New salt marshes were formed in this area since about AD 1000 (Fig. 9).

The *Dorfwurten* on the northern side of the river Eider Elisenhof (Bantelmann, 1975) and Welt (Meier, 1997) are normally related to the purported Frisian inhabitation in the 8th century AD (Fig. 9). Botanical investigations in Elisenhof show that extremely halophytic conditions existed during early Medieval times in the area at the mouth of the river Eider, and the *Wurt* was surrounded by a salt marsh vegetation (Behre, 1976). A group of three aisled stable houses, surrounded by fences, were built as ground level settlements with yards which were raised only slowly (Bantelmann, 1975). In contrast, the lower salt marsh area at Welt soon forced the settlers to build high *Warften* (Meier, 1997). Animal husbandry was the economic base of these settlements, as only modest farming was possible. However, there is no doubt that the peasants of the coastal area profited from the Frisian and Frankish trade, which developed around the North Sea since about AD 700.

Unfavourable environmental conditions, due to the extended peat bogs and swampy areas in the inner part of the present-day North Frisian tidal flat area, prevented habitation before AD 1000 (Hoffmann, 1988). Only areas with outcropping Pleistocene deposits and more elevated parts of the salt marsh were inhabited. A number of settlements and burial places are recorded on the Pleistocene deposits on the islands



Fig. 8. Hassenbüttel, Dithmarschen. Early Medieval *Wurt* with the excavation trench in the middle. Photo: D. Meier.

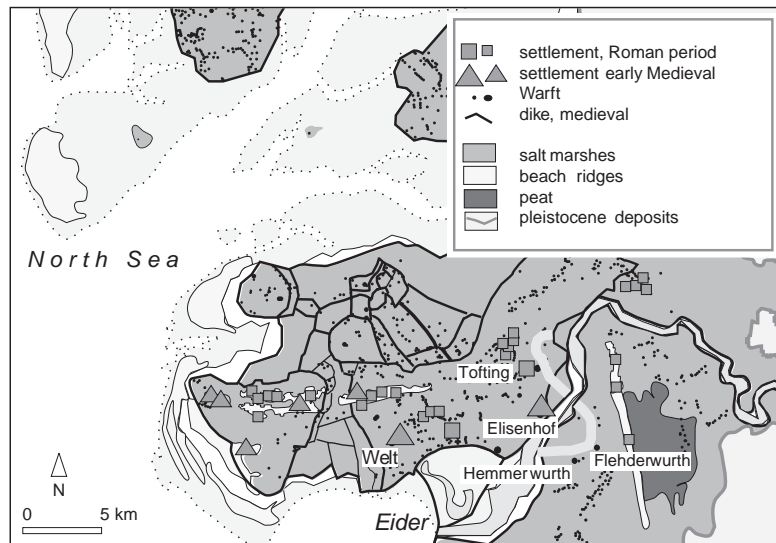


Fig. 9. Peninsula of Eiderstedt with settlements and *Wurten* of Roman and Medieval times and the medieval sea dike (position of the map see Fig. 1). Design: D. Meier.

of Amrum, Föhr and Sylt. The edges of the Pleistocene areas were densely populated. Further archaeological finds are known from the western part of the tidal flat area in the vicinity of the island Hooge and the island of Pellworm (Figs. 1 and 11). These finds indicate that in early Medieval times salt marshes, protected by sand ridges, existed in the western part of the present-day north Frisian tidal flats. Excavations carried out in the course of the “Norderhever-Project” have brought to light a ground level settlement, which was flooded in late Medieval times (Müller-Wille et al., 1988). At that time the sea level had risen so far that people could not live any longer in their houses built on surface of the marshland in North Frisia, because the beach ridges in the West were destroyed by the sea, and the salt marshes were too often flooded during storm tides. As a consequence *Warften* had to be built.

6. Storm floods and dike building: the high and late Medieval times (AD 1000–1500)

Since high Medieval times the entire area of the sea and river marshes were intensively cultivated and were more densely populated than ever before. The building of dikes and the drainage of the land began in the 11th and 12th century. In the beginning, the dikes were not high enough to protect the land against high storm floods. New salt marshes, as in the northern part of Eiderstedt, were inhabited, and the landward swampy areas were drained. The local people generally took the initiative for the construction of dikes. Economic associations of high social standing organized as cooperatives, developed on larger *Wurten*, maintaining complete independence from outside nobles and landlords until late Medieval times, in Dithmarschen until

1559 (Meier, 2001b). The wealth of the leading families was based on the systematic drainage and colonization of the landward part of the marshes and the bogs, which created the transition from a natural landscape to the present-day cultivated landscape.

Extended dike systems embanking larger parts of Dithmarschen and the southern part of Eiderstedt were built by cooperatives, organized in parishes (Figs. 3 and 6). The cooperatives themselves—in Dithmarschen called “*Geschlechter*”—decided about the location and the way of construction and maintenance of the dikes, the draining systems and sluices. In the newly drained areas the farms of the cooperative settlements, built on small single dwelling mounds for protection from the inland waters, were aligned in the landscape like beads on a string, their narrow strips of fields penetrating farther and farther into the peat marsh. New *Dorfwurten* were founded also in the salt marshes of Dithmarschen. Excavations in Büsum (Fig. 1), Norderbusenwurt (Fig. 3), and Lütjenbüttel (Fig. 3) showed that these *Wurten* were erected mostly with clay (Meier, 2001a). The excavation in Norderbusenwurt unearthed a two aisled house, possibly a granary, which was erected directly on the surface of the salt marsh in the late 11th century AD. The construction of such a building in a period of numerous storm floods might only be possible, because the existence of a dike. The first *Wurt* phase in Norderbusenwurt can be dated into the first part of the 12th century. Also, the excavations in Lütjenbüttel (Fig. 3) recorded that the *Wurt* was raised with clay around AD 1150. As indicated by investigations in Eiderstedt the settlement level of the *Wurten* of high Medieval times was higher than the level of the first dikes.

On the low marshes of northern Eiderstedt and the seaward area of the modern North Frisian tidal flat area, where numerous tidal channels divided the landscape in island-like patches, high *Warften* consisting of clay were erected (Fig. 10). Even today they still determine the appearance of the landscape in Westerhever, and around Osterhever and Poppenbüll (Meier, 2001b). Because salt water often inundated the low marshes, the *Warften* were suddenly raised in one phase of construction. Excavations in Hundorf (Fig. 10) have documented an artificial mound of the 12th century with a height of +3.00 m NN, which was raised to +4.00 m NN in the 14th century (Meier, 1996, 2001a; Meier et al., 1989). The *Warft* was built with clay in the 12th century and expanded at the edges with some manure and additional clay. The cooperatives of these *Warften*, largely independent of superior authorities and organized in parishes, erected dikes to protect their cultivated lands, in which single house *Warften* were built. The historical sources give no information about the social structure of the society, the dike building and marsh colonization during high Medieval times.

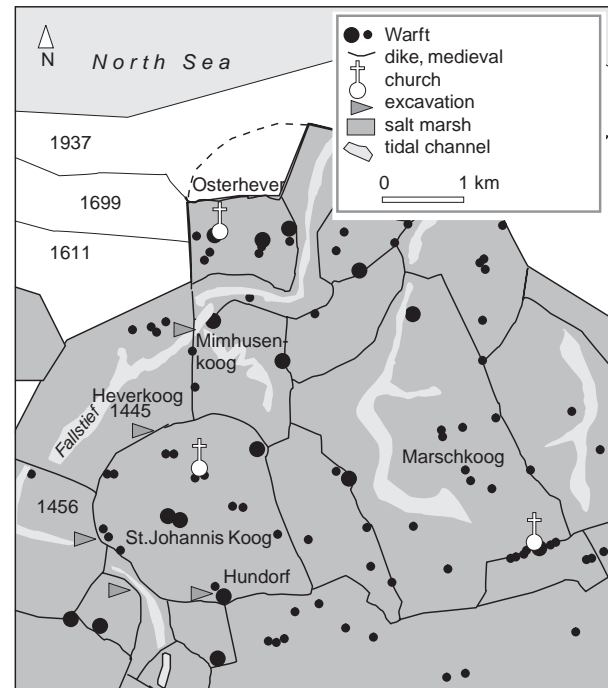


Fig. 10. Northern part of the peninsula Eiderstedt with churches, *Wurten* and medieval ring dikes (position of the map see Fig. 1). Design: D. Meier.

Therefore, this process can be only analysed by field forms, settlement pattern, and by the churches which are named in written sources. Inside the ring dikes irregular field strips are common. The best preserved example of such a preserved medieval landscape is the polder of St. Johannis. The surrounding low summer dike, which has been excavated along two trenches, reached a height of +1.50 m NN in the 12th century and was raised further in late Medieval times (Meier, 2000). Inside the embanked polder is the church and some single *Warften* (Fig. 10). Towards the west and north-west, the ring dike of the St. Johannis polder borders the former tidal channel of the Fallstief, which was not dammed until the mid-15th century (Meier, 2001b). With the construction of higher dikes since late Medieval times, the overflow space for high storm floods was reduced as the dikes offered full protection against the sea. The more recent dikes built by order of feudal authorities are characterized by greater height and straight lines which no longer follow natural landscape structures.

According to numerous archaeological records, the outer salt marsh of North Frisia was not colonized until early Medieval times. Several archaeological sites around the *Hallig* island Hooge, as well as the island of Pellworm, delimit an area of earliest Frisian habitation in the 8th and 9th century (Fig. 11). Increasing influence of the sea and higher storm surge levels forced the settlers to erect *Warften* and dikes. Together with the

building of dikes the low-lying marshes were colonized (Kühn and Müller-Wille, 1988).

Since the late Medieval times North Frisia (Utlande) suffered great losses of land. During the storm surges of 1362 and 1634, large parts of the Utlande of North Frisia between the peninsula Eiderstedt in the south and the island of Sylt in the North were completely lost (Figs. 11 and 12). The salt marsh areas, which had been occupied and cultivated by man since the Viking Age, became part of the tidal flats, because their surface was located below the mean high water level. The reasons for these catastrophes are partly due to the geological development and partly to the activity of man. Local factors like the relief of the pre-Holocene landscape, the thickness and differential compaction of the Holocene coastal deposits (Hoffmann, 1998) have to be considered in time and space with regard to their influence on the landscape development.

Large tidal channels, like the Norderhever, break into the salt marsh area. In general these tidal creeks followed the course of the buried melt water valleys of the pre-Holocene landscape. The settlers did not realise that they themselves contributed to the lowering of the surface of the coastal marshland by building of dikes, systematic drainage of the area, and by peat cutting for the production of salt. However, only in some parts of the present-day north Frisian tidal flat area extensive peat cutting, which lowered the land surface below the mean high tide level, was the dominant factor for the losses of land (Bantelmann, 1967).

Remains of peat cutting can be observed in the vicinity of the *Hallig* Langeness and at other localities of the inner part of the North Frisian tidal flat (Fig. 11). In Medieval times the settlers in this area sustained

themselves on the basis of agriculture and salt production. The raw material for salt production was the peat of the upper organic deposits which was systematically cut over large areas. The earliest report of salt production is from Saxo Grammaticus (1180). Around the time of AD 1230, taxes had to be paid for salt production. How salt was produced in early times is unknown. The technique of the salt production was highly developed in early Modern times. After cutting, the peat was loaded into ships of small draught and brought to the “*Salzkoog*”, a diked area with a dwelling mound, where it was loaded into a two-wheeled cart, in which the peat was taken into the “*Settland*” for drying. The dry peat was heaped up and burnt. The ash was gathered and piled on top of the dwelling mound. Then the ash was filled in boxes with a layer of straw at the bottom. Salt water was poured on the ash, ran through it and into a pipe beneath. This procedure was repeated several times with the same solution until the salt concentration was high enough. Experiments have proved that 24 kg salt could be produced using 1 m³ of wet peat. At the end of the 18th century the salt production came to end, because the peat had become rare and salt was produced cheaper in other places. Around the area of the island Pellworm peat was cut not for salt production but for agricultural use. Therefore, the peat was removed and deposited in elongated pits arranged in lines. These pits still can be seen today in many places of the tidal flats.

Sea-level rise and a severe storm surge led to breaches of the dike and losses of embanked coastal marshes in the 14th century AD. A second disastrous storm surge occurred in 1634 and turned extended areas of coastal marshland into tidal flats. Subsequent reclamation of

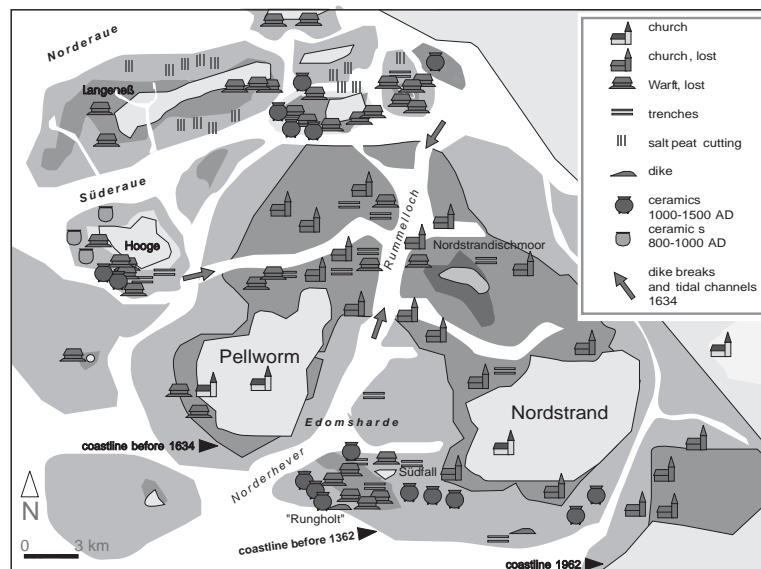


Fig. 11. Land losses during the storm surges of 1362 and 1634 in the southern part of the North Frisian tidal flat area (position of the map see Fig. 1). Design: D. Meier.



Fig. 12. Medieval *Wurt* and field pattern in the present-day North Frisian tidal flat area. The former farm land was lost in the course of the storm surge in 1362. Photo: W. Raabe.

these areas was often impossible. Whereas the first phase of inundation of cultivated land was triggered by natural processes, human impact—diking, drainage, and peat cutting—played a dominant role in the second phase of expansion of a tidal flat environment over arable land. During this second phase, areas with and without compaction of sediments were affected in the same manner. The pattern of tidal channels which developed in Modern times shows some similarities with the relief of the pre-Holocene land surface. The channels follow the morphological depression of the submerged landscape. Since late Medieval times a few *Halligen* formed in this zone, however, most of the formerly colonized marsh remained part of the present-day tidal flat. Remains of the settlements of Medieval and early Modern times are frequently found in this zone (Figs. 11 and 12). They are part of the cultural heritage and signs of the changing landscape- and settlement history.

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