Maritime Celts, Frisians and Saxons

Papers presented to a conference at Oxford in November 1988

Edited by Seán McGrail

1990

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MARITIME CELTS, FRISIANS AND SAXONS

edited by
Seàn McGrail

1990
Maritime Celts, Frisians and Saxons
Wat is de context hiervan
(zie ook Obria en zo)
Wat is jouw idee hierover?

Julie Marais

Academia - een kerk
paa (p. 49)
profes. (p. 52)

Graamskunst!
Het is bijzonder en fascinerend

Annelies p. 70

Rijkel (vb p. 71)

bij Nijmegen (87)

Debouw (78)
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Contributors

Beat Arnold, Musee Cantonal d’Archeologie, Neuchatel, Switzerland

Professor Martin Carver, Department of Archaeology, University of York

Ole Crumlin-Pedersen, Institute of Maritime Archaeology, Roskilde, Denmark

Professor Barry Cunliffe, Institute of Archaeology, University of Oxford

Dr Robert Devoy, Department of Geography, University College, Cork, Ireland

Dr Martin de Weerd, I P P, University of Amsterdam

Dr Detlev Ellmers, Deutches Schifffahrtsmuseum, Bremerhaven, W Germany

William Filmer-Sankey, Institute of Archaeology, University of Oxford

Dr Stephane Lebecq, UFR des Sciences Historiques, Universite de Lille III, France

L Th Lehmann, Bethanienstraat 12, Amsterdam, Netherlands

Professor Seán McGrail, Institute of Archaeology, University of Oxford

Peter Marsden, Department of Urban Archaeology, Museum of London

Gustav Milne, Department of Urban Archaeology, Museum of London

Margaret Rule, Mary Rose Trust, Portsmouth

Dr Michael Tooley, Department of Geography, University of Durham

Dr Ian Wood, School of History, University of Leeds
Editor’s introduction

Over the weekend of the 11th-13th November 1988 a conference on Maritime Celts, Frisians and Saxons was held in the Department for External Studies, University of Oxford. The conference attracted 90 participants from countries bordering the North Sea and the Channel, from Sweden in the Baltic, from Ireland to the north of the south-west approaches, and from Switzerland at the headwaters of the Rhine. The participants included not only archaeologists and historians but also naval architects and specialists in sea-level studies.

The aim of the conference organisers was to promote discussion of the maritime and riverine aspects of the southern North Sea and Channel region from c 300 BC to c AD 800. During the earlier centuries of this period, the Atlantic seaboard routes between the Mediterranean and north-west Europe became more intensively used and were re-orientated as Iberia and Gaul, and then southern Britain, were absorbed into the Roman Empire. Although some of these western routes continued to be used in the post-Roman period, this was on a reduced scale, and the focus for maritime commercial activity appears to have shifted from the Channel region to the southern North Sea, in particular to the lower reaches of the Rhine and adjacent waters. But traders were not the only seafarers in the thousand years or so covered by this volume: raiders, pirates, migrants, missionaries and fishermen also sailed these waters and those of the Channel and the Irish Sea.

The sixteen papers published here, revised versions of those given at the conference, deal with these seafarers and their vessels and the environment within which they used them, during this period of changing political and economic patterns. After two papers on sea-level and coastline changes, an essential prerequisite to any maritime study, the papers are arranged approximately in chronological order: two papers on the late prehistoric period; six on Romano-Celtic or Gallo-Roman times; and six on the Frisians, Saxons, Franks, Angles and Jutes of the Migration and early medieval periods.

Exercising my prerogative as editor, I wish to draw the reader’s attention to two particular matters amongst the several important issues considered in this volume: the crucial position of the Romano-Celtic tradition in the study of the building and use of north-west European boats and ships; and the necessity for closer cooperation between archaeologists and environmentalists if a better understanding is to be gained of the conditions faced by late prehistoric and early medieval seafarers.

Several of the papers that follow consider the evidence for the types of ships and boats used at sea and on the main rivers of the region. It is not possible to present a full picture as we have only isolated pockets of evidence, widely spread in time and space, insufficient to describe the details of all types of shipping or to deduce technological relationships and lines of development from late prehistoric times to the early medieval period. It seems likely, however, that one of these pockets of evidence will prove to be a key element in future research into the origins of the principal types of medieval ship. The river boats and sea-going ships of the 2nd/3rd centuries AD Romano-Celtic tradition (Papers 5-9 in this volume) may well prove to be forerunners of the 6th-10th century Frisian vessels (Papers 11 and 12), and the later medieval cog and possibly the hulc. Furthermore, there are indications that this Romano-Celtic tradition may, itself, have been foreshadowed in the boats of the 1st century BC Veneti and, indeed, earlier Celtic planked boats (Papers 4 and 7).

Thus, from this Romano-Celtic tradition, we may in future be able to make progress both forwards and backwards in time. For any such studies to be firmly based it is essential, however, that those Romano-Celtic boats and ships that have already been excavated be published in as much detail as possible. Only in this way can the data base be enlarged sufficiently for regional, temporal and functional sub-groups to be recognised and the diagnostic traits of the mainstream tradition defined.

It has been said that the techniques used to build these Romano-Celtic vessels mark a radical technological shift from the building in shell sequence to building in the skeleton sequence, with the planking no longer edge-joined but fastened only to the framing. This may be so in a general way; however, there are certain apparent anomalies that require further discussion. Some of these boats do, in fact, have parts of their side planking edge-fastened (Pommerœul 5, Zwammerdam 2, 6, and possible 4); this does not necessarily mean that the shell sequence had been used for parts of these vessels, but it is a strong pointer that such a possibility should be further investigated. Furthermore, at least three different methods were used to fasten this planking: overlapping planking, nailed (Zammerdam 2 and 6) with a possible relationship to proto-Viking clinker boatbuilding techniques: and flush-laid planking fastened either by draw-tongue joints (Zammerdam 6) probably related to the Mediterranean tradition or by obliquely driven spikes (Pommerœul 5 and Zammerdam 6).

Some variations in practices used within a widespread tradition is to be expected, but the implications in this particular case cannot be fully understood until the Romano-Celtic boats now known, and any future finds, are comprehensively published. The re-assessment of Blackfriars 1 (Paper 7) and the preliminary publication of the St Peter Port wreck (Paper 6) are thus significant steps forward. Moreover, they underline the necessity for the full publication of such important boat finds as those from Pommerœul, Belgium (de Boe & Hubert 1977; de Boe 1978).

Early maritime trade and early boat and ship operations cannot be understood without reference to the contemporary environment. Papers 1 and 2 in this volume demonstrate that there have been significant changes in sea-levels, river channels and coastlines in the past 10,000 years. These changes can be described only in very broad terms, except in rare places, such as the Netherlands, where palaeo-geographic maps have been drawn showing details of former coastlines and rivers at particular periods. For the other countries of the North Sea region there are insufficient high-resolution temporal and spatial data on which such maps could be based, especially for the period covered by this volume. Archaeologists working in the maritime zone would thus do well to heed Dr Tooley’s plea that they
augment the meagre data base by including sea-level and related environmental changes amongst the matters to be investigated in their surveys and excavations.

I wish to thank the following colleagues in the Institute of Archaeology, University of Oxford: Mary Mills for typing the editorial content of this volume and amendments to several of the papers; Alison Wilkins for amendments and additions to some of the drawings; and Harry Edwards for additional photography.

Seán McGrail

References
———, & Hubert, F, 1977 Une installation portuaire d’époque Romaine à Pommeroeul, Archaeologia Belgica 192, 5-57.
Figure 1.1 Coastal lowlands of the United Kingdom showing distribution of unconsolidated sediments — sand dunes, shingle, marine clays and silts, lowland peat (based on: International Quaternary Map of Europe, Sheet 6, Kobenhavn, 1:2,500,000, Hannover 1970; Quaternary Map of the United Kingdom, north and south, 1:625,000, Institute of Geological Sciences; Atlas of Britain and Northern Ireland, p 18, Superficial deposits, 1:2,000,000). (Drawing: Author).
1 Sea-level and coastline changes during the last 5000 years

M J Tooley

Abstract

Sea-level and coastline changes during the last 5000 years are described, and attention is drawn to the lack of data for part of this period and the absence of palaeogeographic maps of the coastal lowlands of the United Kingdom, unlike the Netherlands. Rates of sea-level and land-level changes are presented for the United Kingdom as a context for a consideration of the sedimentary history of havens since the Late Iron Age. Examples are given from the coastal lowlands of the Fenland and Romney Marsh. The persistent nature of some havens during this period in the Fenland is contrasted with their ephemeral nature in Romney Marsh. The nature of sedimentation within the havens is considered in relationship to sea-level and land-level changes and local factors.
Figure 1.2  Coastline changes and sediment patterns in the Netherlands during the past 2300 years (Pons et al 1963): 2A coastal depositional environments, 2300-2000 BP; 2B coastal depositional environments, 1700-1250 BP. Revised maps for these periods have been described by Jelgersma et al (1979) and by Zagwijn (1986). (Maps: Editor: Koninklijk nederlandsch geologisch-mijnbouwkundig genootschap).
Figure 1.3  Spatial and temporal pattern of sea-level index points in the United Kingdom (Shennan 1989): 3A distribution of sites yielding sea-level index points from the present to 3999 radiocarbon years ago; 3B temporal pattern of Flandrian sea-level dates. (Diagram: Dr I Shennan and Longman Plc).
archaeological data from a coastal context (Flemming 1978-9; Masters & Flemming 1983). In Hampshire, Cunliffe (this volume) has demonstrated the existence of an Iron Age landing place on the south shore of Christchurch Harbour and this can be related to a contemporary sea-level. In Essex, Wilkinson and Murphy (1986) and Wilkinson et al (1988) have described sea-level and coastline changes in relation to the archaeological evidence from the Mesolithic to the Iron Age. De Brissy (1975) has described the saltmaking industry, manifest as the ‘Red Hills’ of Essex of Iron Age - Romano-British age, in relation to coastal trade and the changing Essex coastline.

The distributions of sea-level index points enhanced by coastal archaeological data are uneven, notwithstanding over 16 years of sea-level projects under the auspices of the International Geological Correlation Programme (IGCP), complementing projects of longer duration sponsored by the International Geographical Union and the International Union for Quaternary Research (Tooley 1987). At the end of IGCP Project 61 (sea-level movements during the last deglacial hemicycle) in 1982, some 782 sea-level data points had been tabulated for the United Kingdom (Tooley 1982a; b). At the end of IGCP Project 200 (Late Quaternary sea-level changes) in 1987, the sea-level data bank had risen to 915 records (Shennan 1989). Whilst there had been an improvement in the spatial distribution (with the exception of north and north-west Scotland, north Wales and much of the south coast), the temporal distribution remained similar. New dates came from the period 3-8000 bp, but the periods 0-3000 bp and 8-10,000 bp continued to have few dates (Fig 1.3B).

The period of particular interest in this volume — 300 BC to AD 800 — possesses very few dated indexed points, and their distribution is very uneven (Fig 1.3A). This makes it difficult to provide concrete facts on the coastlines, the havens, the lower courses of the rivers and the tidal regimes. It is hoped that, as an outcome of the Oxford conference and its proceedings, published in this volume, archaeologists will make a special effort to collect environmental data on sea-levels and coastlines whenever they work in the maritime zone — as, for example, was done during the excavation of the Hasholme logboat (Millet & McGrail 1987). Archaeological, palaeogeographical and historical data from the coastal lowlands for the past 2000 years need to be assembled and integrated to provide high resolution sea-level age-altitude graphs, rates of sea-level change graphs and coastline change maps.

Sea-level and land-level movements in Britain

The changing position of a coastline and the distribution and extent of coastal and near coastal environments are determined largely by sea-level and land-level movements. But, in addition, the supply and movement of sediments, and the wave, tidal and current regime and climate will affect the coastal morphology and the temporal and spatial patterns of accretion and erosion. These patterns will change as relative sea-level changes.

The most recent solution of the pattern of uplift and subsidence in Britain that will affect coastal processes has been calculated by Shennan (1989). It shows (Fig 1.4) current uplift rates of more than 1 mm/yr in north-west Britain compared with subsidence rates of more than -1.5 mm/yr in south-east Britain, based on an analysis of the IGCP sea-level radiocarbon data bank at Durham.

Because of differential land movements, sea-level changes registered by erosional and depositional records will vary spatially. In addition, all sea-level variates plotted on age-altitude graphs are subject to a range of errors, which should be indicated. Hence, a single line on an age-altitude graph is a poor summary of sea-level changes at a site. A more adequate summary is provided by error boxes for each variate, which can be resolved into sea-level bands (eg Shennan 1986a; b; Shennan & Tooley 1987; Tooley 1986). For south-east England Devoy (1982) employed 94 sea-level index points, for each one of which errors in altitude and age were estimated (Fig 1.5); the actual trace of sea-level (however defined) for each site specified will lie within the limits established by the error boxes. Clearly it is not possible, using the present methodology of sea-level investigations, to obtain an age and altitude resolution better than 100 radiocarbon years and 1 metre (Sherman 1982a).

In the absence of high resolution temporal and spatial data, only examples can be given of sea-level and coastal changes during the period 300 BC to AD 800 within the longer time context of the last 5000 years. Two examples will be considered from the coastal lowlands of the Lincolnshire Fen and Dungeness-Romney Marsh.

Tidal inlets in Lincolnshire

The Fenland of East Anglia within the counties of Lincolnshire and Cambridgeshire occupies the largest coastal lowland in Britain. The majority of the ground surface is at or below +5 m OD and, as the result of drainage and reclamation, extensive areas, such as the East Fen of Lincolnshire, lie below the zero altitude datum and, hence, some 4-5 m below the altitude at which the Highest Astronomical Tide intersects the coast. The ground surface of the Fenland is not a plane surface and slight, often imperceptible, changes of altitude bear witness to environmental changes that affected extensive areas, whether of a marine, brackish, freshwater or terrestrial nature. Great estuaries, such as the Welland-Glen estuary north-east of Spalding and the Great Ouse-Kene estuary north of Wisbech, as well as inlets such as Bicker Haven, Boston Haven and Wrangle Haven and the tidal creeks, rivers and tributaries that fed them, were the sites of havens and marked the lines of communication into and through the Fenland (Fig 1.6). They are preserved in the present landscape as distinctive soils, as the sites of saltern mounds and as upstanding meandering ‘roddons’ of silt and fine sand (Godwin 1938) as the adjacent ground surface declines in altitude from drainage and the consequential consolidation and wastage of peat.

Both Godwin (1938; 1978) and Salway (1970) have remarked on the geographical persistence of the great estuaries and rivers feeding them throughout much of the period covered by the Flandrian Age. Godwin (1978) explains this by the size of the catchment and the volume of discharge maintaining the river courses through the Fenland.

The first marine ingress was via the river channels and Sherman (1982a; 1986a; b) has described the stages of infill of the River Nene channel and shown that the first marine episode occurred some 6415 ± 185 (H-9263) bp at a measured altitude of c -8 m OD. Some four interruptions occurred in marine sedimentation, which ended here at 1845 ± 50 (SSR-1588) bp.

The pattern and nature of sedimentation, including the infill of channels and estuaries, have been described by Godwin and others (Godwin 1940; 1978;
Figure 1.4 Map of Britain, showing estimated current rates of crustal movement, based on analysis of geological evidence (Shennan 1989). Units in mm/yr. (Map: Dr I Shennan and Longman Plc).
Tooley: Sea-level and coastline changes

Figure 1.5 Age-altitude graph for south-east Britain, showing 94 sea-level index points with estimated errors for age and altitude (Devo 1982). (Diagram: Dr R J N Devoy and the Geologists’ Association).

Godwin & Clifford 1938; Willis 1961) as a relatively simple succession of Lower Peat, Fen Clay, Upper Peat and Upper Silt. This succession was retained by Gallois (1979) who described four lithostratigraphic subdivisions, roughly equivalent to those described by Godwin, and named the Lower Peat, the Barroway Drove Beds, the Nordelph Peat and the Terrington Reds. These schemes ignore the complexity of the Fenland stratigraphy as demonstrated by Skertchly in 1877 and further elaborated in southern Lincolnshire by Shennan (1980; 1982a; b; 1986a; b). Skertchly (1877, 8) summarised the lithostratigraphy of the Fenland in the following way:

There is no bed of peat constantly underlaid by Buttery Clay [Fen Clay], and, eastwards overlaid by marine silts, but the peat sometimes forms one bed twenty feet thick, and is sometimes largely intercalated with marine silts. There may be one, two, three, or even four peat beds within a few yards of each other, for the whole country was a debatable ground between land and sea, and when the one prevailed peat grew, and when the other had the mastery, silts were deposited.

Skertchly also described the infilling of the ancient estuary of the River Ouse and the interruptions in the succession of laminated sandy silts laid down under tidal conditions recorded along Popham’s Eau. He concluded (1877, 145) that:

…the silting up of the old Ouse estuary was an intermittent action; that the surface of the estuary was intersected by numerous creeks, and that peat immediately commenced to grow when the salt water left any portion of the surface for a time.
Figure 1.6 Map of Wash Fenlands, showing probable coastlines in Saxon and late medieval times (after Phillips 1970; H E Hallam 1965). (Map: Author).
Furthermore, Skertchly drew attention to the variability of the environment, and the continual changes between freshwater and marine conditions both within areas and between areas of the Fenland, and these would have affected the opportunities for settlement and navigation.

Shennan (1982a; 1986 a; b) has also drawn attention to the variability of sedimentation within the Fenland and, employing stratigraphic, micro-palaeontological and radiometric techniques, has proposed a scheme of tendencies of sea-level movement and sea-level changes (Fig 1.7). The Wash stages are represented by marine sediments and record positive tendencies of sea-level movement; the Fenland stages are represented by freshwater or terrestrial deposits and record negative tendencies of sea-level movement. The chronology after Wash VI remains tentative; Fenland VI occurred c AD 50-c 400; Wash VII, c 400-c 800; Fenland VII, c 800-c 1000; and Wash VIII began c 1000.

The tentative nature of these tendencies is due to the destruction of evidence by reclamation and agriculture, the construction of sea embankments and drainage canals and the difficulty of interpreting fragmentary sedimentary evidence in terms of sea-level changes and changes in water quality.

Evidence from archaeology and historical geography may also be employed to establish coastline changes and sea-level tendencies, and it is fortunate that, for the Fenlands, the evidence has been marshalled by Darby (1940a; b), Phillips (1970) and H E Hallam (1965), as it has for parts of the Netherlands by Louwe Kooijmans (1974; 1980). Figure 1.6, based on maps in Phillips (1970) and Hallam (1965), shows the probable Saxon coastline and the late medieval sea bank. Although the Iron Age and Romano-British coastlines around the Wash can only be approximated (Simmons 1977; 1980), S J Hallam (1970) has described the spreads...
Figure 1.8 Map of Romney Marsh in the Roman period (Cunliffe 1988), with additional place names to show position of the three havens and sites mentioned in text. (Map: Professor B W Cunliffe and OUCA).
of Roman material at the heads of inlets or havens, such as Bicker Haven, and concluded that the Roman shore, like the Saxon shore, must have been highly indented, with settlements on levees adjacent to tidal creeks.

Tidal inlets in Kent

The proximity of south-east England to continental Europe bestowed particular advantages for trade to and from the estuaries and inlets of Essex, Kent and Sussex from the late prehistoric period (or earlier) until the present day. There are, for example, Roman harbour works and coastal forts at Reculver, Richborough, Sandwich and Lympne in Kent, and at Chichester and Pevensey in Sussex.

The importance of the Wantsum Channel, separating the Isle of Thanet from the rest of Kent during this and subsequent periods up to the 11th century, has been stressed by Hill (1981), who places it within a European context: 'the Wantsum Channel would appear to have been an important part of the sheltered waterway system that ran from Rich in Denmark to Quentovic in northern Gaul, and from the Alps to the Thames' (Hill 1981, 14). In the Dungeness-Romney Marsh area, the record of geomorphological changes has been summarised by Eddison (1883), and the evolution has been considered in relationship to prehistoric and historic settlement by Cunliffe (1980). A considerable range of new data has been drawn together to illustrate aspects of the evolution, occupation and reclamation of Romney Marsh during the past 10,000 years and, particularly, during the past 5000 years (Eddison & Green 1988).

Attention will be directed here to the 27,000 ha of shingle, dunes and reclaimed marshland known as Romney Marsh and described by R H Barham in the Ingoldby Legends as the 'fifth quarter of the globe'.

The viability of harbours on the coast and navigation along waterways across the marshes to the river valleys of the Rother and Brede that gave access to the resources of the Weald, depended on the volume of sediment from the rivers and from the English Channel and the rate of longshore drift (Fig 1.8). The incidence of storms and storm surges would affect not only the rate at which sediment was moved, but also the stability of tidal inlets. The opening and closing of tidal inlets would also affect water levels and the tidal range in Walland Marsh and Romney Marsh. Subsequently, engineering works, such as the embankments and sluices (including the Rhee Wall from Romney Haven towards

Appledore), would have had a profound effect on discharges of water from the marshes and the scouring of navigational channels and havens.

All these factors must be set against long term processes, such as subsidence in southern Britain and sea-level changes. In south-east England, Shennan (1989) has calculated a subsidence rate of -0.85 mm/yr for the past 9000 years. At a higher level of resolution and, at the site scale, Tooley and Switsur (1988) have provisionally identified for the Romney Marsh area six periods of positive and six periods of negative tendencies of sea-level movement. Positive tendencies are associated with a dilation of marine sediments, alluviation and waterlogging, whereas negative tendencies are associated with channel scouring and erosion, coastline advance and drying of soils and peatlands. The relationship of these tendencies to the three inlets that are known to have served as havens at different times in the period since the late Iron Age has not been established but it is known that the most recent positive tendency of sea-level movement from 1830 ± 80 (SRR-2893) to 1550 ± 120 (NPL-25) bp on Romney Marsh coincides with the occupation of the Roman fort at Lympne.

C Green (1988) has summarised the record of these three successive marine inlets from the Roman-British period onwards. The first inlet at Hythe extended west as far as Port Lympne and became the Roman port of Portus Lemanis (Fig 1.8). Cunliffe (1980) has described the sheltered nature of the anchorage, protected by a sand dune immediately to the east, and by coastal shingle to the south-east enclosing an extensive lagoon, later to be infilled with clays and often fine sandy laminae, and reclaimed as Romney Marsh. Cunliffe (1980) has also speculated that bulk commodities, transported by river barges along tidal creeks and river channels from as far upstream on the River Rother as Bodiam, could be transshipped at Portus Lemanis to sea-going vessels. The nature of these creeks and channels on the marsh is conjectural, although Waller et al (1988) and Burrin (1988) have elucidated the age and nature of the infill of the valleys above the point where they debouch onto the marsh. It has been posited (for
example by R D Green (1968) that the River Rother flowed east at one stage in the evolution of Romney Marsh, north of the Isle of Oxney, past Appledore and into the Hythe Inlet, which it would have scoured. There is no field evidence for this during the Late Iron Age and Roman period, but it is worth noting, however, that earlier the valley of the Horsemarsh Sewer, east of Appledore, was a tidal inlet from 5500 ± 70 bp (Q 2647) until 5150 ± 70 bp (Q 2648) (Tooley & Switsur 1988), when the high water mark of spring tides was at c. -3 m OD. The sea does not appear to have reached the mouth of this valley again until probably the beginning of the 3rd millennium BP at a recorded altitude close to OD, and may have remained there, connecting the tidal inlet at Hythe, until the abandonment of the fort at Lympne in the middle of the 4th century AD. At this time, the haven may have become choked by sediment or partially closed off by longshore drift of shingle or by the migration of the Rother estuary further south to Romney, or by a combination of all three. However, in a charter of AD 732, the site of the Roman port is identified as ‘Huda’s fleet’ or tidal creek (Brooks 1988) and a grant of land for a saltern clearly indicates continuing marine conditions, although navigation from the east may not have been possible.

The second marine inlet, at Romney, may have been in existence by AD 741 and certainly existed by AD 920 (Brooks 1988). A possible estuary of the River
Figure 1.11  Stratigraphy at 100m intervals from Broomhill church to Rainbow Petty Sewer. Signatures and physical properties given according to scheme of Troels-Smith (1955). Drawing: Author.
Rother and the haven of Romney are shown on a map of Saxon Romney by Ward (1953), and reproduced here as Figure 1.9. This map shows the Rhee Wall (River Limen) uniting south-east of the Isle of Oxney and flowing first south, then east and north-east as a 'Great Estuary', before discharging into the sea between Lydd and Romney. Islands or evots in the estuary included Midley (Tatton-Brown 1988; Fig 1.9). It has been posited that the River Rother impinged on the landward margin of the shingle north of Dungeness at a point where shingle was being eroded on the seaward side, resulting in a breach and creating a haven, for the scouring effect of the river would have been considerably enhanced from the shortening of its course. Spurn Point near the Humber and Aldeburgh in Suffolk provide contemporary analogies.

During the centuries succeeding AD 920, distributaries of the 'Great Estuary' of the River Rother silted up and, by the 11th century, it seems possible that the distributary east of Scotney and Midley was no longer navigable. R D Green's (1968) Creek Ridge number 1 may have been abandoned; the line of Creek Ridge number 2 was occupied by the river. By the early 12th century the River Rother had abandoned this course (Tatton-Brown 1988) and, probably by a similar process of impingement on the landward side of the shingle barrier and erosion on the seaward side, the river broke through in the Old Winchelsea area, incised a channel and created the third inlet and haven at Rye, which is maintained to the present day.

The fate of the 'Great Estuary' can be traced in both documentary and stratigraphic records. It continued to silt up, receiving water from Romney Haven in the north and Rye Haven in the south. Renamed the Water of Chene and, later, the Wainway Channel, the depth of water allowed lighters to transport goods towards Lydd as late as the 16th century (Gardiner 1988). At the northern end, the Haven of Romney was sustained by water discharged along a 7 mile long artificial channel known as the Rhee Wall, completed and in use from AD 1258 (Tatton-Brown 1988), with each of its three sections having a different history and function (Vollans 1988). Until the early years of the 15th century, the Rhee served the function of a ship canal linking Romney to Appledore, which also had access to the sea via the Appledore Water and the Rother estuary (Eddison 1988), passing Rye and entering Rye Bay, forming the third marine inlet. The post-16th century history of Romney Haven, contracted to Romney Hoy, has been traced by Eddison (1983).

A series of borings across part of the Wainway Channel (Fig 1.10, B-13, -19) shows the nature of the infill of the Great Estuary (Tooley 1989a). Clays, silts and fine sands are occasionally interrupted by layers of shells: Scrobicularia, Cardium and Hydrobia in B-16 and Scrobicularia in B-18. Some layers are coarsely laminated, bearing witness to a tidal flat type of sedimentation. On the south-east shore of the Great Estuary (Fig 1.9; Fig 1.11, B-14, -15) fine grain clastic sediments overlap coarse flint shingle that accumulated before 3410 ± 60 bp (Q-2651), a date on basal peat before 3410 ± 60 bp (Q-2651), a date on basal peat before 2500 bp. For the intervening period from c AD 1700 to c 500 BC (which includes the period covered by this volume) there is relatively little sea-level change data. Excavators working in the coastal lowlands should endeavour to investigate water-level and sea-level changes and thereby augment the meagre data base. The potential for such excavations on land sites in the coastal lowlands of Britain covering the past 2500 years is considerable. The havens of the Fenland and the three inlets on Romney Marsh at Hythe, Romney and Rye have been described, and each haven is an archive of sea-level changes and probably a graveyard of shipping.

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2 Controls on coastal and sea-level changes and the application of archaeological-historical records to understanding recent patterns of sea-level movement
Robert J N Devoy

Abstract
The paper provides an analysis of the environmental factors controlling the positions of the coastal zone over both long to short term timescales and, in particular, examines the nature of the interaction between changes in coastal position and water-level, or relative sea-level movement. Over approximately the last 2000 years relative sea-level is seen as having risen in height in many parts of north-west Europe by between 0.5-1.00 m to present day levels, with annual rates of rise today of 1-3 mm. Elsewhere, in areas formerly affected by ice loading, land uplift has led to patterns of relative sea-level fall. Interruptions to these trends, represented at the coast in the form of changes in coastal shape and its direction of movement, are seen as a result of the interaction of, for example, variations in climate, continental ice load/volume and melting, geoid shape, earth crustal mobility, land-ocean sediment budgets and human intervention. Ocean-atmosphere interaction forms an important element in controlling coastal position through time, particularly at short term timescales. ‘Greenhouse’ warming, storms and related climate impacts on the coast are discussed in this context. Conclusions are drawn about the contribution of archaeology as both a provider and consumer to sea-level-coastal data and of the subject’s potential in helping the understanding of the broader controls upon coastline development.

The coastline, the zone of meeting between land and sea, is by definition a dynamic environment subject to major changes in form in both space and time. Yet, human societies have traditionally and world-wide chosen to be intimately linked with this zone, with some 25% of the world’s population today living within ± 1.00 m of mean sea-level (Devoy 1987; Carter 1988). As the Celts, Frisians and Saxons, and other groups that have inhabited the shores of the shallow shelf sea areas of north-west Europe showed, the maritime environment has been of enormous importance to people historically in terms of communications, trade, technological-cultural development, art, as well as in belief and religious practice.

This concentration of human populations upon European, as well as upon other world coastlines has, in itself, had important consequences for the nature and pattern of coastal change. This may be seen in Europe in the progressive defining of coastal shape through the built environment and coastal engineering works since c AD 300, or earlier, in the raising of water-levels in estuaries and in widespread relative land submergence, as exemplified in the Thames estuary, parts of south-east England and the Netherlands.

This paper is designed to provide an introduction, therefore, at the level of the general reader, to the subject of sea-level and associated environmental changes. An understanding of such changes may be seen as a useful starting point to a consideration of how people have utilised maritime environments in the past. For, at the risk of being trivial, without the sea and its accompanying alterations in level and shape through time, it would not be possible to discuss the maritime nature of the Celtic, Frisian and Saxon peoples.

Coastal position and sea-level, c 500 BC - AD 1000

Over the broad time span covered by these peoples, relative sea-level (RSL) in most parts of north-west Europe has been rising (Fig 2.1); as it still is today in many parts of the region at rates of 1-3 mm per annum (Rossiter 1972; Emery 1980; Emery & Aubrey 1985), although some recent analyses of the data are more cautious in interpretation (Pirazzoli 1986; 1989; Pirazzoli et al 1988). The exact position of RSL and the coastline at particular times is often more difficult to determine at the local level, however, due to the lack both of precise regional models of sea-level behaviour (Greensmith & Tooley 1982; Shennan 1987) and detailed local data for coastlines. Nevertheless, it seems reasonable to suggest, on current evidence, that RSL position in north-west Europe at c 2000 BP was probably in the order of 0.5-1.0 m below today’s levels for Mean High Water Mark of Spring Tides (MHWST) at the open coast (Devoy 1987a; Tooley 1978).

In a sense an exception to this picture comes from those areas, such as Scandinavia, northern Britain and northern Ireland, which have experienced land uplift (isostatic rebound) since the end of the last glaciation (Fig 2.2). Although sea-surface levels continued to rise in these zones at similar rates to elsewhere in north-west Europe, the land, released from its former ice cover, has lifted here at a faster rate than ocean water-level has risen. This phenomenon has resulted in such coastlines recording a net relative fall of sea-level since c 4000 BC (Carter 1982; Smith & Dawson 1983). This pattern of general RSL rise has not been without apparent interruption, however. During the
period under discussion much archaeological and geological information exists for a prolonged phase of coastline building (progradation) between c AD 100-300. This may have resulted from a possible standstill in relative sea-level rise, or even a relative fall, and from variations in local sediment supply/river discharge factors (Devoy 1979; 1982; Sherman 1986). The subsequent flooding and eventual marine inundation of coastal zones such as the Fenland and the Thames estuary in Britain, or the Netherlands and parts of northern Germany post AD 300 is frequently referred to in archaeological and early sea-level literature as the 'Romano-British Transgression' (Godwin 1940; 1943; 1955; 1978). This time of coastal retreat and flooding may well have been facilitated by major storm events and it is probable that regional climate change had an important part to play in this pattern of sea-level behaviour. From this point in time onwards, sea-level and coastal data together record a pattern of continued marine inundation in many parts of the North Sea region; though evidence of local to more widespread phases of coastal advance, possibly incidental with climate changes, is also recorded (Tooley 1978; Lamb 1977a, 1977b; Shennan 1986).

In terms of the physical position of the coast, many of the lowland areas that are today situated well away from a direct marine influence represented the then coastline during the period under consideration. In Britain, as for elsewhere in Europe, there are many archaeologically and historically documented examples of such changes in coastal position (Devoy 1987c); as in London and the Kent-Essex marshes of the Thames (Devoy 1980; Nunn 1983; Bateman & Milne 1983; Wilkinson & Murphy 1986; 1987); the Rye-Dungeness area (Cunliffe 1980; Eddison & Green 1988); Chichester Harbour and Christchurch Harbour of southern England. Many of the 'then' open coastal sites, navigable inlets and estuaries together formed ports, harbours or safe anchorages and were often associated with substantial human settlement. These sites have commonly become blocked and silted-up subsequently, leading to their abandonment or substantial decline as settlement locations (Fig 2.3).

Causes for these changes result from a variety of interrelated human and physical environmental factors (Fig 2.4) which may be summarised within five main themes:

(a) Human induced alterations to the coastal zone system. Of particular importance here, since the Roman period, has been the impact of large scale coastal engineering works; in progressively confining coastal inlets/embayments and in both defining and adding to coastal shape with embankments, jetties and harbour works. These
Changes have led to both variations in water level and sediment distribution.

A further traditionally invoked element has been variation of sediment supply to the coast, resulting from human alteration of land use practice. Deforestation and increased ploughing is often seen as having led historically to a greater release of sediment to the coast via the rivers and its subsequent accumulation at the shoreline. Equally, deforestation may cause hydrological changes with increased water runoff, concomitant with soil erosion and, therefore, sediment supply.

Although these factors are feasible as a cause of coastal change and have been shown to operate in contemporary settings (Hail 1977; Bird 1979; Gibb 1981), they have yet to be substantiated and proven as a widespread cause of coastal change/sediment supply in earlier situations. The sources of coastal sediments are too often a subject of conjecture only.

(b) Continued post-glacial sea-level rise, as a stimulus to the progressive landward shift of sediment to the coast, from material stored on the continental shelf.

(c) Coastal erosion leading to new sediment recruitment and changes in coastal configuration. Here the process of coastal erosion results in feedback between the consequent coastal shape/offshore bathymetry changes and sediment supply/distribution.

(d) Alterations in coastal processes consequent upon climate change, in terms of short to long term variations in wind/wave/water circulation patterns, again leading to an alteration of sediment supply or its removal at the coast.

Figure 2.2 Present pattern of land uplift and subsidence for north-west Europe shown in mm per annum (after West 1977). Inset Figure 2a shows pattern of relative sea-level change in northern and eastern Ireland; zones of isostatic land uplift. (Diagram: Devoy 1987c, University College Cork).


Figure 2.3 Present coastline at Rye, Sussex. Coastal sediment accretion and river channel changes since c 1300 AD have ‘stranded’ former open harbour. A new channel cut by the River Rother through these coastal sediments is shown in foreground, together with the operation of oblique waves and alongshore, eastward sediment movement to Dungeness. (Photo: University College Cork).

Figure 2.4 Elements of the physical environment conditioning changes in a coastal sediment system, such as a beach barrier environment. (Derived from Derbyshire et al 1981).

(e) The impact of major single or catastrophic events, such as storms or earthquake generated waves, in influencing a coastal system (Smith et al 1985; Smith 1988).

Readers are referred to Orford (1987), Carter (1987), Pethick (1984) and Hails & Carter (1975) for a more detailed discussion of these factors.

The ocean-atmosphere system and sea-level changes

Although coastal processes and dynamics are important in determining coastal position, variations in sea-level and related climate changes remain fundamental forcing factors in ultimately conditioning the broad parameters of coastal location.

The oceans and atmosphere are inextricably linked; there is a continuous transfer of momentum, energy and matter at the ocean-atmosphere interface. The oceans absorb much of the solar radiation that penetrates the Earth’s atmosphere and act as a heat reservoir, slowly heating up in summer and cooling in winter. The atmosphere in turn receives heat and most of its water content from the oceans. Changes in the atmosphere, therefore, are closely related to oceanic changes’ and vice versa. (Stewart 1977)

There is a need, therefore, to examine the causes and past pattern of relative sea-level change, in order to help understanding about the movements of coastlines recorded in archaeological and historical data.
Figure 2.5 Components of ocean/atmosphere interaction responsible for relative sea-level changes at short to medium term timescales (hours to 1 million years). (Diagram: University College Cork).
Long term changes in sea-level

In assessing the factors responsible for influencing long term sea-level changes, two basic assumptions must be made. Firstly, the Earth has remained a 'fixed' size over approximately the last 600 million years and that, secondly, at the same time, the water volume of the oceans has also remained approximately constant (Devoy 1987b; c). On this basis, six main factors may be seen as potentially important in determining long term sea-level variations:

(a) Ocean water exchange with epicontinental seas.
(b) Change in shape of the ocean basins (ie through ocean ridge growth and decay, ocean spreading, sediment infill-loading factors.
(c) Mountain building — influencing basin shape.
(d) Variations in crustal heat flow — crustal thickening, thinning and ocean basin deepening.
(e) Geoid shape.
(f) Climate change.

The sixth factor 'climate change', has probably formed a pervasive influence on sea-level throughout earth history. Geological data relating to the long term history of the earth's crust show that for extensive phases of time (c 100 million years) global climate has been too warm to support the presence of polar ice caps (Hays & Pitman 1973; Mercer 1978; Nilsson 1983). Consequently, ocean levels relative to the land have been substantially higher than at present, at these times. Although processes of continental drift, changing ocean basin shape, mountain building, earth crustal flexure and ocean circulation patterns have been the important direct determinants of land/sea position at such times (see Chappell 1987; Devoy 1987b; c; Tooley & Shennan 1987 for discussion), these factors have also contributed variably to changes in earth climate, and thus in a further additive way to relative sea-level change through this mechanism. During the Cretaceous warm, tropical seas spread over much of what is now Ireland and Britain, positioned at that time at c 30°N (Lovell 1977). Then global temperatures were 5-10°C warmer (than present day averages) and the world's oceans are estimated to have risen some + 350 m higher at maximum against the, then, continental land margins (Pitman 1978; Tissot 1979; Haq et al 1987).

At shorter timescales (< 1 million years) equally dramatic sea-level changes to those of the Cretaceous and earlier have also occurred, though of smaller vertical scale and not all in an upward direction. The onset of global cooling in Miocene times (5-25 million years) led to the re-establishment of the earth's ice caps (Mercer 1975) and the development of the 'Ice Age' (Quaternary). This change in climate and the resulting periodic growth of ice sheets on the land surface, led directly to a withdrawal of water from the oceans and a drop of global sea-levels. Although estimates vary as to the extent and duration of relative sea-level fall during these times of glacial cold (stadia lasting 60-70,000 years), geological evidence from submerged shoreline data from around the world's continental shelves, indicates that low levels of > -100 m present sea-level position were attained at times (Bloom 1985; Devoy 1987a). It must be noted, however, that the areal pattern of low sea-level position probably varied greatly from one part of the world to another (Devoy 1987c).

Quaternary climate improvement and the re-establishment of times of global warmth in turn led to the return of water to the oceans from the melting ice (Fig 2.5). Again, evidence is not unequivocal as to the amount of regional/global relative sea-level shift during these interglacials, although it is clear that the net direction of sea-level movement for most coastlines has been upward. Exceptions occur in areas of former ice loading, such as northern Britain, Scandinavia or Canada, where the removal of the ice has resulted in land surface uplift in post-glacial time, generally at rates faster then water-level rise in the oceans. Geological data in the form of raised shorelines, for example, the shore platforms on the south coasts of Ireland and England, of western France and from the Maritime Provinces of Canada (Devoy 1983; 1987a) may suggest a maximal relative sea-level rise of c +4 to +6 m psl during the last and penultimate interglacials (Marshall & Thorn 1976; Mercer 1978). Crustal flexure/tectonic changes, however, often complicate this picture. Independent evidence from 18O work (Shackleton 1987) suggests possibly a lower maximal ocean level rise of c +2 m psl for recent interglacial warmings.

The form of sea-surface behaviour during times of water return to the oceans is still unclear. Many sea-level researchers dealing with the most recent (Holocene, last 10,000 years) pattern of sea-level recovery feel that, despite significant regional and local anomalies, the dominant pattern has been one of an upward trending, oscillatory behaviour of the sea-surface. Rises in relative sea-level, at varying rates through time, have alternated with either sea-surface standstills, or real downward, negative sea-surface movements (Shennan 1987; Devoy 1987b). If real, climatic and atmospheric controls upon this behaviour, through changing patterns of storm intensity, cloud cover, precipitation, pressure systems and sun energy flux, have probably been significant (Fig 2.5). Periods of negative sea-level tendency in north-west Europe between c 4000-5000 BP and 1650-1850 BP, for example, or alternatively positive upward tendencies post c 1650 BP and, later, post c 750 BP (Shenman 1982; Shenman et al 1983) appear to match well with times of climate deterioration, in terms of global cooling in the first case, or more wet and stormy regional conditions in the other (Lamb 1977a; b).

A further complicating factor, much favoured by some sea-level researchers (Mörner 1987) as an explanation of relative sea-level variations through time is that of earth geoid change. Due to spatial, also possibly temporal, variations in the earth's density-change, periodic measurement of geoid shape by satellite altimetry. Actual sea surface may be some distance (as much us 1-2 m) above or below the geoid surface due to action of waves, storms and tides. Vertical variations in geoid relief may be up to 200 m in height (see Fig 2.7 for details). (After Bearman 1989).
gravity field, the surface skin of the earth is distorted into a series of ‘high and low relief’ areas (Figs 2.6 and 2.7). The difference between ‘high’ and ‘low’ points may give a vertical ‘relief’ to the ocean surface of > 150 m. It has been postulated that these ‘high’ and ‘low’ points may migrate in time (even in timescale < 10,000 years), resulting in major changes in relative sea-level, and thus in coastal position. Such a proposition, though much discussed, has yet to be substantially proven.

Short term and contemporary changes

Storms certainly play an important role in temporarily increasing sea-levels significantly above normal tidal levels (Fig 2.5), especially where the conditions for storm surge prevail (ie the forcing of water by storm action into confined coastal configurations). These lead to major problems of coastal lowland flooding, as in London and Cork city or, alternatively, to coastal erosion and long term loss of land. In Bangladesh such storm surge induced, temporary increases in sea-surface level regularly cause very large losses in life (Southern 1979; Carter 1987; 1988) as, to a lesser extent, did the major 1953 storm in the southern North Sea region. Around the coasts of the British Isles normal storms on ‘open’ coasts regularly raise water levels 4-11 m above normal high water mark (HWM) positions.

Understanding of the mechanisms of sea-level change and their connection to climate forcings has led to the current concern about the future possible rises of global sea-levels, consequent upon the phenomenon of ‘greenhouse’ climate warming. Predictions from many informed science sources suggests that the effects of increasing CO\textsubscript{2} and accompanying ‘greenhouse’ gas levels in the atmosphere, for which the additive effects of ozone thinning must also now be calculated, will be to raise atmospheric temperatures globally by 1.5-4.5°C over the next 100 years approximately, for a doubling of atmospheric CO\textsubscript{2} levels (NAS 1979). Other scenarios are generally much worse (see Titus 1987 for review). This predicted level of increase in world temperature, at variable regional levels, appears to fit with the present observations of climate warming, showing rises of atmospheric temperature of c. 0.4°C since c AD 1880, coupled with CO\textsubscript{2} increase from 280/300 ppm in 1880 to 335 ppm in 1980 (Hansen et al 1981). Some earth scientists dispute these figures and the apparent close correlation between past ‘greenhouse’ gas emission and global temperature increases; pointing to the limited run of accurate data from temperature and ‘greenhouse’ gas observations, as well as to possible inaccuracies in methods of calculation (Pearman 1988).

If real, however, the effects of this global warming will be to accelerate the ‘natural’ post-glacial pattern of sea-level rise. Mercer (1978) suggested that melt-out of the West Antarctic ice sheet would lead possibly to a 5 m rise of sea-level in less than 100 years. As Clark and Lingle (1977) showed, the actual distribution of this water released on a rotating earth would not be uniform. The northern hemisphere would experience a rapid and initially disproportionately large part of this rise in respect to the southern hemisphere, before full global redistribution of water occurred. Subsequently, the glacial modelling work of Budd et al (1987) has demonstrated in their view that the effects of any ‘greenhouse’ induced melt of the West Antarctic ice sheet on sea-level are likely to be significant, but much lower than earlier anticipated, in the order of < 1 m maximum by c AD 2080 (Fig 2.8). Later studies (Warrick & Wigley 1988) of ocean/atmosphere interaction even suggest a global relative sea-level fall consequent upon climate warming and uptake of water into the atmosphere. These discussions, of course, only refer mainly to the effects of climate warming upon the West Antarctic ice mass rather than possible global ice melt. If this occurs at any significant level (ie melt from all glacier sources) then the sea-level rise scenarios will worsen (Meier 1984; Bindschadler 1985; Wigley & Koper 1987).

Apart from this ice melt component of ‘greenhouse’ warming, any increases in atmospheric temperatures will significantly affect ocean temperatures in time, leading to the commensurate expansion of the ocean water column (steric changes). Estimates of this effect in relation to contemporary climate warming indicates that a rise of ocean levels of 20-50 mm has taken place between 1880 and 1985 (Wigley & Roper 1987). Future climate warming along the lines predicted for CO\textsubscript{2} increases might account for a...
Figure 2.8 Global relative sea-level rise scenarios, derived from research studies undertaken in United States in early 1980s. (After Hoffmann et al 1983). Subsequent studies maintain the variability in the prediction of sea-level change.

Further 40-80 mm vertical water level rise, though some scenarios of ocean water expansion indicate even higher levels of rise.

Although these steric effects on sea-level may seem large, the influence of ocean warming will also affect other elements of the ocean/atmosphere system, in particular weather patterns and ocean circulation. Increases in the often biologically devastating incursions of warm equatorial water into the southern Pacific region (El Niño), with accompanying regional temporary sea-level changes of ± 100-200 mm have been tentatively linked to this pattern of contemporary climate warming (Wyrtki & Nakahara 1984; Peltier 1987). Equally important, increasing storminess has been noted in the past 2-5 years from many parts of the world (eg north-west Europe and eastern Australia), as might be expected from the results of initial work on the atmospheric modelling of global warming (Pearman 1988). In terms of sea-level change, it has already been noted that storms are an important contributor to coastal flooding and erosion problems. Therefore, any increases in regional-global storminess, regardless of future long term, net vertical rises of ocean levels, will seriously increase our problems of coastal defence. For coastal dwellers in the lowlying continental margins of north-west Europe and for many of the world’s population, with approximately 25% living within ± 1 m of mean sea-level, such storms may well prove disastrous.

Data sources and the contribution of archaeology

Following this discussion it is now possible to summarise the principal data sources upon which our ‘understood’ picture of RSL change and coastal position is based. These fall into four major categories:

(a) Geological — derived from stratigraphic, sedimentary studies and fossil indicators of former water levels.
(b) Historical sources — maps and other documentary information.
(c) Archaeological — buried material.
(d) Contemporary observations — through satellite remote sensing, tide-gauge monitoring of water levels.

The value of archaeological data as a source of RSL information and its subsequent interpretation is potentially asignificant one. Its role may be seen in terms of its being both a consumer and also a producer of data. As a consumer, archaeology has used RSL and related shoreline information to help test hypotheses about proposed events, lifestyles and physiographic reconstructions of environments at particular times. In a related field of social-anthropological explanation, for example, in the behaviour and movements of peoples about the earth using possible land bridge routes or in the development of trading patterns, sea-level data is again used to test explanations (Devoy 1985; Flood 1986).

Conversely, archaeology can be a producer of information. Louwe-Kooijmans (1974) demonstrated the potential value of using modern positions and former settlement sites in reconstructing former shorelines. Equally, a wealth of other data has potential for use here, in the form of buried boats or wharf locations, for example, as other papers in this volume discuss. The range of data may be such that detailed reconstructions of coastal configurations may be attempted based on archaeological and historical data alone, as in the case of the Fenland (Simmons 1980) and many other sites in Britain (Thompson 1980). Alternatively, the range of archaeological information available, such as specific coastal position/water level indicators to less precise, but intriguing, ‘remembered’ information, as in Australia (Flood 1986) or Scandinavia and Canada (Devoy 1987a), can provide a valuable test upon geological reconstructions.

The major problem in all detailed RSL reconstructions is the need for precise data, particularly if the work is to be further used in modelling or related attempts at fundamental understanding of environmental processes and earth functioning. Accurate index points of RSL position, in terms of their
height, time and the environment represented are required (Plassche 1986). A valuable plus for archaeological data exists here. For whilst providing information about age, either accurately or through provision of material for radiometric dating, or more crudely though relative chronologies, archaeology may also provide important contextual information showing how a site and environment changed over time. Unfortunately, accurate height information, or the significance of a find/site for specific sea-level position within the coastal zone from archaeological sources, has hitherto been all too dubious. The important points remaining, however, are that archaeological information can provide complementary data to an otherwise all too exclusively used range of geological data types. Further, such information may be particularly helpful in elucidating the latest phases in relative sea-level recovery over the last 2000 years; a time of increasing significance for the study of contemporary ocean/atmosphere responses.

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Hengistbury Head in Dorset is admirably sited: outer approaches are protected by a reef and the inner harbour (Christchurch Harbour) is sheltered by the headland itself. Its shelving gravel beaches provide suitable moorings. Moreover, the harbour is linked by two major rivers, the Stour and the Avon, to the productive heartland of Wessex. The site was occupied from time to time throughout the prehistoric period. In the 1st century BC it became a centre for maritime trade, taking on all the attributes of a port-of-trade. A recent campaign of excavations concentrated on the main settlements and on one of the harbour areas; details of harbour works came to light and much environmental evidence.

Of the many fine harbours along the Solent shore of Britain attractive to prehistoric sailors, Christchurch Harbour is one of the best endowed. Today it is a large expanse of shallow, almost land-locked water protected by the ridge of Hengistbury Head from the predominantly south-west winds and currents and scoured by the flow of the two Wessex rivers, the Avon and the Stour (Figs 3.1 and 3.2). The headland is a prominent feature immediately recognisable from the sea and equally easy to locate from further off since it lies on a deep bay midway between the headlands of Ballard Point and The Needles.

That Hengistbury was attractive in prehistoric times has long been evident from the Bronze Age barrow cemetery straggling along the ridge but its importance in the late Iron Age was not established until J P Bushe-Fox carried out a rescue excavation on the north-facing shore in 1911-12 (Bushe-Fox 1915). After an initial burst of interest the archaeological world seems to have forgotten the site until David Peacock drew attention to the exceptional collection of Dressel 1A amphorae contained in the old collection (Peacock 1971). A thorough re-study of the surviving artefacts by the present writer left little doubt that Hengistbury had been a major port on an extensive trading network throughout much of the 1st century BC (Cunliffe 1978; 1982).

Hengistbury was clearly a key site in any attempt to assess the effects of long-distance trade on the socio-economic system of south-eastern Britain in the century or so before the Roman invasion of AD 43. It called for a reassessment based on sound stratigraphical evidence: with this in mind a programme of limited excavation was mounted from 1979-1987. The aims of the project were:
a) to examine part of the settlement area to provide stratified material and a context within which to assess the older collections;
b) to define the range of settlement structures;
c) to evaluate the economy and overseas contacts of the community;
d) to obtain environmental data;
e) to explore aspects of the maritime use of the site in the prehistoric period.

The first three aims were rapidly achieved in the excavation of 1979-84 and have been reported on in full (Cunliffe 1987). The last two were accomplished with rather more discomfort in 1985-7 and are yet to receive full publication.

Hengistbury as a port-of-trade
The archaeological record showed that an extensive settlement had existed along the north shore of the headland overlooking the sheltered waters of Christchurch Harbour. At the beginning of the 1st century BC the settlement expanded rapidly and activity intensified but after the middle of the century gradual decline set in until, by the Roman period, most of the old settlement area had been reduced to farmland. During the early 1st century BC Hengistbury was receiving cargoes of exotic products from the south along the Atlantic sea-ways. Most evident archaeologically were quantities of wine amphorae coming ultimately from northern Italy, a considerable variety of fine pottery from Armorica, blocks of raw purple and yellow glass, figs from the Mediterranean, and there was, no doubt, a range of other commodities no longer recognisable in the archaeological record. Most evident archaeologically were quantities of wine amphorae coming ultimately from northern Italy, a considerable variety of fine pottery from Armorica, blocks of raw purple and yellow glass, figs from the Mediterranean, and there was, no doubt, a range of other commodities no longer recognisable in the archaeological record. In return, raw materials were brought to Hengistbury from far afield in Britain for refinement and ultimately for export. The easiest to recognise were metals, iron, copper, tin, lead, silver and gold. Salt cake and Kimmeridge shale armlets were also in evidence. In addition there is some evidence for the stockpiling of corn from the Wessex chalkland and even tenuous evidence for the amassing of cattle for export, either on the hoof or as salt meat and hides. When compared with Strabo’s list of desirable exports from Britain at about this time the only two items not accounted for at Hengistbury are slaves and hunting dogs, neither of which would be easy to identify under normal archaeological conditions.

The evidence for trade is difficult to quantify but is sufficient to suggest that ships of various kinds must have frequented the harbour, ranging from river craft plying the Wessex rivers to sea-going ships capable of making coastal journeys to the West Country or crossing the Channel to the ports of the north Breton coast.
Evidently some provision must have been made for landing at the headland settlement; the last three years of the campaign were dedicated to the examination of this problem.

Land forms
Crucial to any understanding of the Iron Age use of the headland is the question of the original form of the landscape. Essentially there have been three processes at work sculpting its present shape: massive erosion along the southern seaward side of the head; long shore drift depositing the eroded material in a spit across the harbour mouth; and the accumulation of marsh deposits on the sheltered shore within the harbour. To add to the complexity of the situation minor changes in sea-level introduce another variable which can significantly alter the rate of change of sedimentation. To assess these processes a detailed programme of environmental work was undertaken under the direction of Dr Michael Tooley and the comments offered below represent a preliminary summary of our findings. Some modification in matters of detail can be expected as the results of the various scientific analyses become available.

Figure 3.3 offers a tentative reconstruction of the headland as it is thought to have been in the late Iron Age. Coastal erosion, particularly in the last 200 years, has dramatically reduced the land mass to about half its original size but the greatest interest from the point of view of this paper lies in the character of the sheltered north shore. Simply stated, three massive gravel bars can be distinguished rooted to the headland but thrusting out into the harbour. These are composed of well-rounded flint pebbles sometimes of considerable size and rise to heights of in excess of 2 m from the bedrock base. The simplest explanation for them is that they were created under riverine conditions in the Pleistocene, perhaps by the proto Bourne/Stour/Avon as it flowed to join the Solent river (Cunliffe 1987, 117). By the Iron Age they were ancient features of the landscape. For ease of reference the bars have been given names based on local topographic features (Fig 3.3).

Each gravel bar protected an inlet. Between Barrow bar and Barnfield bar the inlet was narrow and it was here that the main area excavation was carried out. The essential conclusions from the point of view of the present discussion were that the sea-level had dropped by about 0.6 m during the 1st millennium BC exposing...
the sandy base of the inlet, some 20 m wide, which was colonised by the Iron Age settlement.

At the east end of the headland the situation was very different. Limekiln bar extended outwards some 230 m from the land and was met by a complex of other sand and gravel bars, possibly of more recent age, formed as cuspate spits building back westwards from the extreme north-east corner of the promontory. The exact geomorphology of this fascinating area has yet to be studied in detail but it is clear that by the late Iron Age a continuous barrier extended from Limekiln bar to the gravel spit enclosing a large expanse of marshland in which a peat bog had formed.

Thus neither Barnfield inlet, nor the Salthurns, provided a suitable haven. Rushy Piece on the other hand, between Barnfield bar and Limekiln bar, was altogether different and it was here that detailed investigation brought to light evidence of the Iron Age harbour works.

The landing place at Rushy Piece

Rushy Piece, as its name implies, is a low-lying area of reed swamp lying between the two gravel bars and cut off from the present harbour by a low beach of gravel. Excavation was made hazardous by the high and persistent water table but around the fringes conventional excavation was possible while, in the centre, trial pits dug by hand or by machine were sufficient to establish stratigraphy. In addition, probing enabled the surface of the uppermost gravel spreads to be plotted.

The essential stratigraphy is summarised in Figure 3.4. The profile of an early beach was established overlaid by blue grey alluvium with an upper surface at between 0.4 and 1.2 m below present OD. This was the situation c 100 BC when the harbour was established. Two structural phases can be distinguished. In the first an area of the alluvium and part of the old beach was dug away, presumably to create a deep water approach, and the material removed was dumped along the upper edge of the inlet. This was then sealed with a varying thickness of redeposited gravel, quarried from the nearby gravel bars, creating a hard, which projected seaward along the southern edge of the inlet. From the north-west edge of the hard the gravel sloped evenly down to the deep water cut.

The intention of the harbour works is clear enough — to create a landing place where boats could approach...
Figure 3.3 Hengistbury Head: tentative reconstruction of the 1st millennium BC geomorphology. (Drawing: Institute of Archaeology, Oxford).

Figure 3.4 Section through Rushy Piece. Note exaggeration of vertical scale. (Drawing: Institute of Archaeology, Oxford).
close inshore protected from any swell or scend in the main harbour and where they could be beached on a hard and their cargo loaded and unloaded. What is impressive is the very considerable expenditure of energy invested in creating the gravel hard involving the quarrying and movement of many hundreds of tons of gravel (Fig 3.5).

At the time when the harbour was in use in the late Iron Age mean sea-level would have been no more than 0.5 m below present OD but subsequently conditions changed. The most likely explanation is that changes in sea-level led to the creation of a new gravel bar across the entrance to the landing place creating an area of stagnant water where the old landing place and hard once were. The result was that peat grew above the earlier remains while on the slightly drier ground to the south arable fields were laid out. Later, in the late or sub Roman period, a rise in sea-level breached the barrier and the area once more turned into alluvial flats covered at high tide. Throughout this period and subsequently beach formation continued. A slight lowering of sea-level in the medieval period allowed the formation of a peat marsh once more.

**Implications**

What emerges from this brief summary of an Iron Age haven at Hengistbury is that Iron Age harbours with man-made landing places once existed and can be discovered by normal archaeological methods. Clues to their whereabouts are best provided by artefact assemblages incorporating imported material. Once a potential site has been identified a combined archaeological/geomorphological approach is demanded since the archaeological levels are likely to be inextricably bound up with natural stratigraphy consequent upon sea-level change.

That more Iron Age ports exist around the coasts of Britain is certain and it can only be a matter of time before some of them are discovered.

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Evidence for the use of water transport in the southern North Sea and Channel region during the period c. 300 BC to c. AD 50 is evaluated and boat types, building methods, means of propulsion, and likely performance are described. An attempt is made to build upon earlier work by Ellmers and to identify the characteristics of the Celtic tradition of planked boat and shipbuilding. Methods of navigation, trade routes, harbours and landing places are also discussed, and it is concluded that, well before 300 BC, seamen of north-west France, south-west Britain and south-east Ireland used sail, and were capable of open sea navigation out of sight of land.

Water transport
Theoretical investigations, based upon:
(a) the identification of the materials, tools and techniques required to build the various forms of water transport and
(b) the determination of the earliest appearance in the archaeological record of these characteristics — albeit not in a nautical context — indicate that, by the end of the Neolithic, some 2000 years before the period under consideration, almost all the types of float, raft and boat known to Man could have been built in north-west Europe (Table 4.1). The only types of water transport which became technologically possible after the Neolithic, and are therefore not listed in Table 4.1, are:
(i) bundle boats — for which there is no known tradition outside Arabia
(ii) complex bark boats — for which there is no known tradition in north-west Europe, apart from some minor and late evidence from Finland
(iii) complex plank boats — of which there are indeed examples in the Bronze Age of north-west Europe (see below).

Boats
The evidence for boats is more promising, as there is evidence for logboats (dugout canoes), hide boats and plank boats from before, and actually in, the period under discussion.

Logboats
Logboats have been discovered in Britain, Ireland, France, Belgium, the Netherlands, Germany, and Denmark (Ellmers 1973; McGrail 1978; Rieck & Crumlin-Pedersen 1988), but only about half of the 60 or so that have been well documented are dated to the prehistoric period (Booth 1984; Rieck & Crumlin-Pedersen 1988). Of these, five are from the late Iron Age of the southern North Sea region: Hasholme, c. 300 BC (Millett & McGrail 1987); Shapwick, 2305 ± 120 bp (Q-357); Poole, 2245±50 bp (Q-821); Holme Pierrepont 1, 2180±110 bp (Birm-132); and Loch Arthur/Lotus, 2050±80 bp (SRR-403). This is a very limited number on which to base conclusions; nevertheless it seems likely that, wherever there were sizeable trees, simple logboats would have been built and used on inland waters for hunting, fishing, fowling, reed gathering and as ferries of men and of cargo. In some cases these logboats may have carried armed men, as seen in the Roos Carr, north Humberside, models (Sheppard 1901; 1902), recently dated to 2460 ± 70 bp (OXX-1718).

Simple logboats may be modified in several ways to give them the extra transverse stability and freeboard required to become usable at sea. The parent log, providing it is of a suitable timber species, may be expanded, normally after heat treatment, to give greater beam at the waterline and hence increased stability (McGrail 1978, 38-41). Or logboats may be fitted with stabilisers (a sort of close-in outrigger) which also increases their effective beam (ibid, 51-4). A third way of increasing stability is by pairing two logboats side-by-side (ibid, 44-51). Additional freeboard may be obtained by extending logboats vertically by adding one or more strakes of planking to the sides of the basic boat (ibid, 41-3). There is, in fact, no evidence in any of the north-western European logboats dated to pre-Roman
Figure 4.1 Exploded reconstruction drawing of the Hasholme logboat of c300 BC: A. upper bow with treenails; B. lower bow; C. transverse timbers with wedges; D. washstrakes with treenails and keys; E. repairs with treenails and keys; F. shelves; G. beam-thes with treenails; H. transom with wedges; I. hypothetical deck. (Drawing: National Maritime Museum).
Table 4.1 A theoretical assessment of the earliest technological stage that certain types of water transport could have been used in north-west Europe

<table>
<thead>
<tr>
<th>Technological stage</th>
<th>Water transport</th>
<th>At sea or on inland waters</th>
</tr>
</thead>
<tbody>
<tr>
<td>Palaeolithic</td>
<td>log float</td>
<td>inland waters</td>
</tr>
<tr>
<td></td>
<td>bundle float</td>
<td>inland waters</td>
</tr>
<tr>
<td></td>
<td>hide float</td>
<td>inland waters</td>
</tr>
<tr>
<td></td>
<td>simple log raft</td>
<td>inland waters</td>
</tr>
<tr>
<td></td>
<td>simple hide-float raft</td>
<td>inland waters, but no known tradition</td>
</tr>
<tr>
<td></td>
<td>simple bark boat</td>
<td>inland waters</td>
</tr>
<tr>
<td></td>
<td>simple hide boat</td>
<td>inland waters</td>
</tr>
<tr>
<td>Mesolithic</td>
<td>complex log raft</td>
<td>inland waters</td>
</tr>
<tr>
<td></td>
<td>multiple hide-float raft</td>
<td>inland waters, but no known tradition</td>
</tr>
<tr>
<td></td>
<td>bundle raft</td>
<td>inland waters</td>
</tr>
<tr>
<td></td>
<td>simple log boat</td>
<td>at sea and on inland waters</td>
</tr>
<tr>
<td></td>
<td>multiple-hide boat</td>
<td>at sea and on inland waters, but no known tradition</td>
</tr>
<tr>
<td></td>
<td>basket boat</td>
<td>at sea and on inland waters, but no known tradition</td>
</tr>
<tr>
<td>Neolithic</td>
<td>pot float</td>
<td>inland waters, but no known tradition</td>
</tr>
<tr>
<td></td>
<td>pot-float raft</td>
<td>inland waters, but no known tradition</td>
</tr>
<tr>
<td></td>
<td>complex log boats</td>
<td>at sea and on inland waters</td>
</tr>
<tr>
<td></td>
<td>simple plank boats</td>
<td>inland waters</td>
</tr>
</tbody>
</table>

Notes: 1. For definition of types see McGrail 1985c; 1987a, 4-11.
Table 4.2 Theoretical load carrying performance of the logboats from Poole and Hasholme

<table>
<thead>
<tr>
<th>Boat</th>
<th>Description</th>
<th>Draft (m)</th>
<th>Freeboard (m)</th>
<th>%1</th>
<th>Deadweight2 (kg)</th>
<th>Deadweight3 coefficient</th>
</tr>
</thead>
<tbody>
<tr>
<td>Poole</td>
<td>Light displacement (862 kg)</td>
<td>0.19</td>
<td>0.31</td>
<td>38</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Hasholme</td>
<td>Light displacement (4398 kg)</td>
<td>0.38</td>
<td>0.87</td>
<td>30</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Poole</td>
<td>Maximum men (2 plus 16)</td>
<td>0.30</td>
<td>0.20</td>
<td>60</td>
<td>1080</td>
<td>0.56</td>
</tr>
<tr>
<td>Hasholme</td>
<td>Maximum men (2 plus 18)</td>
<td>0.46</td>
<td>0.79</td>
<td>37</td>
<td>1200</td>
<td>0.21</td>
</tr>
<tr>
<td>Poole</td>
<td>4 men plus 898 kg peat4</td>
<td>0.30</td>
<td>0.20</td>
<td>60</td>
<td>1102</td>
<td>0.55</td>
</tr>
<tr>
<td>Hasholme</td>
<td>5 men plus 5502 kg peat4</td>
<td>0.75</td>
<td>0.50</td>
<td>60</td>
<td>5802</td>
<td>0.57</td>
</tr>
</tbody>
</table>

Notes: 1. Ratio of draft to maximum height of sides expressed as a %. It is considered that the 60% values are best for comparison of boats as cargo carriers (McGrail 1988).
2. Weight of cargo and crew
3. Deadweight/Displacement. A measure of ability of boats to carry cargo, in particular high density, low stowage factor, loads.
4. Alternatively, materials of greater bulk density (eg grain, meat, timber, iron or stone) may be carried, resulting in increased stability.
sides of the boat firmly against this transom, thus making the stem watertight. Also shown in Figure 4.1 is a hypothetical quarter deck for two steersmen using large paddles; it is thought that such a deck could have rested on the shelves found in the sternsheets (Fig 4.3). In several parts of the world today, for example, Pakistan (Greenhill 1971) or South America (Edwards 1965), logboats are used on the same river systems as planked boats. Logboats fit into a different cultural context from planked boats, being usually found in peripheral regions; they are generally preferred to planked boats for economic reasons. Thus it is not surprising to find prehistoric logboats in the River Humber, where prehistoric planked boats were also used, and it seems reasonable to suppose that both types were similarly used in the lands bordering the southern North Sea and Channel in the late Iron Age.

Hide boats

The evidence for the use of hide boats (sometimes known as skin boats) in north-west Europe before the Iron Age is meagre: antler fragments from Husun, Schleswig-Holstein, of doubtful provenance (Ellmers 1984); a so-called boat grave at Dalgety, Fife (Watkins 1980); rock carvings in Scandinavia and northern Russia, including some which probably represent boats, though there are differing views on dating and on the type of boat depicted (Marstrander 1963; Johnstone 1972; Coles & Harding 1979, 317); a small shale bowl from Caergwrle, Wales (Denford & Farrell 1980; Green et al 1980), which it is difficult to demonstrate represents a hide boat (except in a symbolic way) let alone to identify the type of boat; and some minute gold models from Nors, Denmark (Muller 1886) which do have a more obvious boat-like form (see Fig 14.5) and which Johnstone (1980,126) believes represent Bronze Age hide boats, but which Crumlin-Pedersen (this volume) has suggested may represent expanded logboats of the 5th/6th century AD. This is not to imply that hide boats were not used, for they were technologically possible from the Mesolithic, but the evidence available at present is thin. However, in the Iron Age and the Roman period there is more substantial evidence, although no actual hide boat has yet been found, apart from a ‘coracle-like vessel’ with a human skeleton found near the River Ancholme at South Ferby, South Humberside, and thought by Sheppard (1926) to be of Roman date — the remains no longer exist.

A small gold model from Brighter, County Derry, Ireland, dated to the 1st century BC (Farrell & Penny 1975) originally had nine rowing thwarts with associated oars in grommets on each side, and there are also three poles for propelling the boat in the shallows (Fig 4.4). A yard on a mast stepped through a hole in the central thwart indicates that this boat could also be sailed, probably using a square sail of aspect ratio between 0.75 and 1.38, depending on where on the mast the yard was positioned. She was steered by a steering oar over the quarter and had a four-hook grapnel anchor. From the general shape and the proportions of this model it seems likely that it represents a sea-going hide boat of the coracle type.

There are several references by Roman authors (1st century BC - 3rd century AD) to the contemporary use of hide boats on inland waters and at sea off north-west Europe (Caesar, Bello Civili, 1.54; Pliny, 7.206; Lucan, Pharsalia 4, 130-8; Solinus, Polyhistor 23). Two other references are important because they contain information from much earlier sources. Pliny (4.104), writing in the 1st century AD and quoting from an early 3rd century BC history by Timaeus, states that Britons involved in the tin trade used boats with a wryth framework covered with sewn hides (vulhibus navigis corio circumstantis; see also Pliny Nat Hist 34, 156). In his 4th century AD poem, Ora Maritima, Avienus preserved extracts from an early periplus which Hawkes (1977, 19) and others date to the 6th century BC, before the time when the Cathay region is known to have prevented Greek ships passing through the Strait of Gibraltar. Periplotoi were originally oral aids to coastal pilotage for mariners and traders, and the Massaliote periplus quoted by Avienus describes the main features of a voyage southbound along the western coast of Atlantic Europe and then along the northern shores of the Mediterranean to Massilia (Marseilles). There are undoubted difficulties in interpreting the names of people and places mentioned, difficulties increased by the apparent interpolluation of extraneous matter — for example, Himilco of Carthage’s description of a windless, tideless, seaweed-strewn sea (Murphy 1977, line 117-29, 380-9, 406-16). Nevertheless, the main elements of the description are clear, even if some details remain ambiguous. The information of relevance to the present discussion — those lines dealing with seafarers who lived in the vicinity of a headland Oestrymnin — may best be presented by paraphrasing and interpreting Murphy’s translation (1977):

The hardy and industrious peoples of the islands and coasts of the lands around Ushant or Ouessant [ie the predecessors of the Veneti, Osismi and Coriosolites] were heavily involved in maritime trade, much of it in tin and lead. They used hide boats (netisque cumbis) on these oceanic voyages. [Lines 94-107]

From Ushant/Ouessant it is two-days’ sail to Ireland [see Fig 4.5; a two-day voyage requires an average of c 5 kts made good — which is not impossible] and Albion [Britain] is sighted on this voyage. [Lines 108-112]

Merchants from Tartessus [a harbour in the Gulf of Cadiz, south-west Spain], from Carthage, and from the vicinity of the Pillars of Hercules [Strait of Gibraltar] sailed to the Ushant/Ouessian region to trade. [Lines 113-116]

Thus, from at least the early Iron Age, hide boats were used on sea-going trading voyages in the western Channel and the north Bay of Biscay region.

Caesar (Bello Civili, 1.54) states that British hide boats had keels, and this is sometimes thought to have been a mistake as 20th century Irish and Welsh coracles and coracles do not have them, and only certain types (eg those from County Kerry) have a central lath which is broader than other laths in the framework. However, Adomnann in his 6th/7th century AD Vita St Columbae (Anderson & Anderson 1961) and other medieval authors (Marcus 1953-4, 315) refer to coracles with keels, and a late 17th century drawing by Captain Philips, now in the Pepys Library, Magdalene College, Cambridge, shows a large Irish sailing coracum with prominent keel and stem (Fig 4.6). It seems very possible that Iron Age sea-going hide boats similarly had keels and stems.

Philip’s ‘Wilde Irish’ coracum also has a waven wickerwork hull inside the hide (as has a 19th century Scottish coracum now in Elgin Museum; Fenton 1976), and not the unwoven, fastened-lath framework of recent coracles. Descriptions by Caesar (Bello Civili, 1.54), Lucan (Pharsalia 4, 136-8), Pliny (Nat Hist 7, 205-6; 34,
Figure 4.4 Small gold model boat of 1st century BC from Broighter, Co Derry, Ireland. (Photo: National Museum of Ireland).
Figure 4.5 Map of region between south-east Ireland, south-west Britain and north-west France. (Drawing: Institute of Archaeology, Oxford).
Figure 4.6 Captain Phillips’ late 17th century drawing of curachs. (Photo: Pepys Library, Magdalene College, Cambridge).

There are some disadvantages to these boats: the hide cover, which is relatively easily holed contributes little to strength, and thus boats are limited in length to c 12 m (or possibly 18 m; McGrail 1987, 184); thus they could never have been enlarged into ships. The lightness of the structure and consequent good freeboard also mean reduced resistance to leeway (despite having a protruding keel and the use of a steering oar), thus windward performance may not be as good as that of a comparable planked boat. Nevertheless, in certain physical environments and economic conditions, the hide boat has advantages and is preferred to the planked boat, and there is every reason to believe that they were widely used in the early southern North Sea and Channel region, both sea-going types and others more suitable for inland waters, even though in certain parts of that region the planked boat was also known and used (see below).

Bronze Age planked boats
Despite the apparent dominance of hide boats as sea-going craft in the early Iron Age of the southern North Sea and Channel region, the future was to lie — as in the rest of the world — with the planked boat which, of all the boat types, was the one that could be successfully developed into a ship. There are five planked boats from north-west Europe dated to the Bronze Age: three finds from North Ferriby, North Humberside, dated to the 2nd millennium BC (Wright 1976; 1985); the planked boat from Brigg, South Humberside, of the mid 1st millennium BC (McGrail 1981b; 1985a); and the boat from Hjortspring, Als, southern Denmark, dated to c
Table 4.3 Theoretical cargo capacities of the plank boats from North Ferriby, Brigg and Hjortspring

<table>
<thead>
<tr>
<th>Boat</th>
<th>Draft (m)</th>
<th>Freeboard (m)</th>
<th>%1</th>
<th>Deadweight1 (kg)</th>
<th>Deadweight1 coefficient</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ferriby</td>
<td>0.30</td>
<td>0.36</td>
<td>45</td>
<td>3000</td>
<td>0.54</td>
</tr>
<tr>
<td>Ferriby</td>
<td>0.40</td>
<td>0.26</td>
<td>61</td>
<td>5500</td>
<td>0.52</td>
</tr>
<tr>
<td>Brigg</td>
<td>0.25</td>
<td>0.09</td>
<td>74</td>
<td>1540</td>
<td>0.23</td>
</tr>
<tr>
<td>Brigg</td>
<td>0.46</td>
<td>0.09</td>
<td>84</td>
<td>7160</td>
<td>0.57</td>
</tr>
<tr>
<td>Hjortspring</td>
<td>0.31</td>
<td>0.39</td>
<td>44</td>
<td>2110</td>
<td>0.80</td>
</tr>
</tbody>
</table>

Notes: 1. See notes 1, 2 and 3 in Table 4.2.
2. Side height of 0.34 m.
3. Side height of 0.55 m.

350 BC (Rosenberg 1937). These boats were all sewn-plank boats, no iron fastenings were used, and they were all suitable for river and estuary work rather than open sea voyages, the Brigg ‘raft’ of box-like form being especially suited to upstream work. The Ferriby boats with their high length/breadth ratio (c 6:1) were evidently built with speed in mind, essential when crossing the tidal Humber estuary. Estimates of the cargo capacity of these three boats are given in Table 4.3, although these figures are not directly comparable as they have not been calculated at similar waterlines.

None of these boats had any evidence for sailing or rowing (the earliest evidence in north-west Europe of oared propulsion is on the small gold model from Durnberg of the 5th century BC; Ellmers 1978), and it must be assumed that they would have been propelled and steered, by paddles, which were indeed found with the Hjortspring boat.

The Brigg ‘raft’ is keel-less: Ferriby boat 1, on the other hand, has a keel, in the sense that the central longitudinal member of the bottom is of greater scantlings than the remainder of the bottom planking, but it is not a very prominent one and may be best classified as a ‘thin-plank’ keel (McGrail 1987, 112-13). There are suggestions, however, that, in addition to the Ferriby/Brigg type of planked boat, there were also boats with prominent keels and stems in early Britain: the Bronze Age boat-shaped log coffin from Loose Howe, North Yorkshire (Elgee & Elgee 1949) has a pseudo-keel and stem; and the Iron Age logboat from Poole, Dorset has a pseudo-stem. Such features are non-functional on a logboat and thus must have been copied from a planked boat, or possibly a hide boat.

Early Iron Age plank boats

Table 4.4 attempts to summarise the range of boatbuilding techniques available to late prehistoric man in north-west Europe, based on the evidence from boat-shaped coffins, logboats, hide boats and planked boats. Thus, at the beginning of the period under review, some or all of these techniques could have been used to build the plank boats of the southern North Sea region. Whether there were in fact early Iron Age planked boats with these features remains to be

Table 4.4 Techniques available to the late prehistoric boatbuilders of north-west Europe

| Shape          | flat-bottomed (Ferriby, Brigg) |
|                | round-hulled (Hjortspring, Logboats) |
| Sequence       | shell (Ferriby, Brigg, Hjortspring) |
|                | skeleton (Hideboats) |
| Ends           | with stems (Loose Howe, Poole) |
|                | with stems plus protrusion (Hjortspring) |
|                | without stems (Ferriby, Brigg) |
| Keels          | with prominent keel (Loose Howe) |
|                | without keel (Brigg, Hjortspring) |
|                | with ‘low-profile’ keel (Ferriby) |
| Planking       | overlapping but superficially flush-laid (Ferriby, Brigg, Hasholme) |
|                | overlapping clinker-style (Hjortspring) |
| Caulking       | moss (Ferriby, Brigg, Hasholme) |
|                | hide (Poole) |
| Fastenings     | sewn (Ferriby, Brigg, Hjortspring) |
|                | cleats with transverse timbers (Ferriby, Brigg, Hasholme) |
|                | locked treenails (Hasholme) |
|                | metal (Holme-Pierrepont 1) |
| Oculi          | boat’s eyes (Logboats from Brigg, Loch Arthur, Hasholme and the Roos Carr model) |

demonstrated by excavation, and whether such hypothetical boats were used at sea, in addition to hide boats, or were restricted to lakes, rivers and estuaries, as were their only known Bronze Age predecessors, must remain an open question for the present.

Later Iron Age planked boats

The early Iron Age planked boat is therefore conjectural, but towards the end of the Iron Age, in the 1st century BC and the early 1st century AD, the sea-going plank boat becomes more tangible as there is documentary and iconographic (but not excavated) evidence for them in the Channel region.

The Veneti boats

Caesar (Bello Gallico, 3.13) and Strabo (4.4.1) have left descriptions of the sea-going boats of the Veneti, a sub-group of the Belgae of north-west France (Fig 4.5). These vessels were solidly built with high bow and stern, and bottoms that were flatter than those of the Roman ships, enabling them to sail closer inshore and to take the ground readily in tidal waters. These Celtic craft were more seaworthy than Caesar's ships, yet not so fast. Most, if not all, of these differences are to be expected when sail-propelled Channel trading vessels are compared with oared warships which, although they may have been built on the River Loire (Bello Gallico, 3.9) were undoubtedly to a Mediterranean specification. Other points made by Caesar and Strabo may be more diagnostic of the late Iron Age, Celtic boatbuilding tradition.

The Veneti ships had oak planking — presumably (at least superficially) flush-laid, otherwise the difference from the Classical tradition would have been noted. This planking was caulked with what is usually translated as 'seaweed' but which may have been moss (E V Wright, pers comm) or even reeds (harundines) which Pliny (Nat Hist, 16.158), of the 1st century AD, tells us was used by the Belgae to caulk seams 'where it held better than glue and was more reliable than pitch'. The Veneti boats' thwartships timbers (transa which should probably be translated as 'frames' or 'floor timbers' rather than 'crossbeams') were c 1 ft or 0.30 m thick (pedalibus in altitudinem) and were fastened by iron nails (ferreis digiti), a thumb or 1 inch (25 mm) in diameter. Caesar tells us these ships were propelled by leather sails but he gives no description of mast, yard or standing and running rigging, except for a passing reference to ropes (funes) which fastened the yard to the mast. There is also no mention of the steering arrangements and so, perhaps, it may be concluded that it was by side rudder, generally similar to those used in Classical ships. Caesar does, on the other hand, tell us that the Veneti used iron chains with their anchors — these chains were probably forerunners to cables of organic material and similar to the 6.5 m iron chain found with a 1st century AD iron anchor at Bulbury, Dorset, some 2-3 miles up the River Shelford from Poole Harbour (Cunliffe 1972).

Caesar (Bello Gallico, 3.8) and Strabo (Geog, 4.4.1) also describe the seafaring activities of the Veneti, how they had numerous ships and exercised authority over coastal traffic by making 'almost all' pay tribute. In the theory and practice of seamanship they had no equal, and they regularly sailed to an emporium in Britain.

The distribution of Veneti gold coins (Galliou 1977) indicates that the Veneti, from their territory in Morbihan, were active up the River Loire beyond Angers, along the rivers Aunie and Elorn, and as far as Rennes on the River Vilaine (Fig 4.5). On the other hand, they are not well documented in the archaeological record of Britain but, as Cunliffe (1982, 1201) and then by de la Ronciere & Clerc-Rampel(1934, 2-3). Some six years after Caesar had first encountered the Veneti ships he mentions in his book on the Civil War (Bello Civili 3.29) pontones quod est genus navium Gallicarum, a 'kind of Gallic craft' known as a ponto, which was a navis oneraria, capable of transporting troops, and possibly horses. This ponto probably had a reputation as a reliable sailing ship for Antony left thirty of them at Lissus in Greece, so that Caesar might use them to pursue Pompey (Bello Civili 3.40).

Johnstone (1938, 87-8) and, following him, Weatherhill (1985) have suggested further consideration should be given to the ponto, a view first expressed by Jal (1848, 1201) and then by de la Ronciere & Clerc-Rampel(1934, 2-3). Some six years after Caesar had first encountered the Veneti ships he mentions in his book on the Civil War (Bello Civili 3.29) pontones quod est genus navium Gallicarum, a 'kind of Gallic craft' known as a ponto, which was a navis oneraria, capable of transporting troops, and possibly horses. This ponto probably had a reputation as a reliable sailing ship for Antony left thirty of them at Lissus in Greece, so that Caesar might use them to pursue Pompey (Bello Civili 3.40).
1978, 24, 127, 136, pl 122). The ponto (Fig 4.7 and 4.8), which is being towed by a boat of similar form, appears to be a ship of some size, with a relatively deep hull (length/depth = 3.36). The sheerline is generally parallel to the keel except at the ends where it rises sharply and, at the stern, curves forward. There appears to be a wale or rubbing strake below the sheer. She was propelled by a square sail (aspect ratio of c 1) on a mast stepped near amidships which is supported by shrouds. The yard, on which the sail is furled, has several lifts to the mast-head, and braces from the yard arms to the deck. Other rigging leads to a now-obliterated, sharply angled mast which probably had an artemon sail over the bows. There is a rudder on the port quarter which may be one of a pair.

Stem projections
This appears to be a representation of a ship ‘high and dry’ rather than afloat, thus the lowest part of the hull visible may be taken to be the keel which meets the curved stem in a projecting forefoot. Projections of various forms may be seen, for example, on the prehistoric Hjortspring boat (Rosenberg 1937); on late Bronze Age and early Iron Age Scandinavian rock carvings (Christensen 1972, 162); on 1st century BC coins of the Continental Atrebates (Fig 4.9); on British coins of the early 1st century AD (see below); on a Gallo-Roman bronze model river boat from Blessey near the source of the River Seine (Johnstone 1980, fig 12.5); on several late 3rd century AD coins of Allectus (Marsden 1964; Dove 1971); and on an engraved stone from Lőddeköpinge, Sweden, tentatively dated to the 9th century AD (Rieck & Crumlin-Pedersen 1988, 131, 143) (Fig 4.10). They are also found in the Mediterranean region; on Minoan engravings of c 2000 BC (Casson 1971, fig 36); on 7th century BC boat models and engravings from Italy (Bonino 1975); on the 3rd century BC Punic shipwreck from Marsala (Basch & Frost 1975); and on the 1st century BC Madrague de Giens wreck (Tchernia et al 1978); on 1st/2nd century mosaics at Ostia (Basch 1983, fig 1); on a mosaic of the 1st century AD at Magdala (Raban 1988); see also Casson (1971, figs 30, 137, 140, 145, 191). They have been known in the 20th century on boats of the Celebes (Hornell 1946, 210, fig 39); in Lake Victoria (Worthington 1933); Siberia (Brindley 1919/20); and in Oceania and the Indian Ocean (Hale 1980, 126). These projections are thus wide-ranging in time and space.
Only rarely do they represent rams, which are only practicable at the waterline of an oared fighting vessel. There are a number of other reasons why boats may have such projections:

(i) for use when beaching bows first when the protrusion prevents the bows digging in,
(ii) to increase speed potential, by increasing the waterline length, by reducing resistance or drag due to the cancellation of the bow wave, and by fairing an otherwise blunt bow,
(iii) to improve windward performance by increasing the lateral plane area thus increasing resistance to leeway,
(iv) to improve steering characteristics (Mudie 1986, 53),
(v) in a short, steep sea it is said to be effective in keeping up a boat's head (Worthington 1933, 161), or,
(vi) as a structural solution to the problem of making a strong, watertight joint between keel and stem by running the keel beyond the stem and supporting the latter by an external knee.

Ships on Celtic coins

The representation of boats with stem projections, nearest in time and place to Caesar's Veneti, are the one on the 1st century BC Atrebates gold coin (Fig 4.9) and those on two bronze coins of Cunobelin (Figs 4.11 and 4.12). The Atrebatic depiction is stylistic and little more than the fact that this is a relatively deep boat with a bow projection can be deduced. The coins from Canterbury and Sheepen, which were issued by Cunobelin of the Trinovantes/Catuvellauni during the period 20-43 AD (van Arsdell 1989, 408, cat no 1989-1, pl 51), show more details.

Figure 4.11 Early 1st century AD bronze coin of Cunobelin from Canterbury. Scale 2:1 (Photo: Canterbury Archaeological Trust).

There are problems in interpreting representations on coins: the engraver is constrained by the shape and size of the coin; he may be drawing something from outside his own experience and the model he uses may be taken from another culture and/or another age; the representation may be stylised and details may be difficult to interpret; and boats are generally represented by a longitudinal elevation whereas transverse sections are needed if worthwhile estimates of performance are to be made. The difficulties here have been well described by Coates (1987). Even when it is certain that the representation is of a boat or ship, it is difficult to be certain about the precise type depicted. Marsden (this volume) has, for example, raised the question of whether the boats depicted on the two Cunobelin coins may be representations of Classical vessels in view of the fact that on the reverse of both coins there is a copy of a Classical motif, a standing winged Victory. However, there are other instances of Celtic and Classical art forms appearing on the same coin, for example, early 1st century AD silver coins of Verica of the Atrebates/Regni (van Arsdell 1989, 164, cat no 506-1) has a bull of Augustus on the obverse and a Celtic deity on the reverse (Andrew Burnett, pers comm).

Moreover, there is reason to believe that Cunobelin was indeed in the political, economic and geographic position as leader of the Trinovantes/ Catuvellauni to use his own ships in the cross-Channel trade, the main axis of which had, by this time, moved from the western and central Channel to the eastern crossings linking the Rhine mouth and Belgic Gaul with the Thames and the Essex Stour, Blackwater and Colne (Cunliffe 1982, 53-393). Furthermore, it is not possible to suggest a Classical representation of a sailing vessel with the group of features shown on the Cunobelin coins from which they might have been copied. It seems not unreasonable, then, to consider the alternative hypothesis that the engraver depicted a ship type that he knew, and that these are representations of a ship of the Trinovantes/ Catuvellauni which Cunobelin recognised as a prime support to his political prestige which was based on cross-Channel trade, as suggested by Muckelroy et al (1978).

Figure 4.12 Drawing of the Cunobelin coins from Canterbury (left) and Sheepen near Colchester (right). Scale 2:1. (Drawing: Institute of Archaeology, Oxford).

The ship on the Canterbury bronze coin (Fig 4.11) has a relatively deep hull (L/d = 3.2), comparable with that of the Althiburus ponto. The sheer line is generally parallel to the keel except at the ends where it rises, especially at the bows. She was propelled by a square sail (aspect ratio of c 0.70) on a mast stepped just forward of amidships, which is supported by forestay and backstay. The mast is cut short at the edge of this coin, but on the coin from Sheepen (Fig 4.12) there appears to be a feature at the mast head. The yard is depicted fore and aft, as is often the case on coins, and there appear to be braces from the yard-arms (or possibly these lines depict the sail). There is a transverse spar at the head of the fore stem (also on the Sheepen coin) which may represent a
The differences may also be listed:

(i) whereas both sheerlines rise markedly at the ends, the ponto’s after post is incurving in stylum fashion (Casson 1971, 66-8),
(ii) neither ship has a high aspect ratio sail, but the ponto’s ratio is greater (1 compared with 0.70/0.50),
(iii) the ponto’s yard is supported by lifts, the Cunobelin ship’s sail may have had a bowline to taughten its leading edge when close to the wind,
(iv) the ponto has an artemon as an auxiliary sail, the ponto mast is supported by shrouds whereas the Cunobelin mast has stays. This may not be especially significant as shrouds and stays together on a representation hide detail and the two craftsmen may have chosen to omit one or the other for clarity,
(v) both have side rudders but the ponto may have had two,
(vi) the ponto keel is straight and its stem is curved, whereas the Cunobelin ship has a rockered keel and a straight stem.

Caesar’s and Strabo’s descriptions undoubtedly refer to a type of Celtic sea-going cargo ship used in the Channel and the northern region of the Bay of Biscay in the 1st century BC. Whether this was the ponto subsequently mentioned by Caesar seems likely but is not certain. We cannot, however, precisely equate the 1st century BC ponto of Caesar with the 3rd (possibly 2nd) century AD ponto of Althibaurus, for it is well-known for ship types to change over time, both in form and in function, although the same name continues in use - for example, the punt, the barge and the hulc. On the other hand, Caesar was evidently impressed by the capabilities of the Veneti cargo ships and it is not unlikely that he requisitioned some for his own fleet. Such a vessel would need some modification for use in Mediterranean waters and it is likely that there would be some introduction of Classical techniques and practices. Gains in general shipbuilding knowledge and competence are also likely to have occurred with the passage of time. Thus an artemon sail and paired side rudders could have been fitted, as we see on the Althibaurus ponto, to increase manoeuvrability and improve steering. The introduction of the head sail would have necessitated the moving aft of the mainmast towards the centre of the waterline length. The use of an oared tug to tow the Althibaurus ponto suggests not only the use of harbours rather than informal landing places, but also an increase in size of ship. Large ships require larger masts and yards and heavier yards require lifts to be fitted. Other changes in the rigging and the addition of an incurving stern suggest there may have been less requirement in the 2nd/3rd century Mediterranean to sail close-hauled and more time spent with a following wind and sea. The use of formal harbours where the vessel could berth alongside a waterfront implies not only that a rockered keel was no longer essential but also that the ponto stem projection was not to assist in beaching but more probably to improve the hydro-dynamics of the hull.

The Celtic tradition of boat- and shipbuilding
As is often the case in a proto-historic period, there are problems in attempting to conflate archaeological and documentary evidence and to identify archaeological entities with historical facts. Nevertheless, there is sufficient overlap in the several forms of evidence...
considered above to advance as a working hypothesis that, in Caesar’s descriptions of the Veneti craft and of the Gallic ponto, in the ships depicted on the Atrebates and Cunobelin coins, and in the ponto on the Althiburus mosaic, we can see different aspects of a boatbuilding tradition indigenous to the southern North sea and Channel region, which changed somewhat over time and was adapted for several functions, including use in the Mediterranean. A boat- or shipbuilding tradition is a broad concept and there is no requirement that all vessels built in that tradition, even at any one time, should be identical. Such variability may be due to differences in function or in operating environments, or to local preferences, or to technological progress. In any one planked boat or ship tradition, for example, the Viking or the Classical, we may expect to find river barges, ferries and coastal fishing boats as well as fighting vessels and ocean-going cargo ships. A tradition is identified, and may be recognised, by a general continuity in time and space and by a set of diagnostic attributes which are more likely to be technological characteristics than morphological features. Shape (per se) has a relatively minor part to play in defining traditions as it is itself generally determined by the function the vessel is to undertake and by the operating environment. Only in the case of an innovation in shape, or in the case of a tradition with a very limited range of functions and operating environments, may this attribute make a significant contribution towards defining a specific tradition.

There is, to date, no excavated ship or boat of the 1st century BC southern North Sea and Channel region to give support to this working hypothesis or, alternatively, to cause it to be questioned. There are, however, a dozen or more boats of the 2nd/3rd century AD, from the Thames estuary, the Rhine region and Guernsey which have distinctive boatbuilding features generally known as Romano-Celtic or Gallo-Roman (du Plat Taylor & Cleere 1978; McGrail 1981a; 23-4; papers by Rule; Arnold; Marsden; de Weerdt; and Lehmann, this volume).

Some characteristics of these Romano-Celtic craft, the heavy floor timbers, the massive nails, and possibly the caulking (Arnold 1977), reflect aspects of Caesar’s description of the Veneti ships. The majority of these vessels are river barges but two of them, St Peter Port, Guernsey and Blackfriars 1, London, are clearly estuary vessels and probably sea-going, although their lack of, a prominent keel would have limited their operational performances. The mast steps of these two are approximately one-third the waterline length from the bow, an ideal position for a towing mast for bank towage, but not so for a mast with a square sail (McGrail 1987, 216-8). It may be that these two vessels were two-masted and the second mast step has not been found, but this seems unlikely. Another possibility is that they were dumb-lighters towed by larger ships or oared boats. An alternative hypothesis is that these vessels were fitted with a single fore-and-aft sail, such as a sprit or lugsail, which would need to be stepped forward of amidships. Ellmers (1969, pl 16; 1975, fig 8; 1978, fig 3) has suggested that representations of Romano-Celtic river boats of the 2nd/3rd century AD on a mosaic at Bad Kreuznach and on a gravestone from Junkerath depict leather lugsails with battens. It may thus be that Celtic lugsails began to be used in the 2nd century AD, replacing earlier square sails.

The working hypothesis formulated above may now be extended to include the evidence from the Rhine, Thames and Guernsey vessels of the 2nd-3rd centuries AD. The hypothesis then is that there was a Celtic tradition of plank boat and shipbuilding extending from before the 1st century BC to after the 3rd century AD. The diagnostic attributes of this tradition may tentatively be identified as the use of a form of the skeleton sequence of building, with planking that was generally not edge-joined, but fastened to heavy floor timbers and side timbers by large iron nails clenched by turning the point through 180° so that the nails became J-shaped, and with a distinctive caulking between the strakes (see Rule; Arnold; Marsden; and Lehmann, this volume). The use of leather sails may also be a distinguishing feature. A stem projection may be typical of some of them but not characteristic of the entire tradition.

The majority of the Romano-Celtic vessels so far excavated have a flat-bottomed transverse section with hard chines; but this need not be a diagnostic attribute of the Celtic tradition, rather a requirement of their function as river barges. The exceptions are the Blackfriars 1 and St Peter Port wrecks which have bottoms which are flattish in the floors with rounded chines. Such a transverse section would indeed be flatter than those of Caesar’s fighting ships and would ensure good cargo capacity, give the necessary transverse stability, and enable the vessels to sit upright on the beach for loading and unloading. The fact that these two vessels did not have prominent keels need not preclude other (as yet unknown) sea-going vessels of the Celtic tradition having them, and it can be seen from Table 4.1 that such a feature was within the technological inheritance of late prehistoric north-west Europe. A hull form with a prominent keel does not prevent a vessel taking the ground; Figure 4.13 shows a 100 ton ketch of

![Figure 4.13 The coasting ketch Charlotte discharging cargo on the beach at St Ives, Cornwall, c 1908. (Photo: Gillis Collection).](Image 286x140 to 532x429)
round-hull form with prominent keel beached for cargo unloading at St Ives, Cornwall. The transverse sections of medieval cogs, which are also known to have been beached (Ellmers 1979, fig 1.6; Crumlin-Pedersen 1979, fig 2.12), are not unlike those of the Blackfriars I and St Peter Port vessels, except that the former have a more prominent keel.

The foregoing hypothetical description of the Celtic building tradition is based on three descriptive passages, four representations, and a dozen or so boat finds. When more evidence comes to light, especially wreck finds from the period 200 BC - AD 500, it may become clearer whether this is indeed one tradition, what the distinctive characteristics are, how the tradition changed over time, and how it was adapted to build vessels for different functions and for use in different environments. Such studies should also increase our understanding of the early history of the medieval cog (Fliedner 1964; Crumlin-Pedersen 1965; Ellmers 1979): they may also throw some light on the early history of skeleton building.

Trade routes and navigation

The seaborne distribution of stone within the British Isles in the Neolithic period (Flanagan 1975; Cummins & Clough 1988, maps 1, 2, 3, 6, 9, 10, 11, 12, 16) and the cross-Channel metal trade in the Middle Bronze Age (Muckleroy 1981) indicate a long established seafaring tradition in Britain, Ireland and France. Their successors in the later Bronze and early Iron Age were thus able to respond to the overseas demands for tin. Subsequently in the late Iron Age cross-Channel trade was in insular gold, iron and other metals, grain, cattle, hides, slaves and hunting dogs (Strabo, 4.5.2; Cunliffe 1988a, 98-104, 145-9) and the import of Mediterranean produced goods such as wine, figs, glass and pottery.

Four or five cross-Channel routes between the Continent and Britain may be identified from excavated and documentary evidence as having been used in the 1st century BC, and probably earlier (McGrail 1983a). It seems likely that the open sea route from Ireland to the Continent was from Carnsore Point, Wexford to the vicinity of Scilly (both lie approximately on longitude 6½° W); and then from Lizard Point to the vicinity of Ushant (both on c 5½° W), this leg also being the westernmost of the probable Britain/Continent routes (Fig 4.5). The likely maximum speed made good on these two legs can hardly have been more than 5 kts: at this speed and with the requirement to take departure from, say, Carnsore Point or Lizard Point in daylight and to make a landfall at Scilly or Ushant also in daylight, there would have been a period of at least 10 hours out of sight of land even in midsummer. Thus for such open sea voyages deep-sea navigational techniques were necessary, in addition to the skills of coastal pilotage (McGrail 1983, 314-9).

As similar voyages — based on the evidence of the Massalioit Periplus (see above) — were undertaken in the 6th century BC, Iron Age seamen must have been capable of ocean navigation from those times, or even earlier. Furthermore, it seems likely that such voyages were undertaken primarily by sail rather than under oars (although this method must remain a possibility). If this proposition is accepted, then the date for the earliest use of indigenous sail in the waters of north-west Europe is put back to c 600 BC, half a millennium earlier than the Bellerophon vessel model's mast and yard and the sails of the Veneti ships described by Caesar (Bello Gallico 3.13) and by Strabo (Geog 4.4.1).

Harbours and landing places

The sea routes discussed above are based on the evidence of Classical authors (McGrail 1983a) and on excavated sites and artefacts, leading to the identification of natural harbours with river access to the interior. Excavated evidence has shown that, by the late Bronze Age, sites within certain harbours, as for example at Mount Batten within Plymouth Sound (Cunliffe 1988b), had become the prehistoric equivalent of ports. But these were not ports with built-up waterfronts as were to be found in the Classical world at that time (Casson 1971, 361-70). The indigenous hide and (later) wooden boats and ships of the southern North Sea and Channel region (even those that were ocean-going) used informal landing places adjacent to the settlement, workshops and trading areas which comprised the 'port'. Here they were beached by taking the ground on a falling tide or they were anchored or moored in the shallows and their goods unloaded by wading men or into smaller boats (logboats?) or into horse-drawn carts (Ellmers 1985, fig 30-31), as still happens in certain parts of the world today (McGrail 1981c; 1985b).

With few, if any, fixed structures the precise sites of early landing places may be difficult to identify archaeologically but there are many clues which may help in the search for them (McGrail 1983b, 34-41). One such landing place has recently been identified at Hengistbury Head within Christchurch Harbour by the recognition of a man-made gravel hard close to the site of a 1st century BC international trading place (Cunliffe, this volume).

In the late 4th century BC Pytheas sailed from Massalia to explore the northern sea and bring back commercial and navigational information (Hawkes 1977; 1984). Pytheas’ subsequent book is now lost, but Strabo (Geog, passim) of the 1st century BC and Pliny (Nat Hist 4, 102-4) of the 1st century AD, quote from him and from Timaeus of the 3rd century BC, and from these several accounts it is deduced (Hawkes 1977; 1984) that Pytheas probably made a landfall at Belerion (Lands End in Cornwall), followed by a landing somewhere in the south-west peninsula, where he was told that tin, mined nearby, was taken by hide boat to Mictis, an island some six days’ sail up the Channel, where it was made available to foreign merchants. It is generally agreed that this emporium was probably on or near the Isle of Wight (Vectis in later times), The practice of using an island or a promontory as a mart or entrepot has been, and is widespread, on such isolated and readily defended sites traders can be segregated, protected and supervised, justice dispensed and tolls imposed (McGrail 1983a, 311-3).

Diodorus (5.22.1-4) of the 1st century BC mentions an island Icits connected at low water to the British mainland by a causeway where tin, mined in the Belerion peninsula, was brought in wagons for foreign merchants to buy and transport to the Mediterranean via Gaul. Sixteen or more places have been suggested for the location of Icits (Maxwell 1972): the two considered most likely being the island of St Michael’s Mount, Cornwall and the peninsula of Mount Batten on the eastern side of Plymouth Sound (Cunliffe 1983; 1988b; Hawkes 1984). A major difficulty is to establish whether either site in the 1st century BC would have been an island which dried at low water leaving a (natural) causeway to the mainland. St Michael’s Mount has scarcely been investigated archaeologically, but there are a number of finds from Mount Batten which indicate that it was prominent in international seaborne trade
from the 4th century BC until just before the Roman Conquest (Cunliffe 1988b). Access may readily be gained from Mount Batten by rivers Tavy and Tamar to tin and copper deposits on Dartmoor and around Callington. These minerals would thus almost certainly have been brought to Mount Batten by boats, although other material to be exported could have been brought by wagon. Wagons could also have been used to load and unload ships anchored or moored in the shallows off both Mount Batten and St Michael’s Mount. An alternative interpretation of Diodorus’ causeway might be that it was a hard of the Hengisbury type which dried at low tide, and on which boats were beached.

There are other natural havens on the south coast of Britain, for example in Poole Harbour and in Weymouth Bay (Cunliffe 1982,46), with some evidence for use as international ‘ports’. On the east coast recent excavations at the 1st century BC/AD site at Redcliff on the northern shores of the River Humber have also revealed evidence for international trade, although it is not yet clear whether this was by a direct or an indirect route (Crowther et al forthcoming). It seems likely that a similar site or sites remain to be found in the River Thames near the head of tidal waters. Excavations at Bordeaux on the River Gironde (Debord & Gauthier 1979) and at Alet near St Malo, Brittany (Langouet 1984) have revealed further evidence for an international trade which linked Atlantic north-west Europe, especially the southern North Sea and the Channel region with the Mediterranean. There must be numerous smaller sites with landing places, associated with local coastal and river traffic, remaining to be discovered.

Endnote

The meaning of ‘landfall’ is sometimes misunderstood. In this paper it means the sighting and identification of a prominent coastal feature, usually when at some considerable distance from it.

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The Romano-Celtic ship excavated at St Peter Port, Guernsey
Margaret Rule

Abstract
The remains of a single masted sailing vessel which sank at the end of the 3rd century AD were recovered from the Harbour entrance in St Peter Port, Guernsey, Channel Islands, in 1984-6.

The ship was a minimum of 22.21 m long at the waterline and it was preserved to a maximum width of 4.5 m at a height of 0.6 m above the keel. It was constructed entirely of oak, with a tripartite keel plank and strakes secured to the floor timbers and side-frames with J-shaped, large iron nails. There were no carpentered joints in the structure.

The vessel burned to the waterline and sank in 4-5 m of water sometime shortly after AD 285.

The site
The wreck lay in 5 m water (Below Chart Datum) at the side of the channel into the Harbour entrance (Fig 5.1). The seabed around the site was soft muddy sand and there was little or no colonisation of the site by marine animals or plants. There were no natural hazards in the area for either divers or the wreck, but the frequency of commercial shipping movements through the Harbour entrance demanded the utmost vigilance on the part of the Dive Marshal.

The site was discovered in 1982 by Richard Keen, a professional diver and amateur archaeologist who recorded what was visible at that time, and reported it to the Island authorities and professional archaeologists. The wreck structure had been exposed by the thrust from propellors of large vessels (‘prop wash’) but, at that time, there was no evidence to suggest its importance. In 1984 further exposure of the wreck occurred and it became clear that the integrity of the hull was being destroyed. A portion of a timber, displaced from the hull earlier that year, had been dated by radiocarbon analysis to 1840 ± 80 BP (HAR-6135) and Roman pottery and tile had been noticed exposed on the seabed and protruding from the layer of pitch which capped the structure.

Excavation
A rescue excavation was organised by the Guernsey Maritime Trust in November 1984 to record the structure and its contents and recover as much as possible of the ship for study, conservation and display. On low water springs the propellors of passing ships occasionally appeared to have touched the wreck itself, and heavily weighted lifting trays were easily displaced and scattered if they were left on site. In these circumstances it was decided to limit the time taken to record both the structure and the finds on the seabed to the absolute minimum. A framework was constructed over the wreck to support the divers’ bodies above the archaeological deposits, but this was not used for accurate survey. Discrete numbered tags were placed on the structure and measured plans, sketches and photographs were made of all timbers in situ with their associated tags. Finds within the ship were only removed after their context had been recorded. Unstratified objects recovered from around the wreck were identified individually, with unique numbers signifying their location within the area where they were found. The layer of solidified pitch which concealed and preserved most of the stratified material was broken up using hammers and chisels, endeavouring to retain the relationship of the lumps to each other, and to the area of the hull where they were found. As this layer was removed the structure of the hull became inherently unstable. The work had to be paced to ensure that removal of the pitch and the stratified sediments did not leave large areas exposed and unrecorded when the weather finally deteriorated at the end of November 1984 and further excavation that year became impossible.

During the following winter 16 tons of sandbags were placed over the structure covering an area c 6 x 6 m. These had to be monitored and replaced several times after winter storms. The excavation and recovery of the stern structure was completed in April 1985. Recovery of the loose timbers, displaced from the wreck prior to the excavation, continued until August 1987.

The ship
The ship was constructed entirely of oak (Quercus sp) with edge-to-edge planks fastened to floor timbers and side-frames with long iron nails. All the longitudinal seams were caulked with oak or willow shavings and moss was used to effect a seal between the cone shaped heads of the nails and the planks (Figs 5.2 and 5.3). There were no carpentered joints within the ship; simple butt joints were secured by fastening a third timber over the joint. Thus joints in hull planking occurred where a side-frame or floor timber overlay them, and the inherently weak joint between the keel plank and the stern post was accomplished by securing a carefully rebated floor timber over the junction of the two (Fig 5.4). This apparently weak structure at the stern and the bow would have allowed for the easy replacement of a damaged stem or stern post with the minimum disruption of the keel and floors.
There was no evidence for a steering oar, or quarter rudder, nor was any part of the mast, yard or sails found apart from a few fragmentary cringles found in the bilges. These, however, could have been part of a sailcloth being used as a tarpaulin on the ship’s last voyage. No anchor was found; any useful items of this nature would have been easily salvaged after the ship sank.

The evidence of a fragmentary mast partner suggests that the ship may have been decked but no ballast or cargo was found which could be related to the main hold within the ship. When she caught fire and burned to the waterline it appears that the main hold was empty. This is one reason why the forward two thirds of the ship was so easily destroyed when it was exposed to prop wash.

A specialised floor timber (T49) at the stern was fashioned with a lateral ridge and two small sockets for vertical posts c 0.10 m square. These provided support for a lightweight partition which divided a small cabin at the stern from the main hold. This compartment was provided with a hearth, cooking equipment and sufficient utensils for a crew of at least three people. Blocks of pitch and barrels found in the hold at the stern may be part of a cargo which was totally destroyed by fire in the forward end of the boat, but the absence of ballast suggests that the main hold was empty when the ship sank. There is no evidence to suggest that the hold was lined with fixed boards or ceiling planking, but fragments of charred lightweight planking may have been part of a detached framework of bottom boards. The hull planking exposed between the frames is charred in many places, suggesting exposure to the main force of the flames for a period of time before the ship sank.
The ship sank in shallow water and, if we accept that the sea level was probably 2 m lower than at present on this site, it follows that the wreck would have been a bare 2 m below the surface on a low spring tide. It would have been easy to salvage useful timbers such as the steering oars or the anchors, and it would have been equally easy for the crew to swim ashore when the ship caught fire. Any perishable cargo would have been destroyed in the fire and livestock could have escaped with the crew.

The original work programme included a topographical survey of the Harbour in order to determine the original Roman shore line. Regrettably, dredging operations in 1985 removed most of the modern and post-Roman silts and this research is in abeyance for the present. Investigation of other sites where wreck debris has been found may add further evidence for the commercial and possible military exploitation of the fine natural anchorage between Guernsey and Herm during the first four centuries AD.
The timbers of the ship

The keel plank
The strongest and heaviest element in the hull is the tripartite keel plank (Fig 5.5). It is constructed of three timbers lying alongside each other, each one 14.05 m long and 0.12 m thick. The maximum width of the three timbers together is 1.21 m. They were secured to the overlying floor timbers with large iron nails clenched by turning through 180° (see below). There is no evidence of temporary battens to hold the elements of the keel plank in position while the holes for the nails were drilled. The central plank is scored with an incised line which marks the centreline of the vessel, and a series of blind nail holes on the same alignment suggest that a setting out line was used to mark the desired position of the centreline before it was cut into the surface of the wood. At intervals along this line, an incised slash cut across the centreline marks the position of each of the floor timbers. The mean interval between these marks is 0.56 m, i.e. 22.95 uncia, just one uncia short of two pedes monetales (0.59 m) suggesting that the mean interval between the floor timbers, centreline to centreline, was intended to be two Roman feet. Where the necessity for a wide floor timber breaks this pattern, the centreline to centreline spacing of the three adjacent floor timbers is adjusted so that the average of two adjacent measurements is 0.56 m. This suggests that the workman setting out the lines was either aware of the dimensions of the floors and was acting under specific instructions or he was, by setting out the marks, controlling the design of the hull and ensuring that the ship builders were following a preconceived design. At a distance of one quarter of the length of the keel, measured from the bow, the centreline is marked with an ‘I’ to indicate the position of a wide, thick floor timber rebated to provide a step for the mast.

The stern post
The stern post (Fig 5.6) was more than 3.73 m long and asymmetrical along all its axes. It was rectangular in section where it butted against the keel plank but it was roughly adzed to shape throughout its length to accommodate the floor timbers and the stealer planks. Its thickness diminished from 0.19 m to 0.10 m as it rose up from its junction with the keel while its width tapered irregularly from 0.48 m to 0.26 m. The floors which overlay the stern post are rebated to fit over it and they have two limber holes (Fig 5.4). Crudely tapered rebates or chamfers are cut into each side of the stern post to allow a small stealer plank to lap over the edge of the post. As the post rises upwards it becomes an inboard structure. We were unable to record how this arrangement terminated, as the extreme end of the stern post had been removed at some time in the past. The drill marks where the timber had been cut were fresh and uneroded and it is possible that this ‘demolition’ occurred in the recent past, possibly as late as the Second World War.

Floor timbers
There were a minimum of 38, and possibly as many as 42 floor timbers in the ship. Twenty-two of these were recovered reasonably intact and their position in the ship can be demonstrated with confidence. Seven floor timbers were found in situ at the stern and the position of

Figure 5.5 Tripartite keel plank. (Drawing: Author).

Figure 5.6 Stern post (T4) plan and section. (Drawing: Author).
the remaining 16 can be deduced from a careful examination of the nail holes in the keel planks (Fig 5.7). All of the floor timbers had been cut to shape with an adze from a sawn baulk of oak. Saw marks, adze marks and sap wood survive, and the carpentry of the timbers will form part of a detailed report. All the floor timbers were rectangular in section as they crossed the bottom of the hull. Their section then diminished and became more square as they curved upwards. The outer face of the floor timbers were sometimes dressed with an adze in a series of flat facets or faces to receive the strakes. Floortimbers overlying the keel have three timber holes whereas those which overlie the stern post below the waterline have two.

Planks
All of the planks (Fig 5.8), including the keel plank, were cut tangentially from a baulk of oak using a saw. This may have been done on a trestle, but considering the weights involved, (the centre element of the keel plank alone weighed some 700 kg when cut to shape) it would seem to be more sensible to cut these timbers over a pit using rollers to bring the timber baulk into position. Traces of saw cuts are visible on the inboard and outboard faces as well as the internal edges of the planks wherever the surface survives. The undersurface of the keel plank was worn during the life of the vessel, presumably as a result of being beached or grounded at low tide. Most of the timbers which were scattered on the seabed before recovery are so degraded by gribble (Limnoria sp) that the surface evidence has been totally destroyed.

Side-frames
The remains of four futtocks or side-frames were found in situ. The grain of the timber follows the shape of the frame, but too little survives to allow extrapolation of the curve of the frame above the eroded top of the adjacent floor timbers. The frames were secured to the planks with iron nails driven through pre-drilled holes in the strakes and turned through 180° into the inside face of the frame. Some of the holes in the strakes missed the frame they were intended to secure. These unwanted, misplaced holes were plugged with a wooden dowel driven in from the outside. It is clear that the hull was planked up to the level of the tops of the floor timbers before the side-frames were inserted. Whether skeleton or shell construction continued above this height cannot be deduced from the evidence which survives. The position of missing side-frames can be surmised from a careful study of nail holes in the strakes.

Hull fastenings
The timbers of the ship were fastened together with iron nails driven through pre-drilled holes. Recesses were cut into the outer face of the keel planks to house the heads of the nails and protect them when the boat was beached (Fig 5.2). On the remainder of the hull the heads were allowed to remain proud of the wood. In every case moss had been used to effect a watertight seal between nail head and planking.

The keel nails were hammered home with great thoroughness, and often the conical head of the nail bit into the timber, compressing the wood into the head of the nail. This was not the case with the nails securing the strakes to the floor and side timbers, where the head of the nail sometimes barely penetrated the loosely twisted rove of moss. In a few cases the nail was driven through a
treenail (cf Blackfriars 1; Marsden, this volume). Whether this was to check a split in the timber is uncertain.

As most of the iron work in the wreck had completely corroded away, silicon rubber was used to make casts of the lost iron nails which were then drawn. The nails passing through the strakes and frames varied from 0.32-0.69 m in length, with a mean of 0.48 m. Nails securing the keel plank to the floors measured 0.41-0.79 m in length, with a mean of 0.57 m. The maximum thickness any nail had to penetrate, excluding the mast step was c 0.33 m and all the nails were turned over on the inboard face of the timber and turned again to ensure that the point of the nail was embedded in the face of the timber. The nails were generally circular in section with a diameter c 22 mm at the head diminishing to 12-18 mm by the time it had passed through the timber. The last 20-40 mm of the tip of the nail is sometimes square in section.

The sequence of construction
(1) Timbers were selected, felled and possibly seasoned. (It is possible that dendro-chronology will suggest a date of felling and a provenance for the timber used to build the ship).
(2) The timber was cut into baulks, sawn and dressed to shape.
(3) Keel planks were assembled and the centreline was marked out. They were either supported on stocks or placed on logs and rolled over a pit.
(4) The floor timbers were placed in position on the keel planks at predetermined intervals according to their size and function.
(5) Holes for the nails were drilled from the inside through the floor timbers and the keel planks.
(6) Rebates were cut in the outer face of the keel plank to house the heads of the nails.
(7) Nails were driven through keel planks and floors from the outside, taking care to secure a grommet of moss (Polystichium sp) beneath the head of the nail as it was driven into the rebate.
(8) The emergent tip of the nail was turned over onto the inner face of the floor timber and then driven back into the face of the timber.
(9) The stern post (?) and the stem) were offered into position and held in place with timber shores.
(10) The keel plank was dressed to fit flush with the inner face of the stern post and the floor timber (T 51, Fig 5.4) was fitted over the butt joint and secured in place with iron nails. The next three frames aft were secured to the stern post. The hull was then planked up to the top of the floor timbers. The 'wedge' shape of the stern frames suggests that they were fitted after the other strakes were secured in position.
(11) Fastening holes bored through the upper strakes were drilled before the side-frames were placed in position and secured with iron nails. In some cases misplaced predrilled holes were plugged with dowels.
(12) The two stern frames, T56 and T57, were placed in position and secured after the shell of planking had been completed.
(13) There is no direct evidence for the construction technique above this point, but it would have been possible to secure the side-frames temporarily with transverse and
Figure 5.7 Reconstruction of wreck based on timbers recovered in situ at stern and loose timbers recovered from the Harbour after the forward end of the vessel was destroyed in 1984. (Drawing: Author).

Figure 5.8 Plan of outer hull planking, stern post and keel planks. (Drawing: Author).
longitudinal battens, and complete the framework up to the gunwale before continuing to plunk the hull.

The finds
The bilge at the stern contained stratified objects and cultural environmental debris. This material has been studied in detail and it forms part of the archaeological report (in prep). Only the significant dating material will be commented on in this report.

Pottery
A group of stratified pottery found in the stern of the vessel may be interpreted as the domestic equipment of the crew. The group dates from the late 3rd century (AD 250-300) and it includes Rhenish ware as well as Ceramicque l’Éponge bowls. The sources of the pottery represent the trade routes of the period; Algeria, Spain, western France, Dorset and the Rhineland.

The pottery included: Three amphorae; three double-handled flagons; one single-handled flagon; one beaker; one cup; two fine flanged bowls; one coarse flanged bowl; three cooking pots; one dish; one mortar. (Other domestic items include a quern and a finely turned cup of maple wood.)

Other pottery found unstratified around the site, including samian from eastern Gaul and Black Burnished ware from the Thames Estuary may not derive from this wreck. It should be noted that recent underwater fieldwork is revealing a spread of anchorage debris from a wide date range; these finds will be the subject of a separate report (Monaghan forthcoming).

The coins
The loss of the ship can be securely dated by 80 coins which were found within or immediately adjacent to the wreck. All were in stratified deposits. They fall into two main groups. Firstly, a group of 2nd century regular issues dating AD 117-200. These coins are all well worn, in low relief with the minimum of detail, and they were clearly in circulation for a long time before they were lost. The second group of 74 coins are all Antoniniani dating from the late 3rd century. These coins are the subject of detailed reports by J A Davies and which will be part of the full archaeological report which will be published by Guernsey Museum.

In the absence of later issues it is suggested that the group was lost sometime in the early 280s. The coins were found in two ‘clusters’ at the stern of the ship and they probably represent the contents of a purse or box.

The context of the wreck
In the early years of the Christian era the requirements of a mariner crossing the Channel were similar to today, including a safe, sheltered anchorage in a south-westerly storm and a plentiful supply of fresh water.

The problems of coastal navigation in these waters, without benefit of compass and using only the stars, landmarks and a sounding lead, have been discussed elsewhere (McGrail 1983, 299).

The recent excavation of store buildings at La Plaiderie in St Peter Port (Burns pers comm, publication forthcoming), suggests that there was a developed harbour in the town throughout the 2nd and 3rd centuries, and evidence of trade routes established before the conquest of Britain.

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Underwater finds by divers and trawlers suggested that the waters between Guernsey and Herm had been used as an anchorage or haven during the Roman occupation of Britain. In November 1977, Richard Keen, a Guernsey professional diver and amateur archaeologist, discovered a group of amphorae dating from the late 1st/early 2nd century AD, in 17 m of water just outside the entrance to the modern harbour (Keen 1979). Although no evidence of a hull structure has been seen on this site the close association of the amphorae with each other, and their alignment in the seabed suggest that they are more likely to be associated with a wreck than to be unrecorded anchorage debris.

The site remains undisturbed and protected by legislation.

The recent excavation of store buildings at La Plaiderie in St Peter Port (Burns pers comm, publication forthcoming), suggests that there was a developed harbour in the town throughout the 2nd and 3rd centuries, and evidence of trade routes established before the conquest of Britain. The sheltered channel between Guernsey and Herm would have been a welcome haven for sailing vessels in the past, just as it is today, and the hazards of a cross Channel voyage from the port at Alet on the River Rance to the ports between Selsey Bill and Dorset have been well defined (McGrail 1983). Any mariner attempting to pass west of Guernsey to avoid the reef at the Casquettes, or making for the route between Guernsey and Jersey, would have increased confidence and a better chance of survival if he had knowledge of the natural haven and plentiful fresh water provided in the anchorage at St Peter Port.

Evidence is lacking for an economy in Guernsey capable of producing a surplus for export, but it is hoped that future fieldwork in the island will throw new light on the social and economic structure of the rural settlement which must have flourished behind the facade of the Harbour.

It is tempting to speculate on the possible military importance of a secure natural harbour at the end of the 3rd century when continuing unrest and piracy necessitated the construction of new forts at Portchester, Hampshire and at the mouth of the Seine and the Somme (Cunliffe 1986).

If the signal station constructed at the Nunnery on Alderney (Johnstone 1981) can be dated to this period then the prospect of another similar station being established on Guernsey becomes more feasible. But this is speculation; there is no direct evidence to suggest that the St Peter Port wreck had any function other than as a merchant vessel.

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Fashioning the planking of the Bevaix boat

Since 1985, during the period in which ‘rescue’ archaeological excavation was restricted, we undertook the process of ‘preserving’ the Bevaix boat, finally opting to make a cast of each plank; the original pieces were then put into large boxes filled with lacustrine and immersed in the lake for posterity (Fig 6.1).

The Bevaix boat had been temporarily stored in great tanks of water since its excavation more than 10 years before. The casting created an opportunity to undertake a new and detailed analysis of it.

For technical reasons inherent in the rescue operation of 1973, the large sheathing planks were cut into 1.8-2.0 m pieces. The multiple transverse sections obtained in this way proved essential for understanding the fashioning techniques of the various plankings, and optimal for dendrochronological analysis. The Bevaix boat was built with oaks felled in AD 182 (Fig 6.2).

The most remarkable conclusion, however, is the fact that all the planking was carved out of tree trunks, like logboats: the carpenters knew exactly where each piece they carved was to be placed and the shape it needed to have, in three dimensions (Fig 6.3), except plank A (and probably D) which was secondarily bent with heat (Fig 6.3A).

This three dimensional conceptualisation of the various plankning elements and their fashioning by carving certain amounts of material out of the trunks (becoming veritable sculptures) shows that we are still quite close to the techniques used in making logboats. Here, however, an even more remarkable mastery of volume is achieved. The perfect illustration of this is the Yverdon 2 boat, discovered in 1984.

Let us recall (Arnold 1974; 1978; 1980) that the bottom planking of the Bevaix boat is essentially made up of four boards arranged diagonally along the bottom; the beginning of the first (A) constitutes the bow and the end of the fourth (D), the stern. These two pieces are rather similar; in both cases the stump (or butt) end of an oak tree trunk was used, ie, the widest part out of which to carve the raised extremity. On the other hand, a considerable mass of wood was carved away to obtain the longitudinal curve, and the plank was finally bent by heating a small portion of its length.

Planks E and F, which fill the space between the four parallel bottom planks (A, B, C, D) and the bilge strakes, were also carved out of oak trunks.

The B and C planking, however, was derived from the tangential cutting of large oak trunks, which yielded exceptionally wide, flat boards. Although marks left by a pit-sawyer were identified in two spots, all the finishing work was done with axes and adzes. Lastly, in the case of plank B, a main branch was used to follow the curved part of the bow (Fig 6.3).

To carve the four bilge planks (two each side), the carpenters used a whole oak trunk each time and not a trunk split in half lengthwise as one could be led to believe by a single transverse section (Arnold 1980, fig 11).

The basic tools used to fashion this boat still remain the axe and the adze. At least three categories of blades can be distinguished:
1) a series of narrow, rectilinear blades, 64-70 mm wide,
2) a wide, slightly arched blade at least 100-110 mm wide (this tool was used tangentially, as only one edge of the blade could sometimes be observed, never both; Fig 6.4A),
3) a concave blade, belonging exclusively to an adze which was designed to carve, among other things, a groove on each side of the bottom of the boat to channel any water to the lowest point.

It can also be pointed out that, in the first case, certain marks in the rough-hewn underside of some frames were indubitably made by an adze with a narrow
rectilinear blade. Traces of a pit-saw were also observed at some places on planks and frames (Fig 6.4B).

To complete the set of tools used in building this boat, we can also mention the frequent use of a hand-saw for adjusting the edges of the planking. A bevel, creating a space to introduce the caulking, was carved afterwards with an axe in the starboard edge of each plank. Finally, an auger with a spoon-bit (diameter 16-18 mm) was used to bore holes for round wooden pegs designed to hold the planking temporarily together while in the building yard, but also to prepare for the nails which were driven from the outside through the narrowest frames to prevent them from splitting.

As far as plank C and bilge plank H are concerned, these are recycled pieces. For the former, little square pegs used to plug the holes left by torn-out nails indicate that at least two series of frames had been previously used. The dendrochronological analysis shows that this plank C could have been carved, at the most, 20 years earlier; the lack of precision is due to the total absence of sapwood on this plank. Bilge plank H, discovered during a dive in 1980, also shows traces of recycling: round extra pegs used for an earlier assemblages, and small square pegs.

In conclusion, we note that only by cutting the long planks into pieces can the techniques used to carve them be recognised through clear and precise observation; a method of analysis which is quite out of keeping with museum objectives which generally take priority.

At Bevaix, the planks were carved according to the form they were to have in the finished boat. This demanded, on the part of the carpenters, a very precise knowledge of the ultimate shape of the boat and the
Figure 6.3 Each plank was carved to the required shape. (Diagrams: Author).
Figure 6.4  a. Traces of a wide blade, slightly arched. Scale 1:1. b. Traces of a pit-saw. Scale 1:1. (Photos: Yves André).
exact spot where each carved piece was to be inserted. In this context, and in opposition to the boat of Zwammerdam 2 (de Weerd 1987; see below and Fig 6.7), it is apparent that no standardisation of preliminary carving of the planks was possible. Here we remain very close to the carving techniques of logboats and to the Celtic or pre-Celtic traditions.

Towards a typology of Gallo-Roman boats

Various attempts at classification have already been proposed for Gallo-Roman boats (Marsden 1976; Lehmann 1987; but also Ellmers 1984). They do not, however, take sufficiently into account the constraints imposed on a boatbuilder by the size and shape of the trees available to him. Logs are the essential limiting factor, ensuring the boat’s rigidity (like a keel), while also inducing the principal lines of the boat’s shape and size.

These constraints due to the raw material are actually the same as those present in logboats where the bottom, for example, chosen to be made from a certain part of the cross-section of the trunk, directly influences the shape of the sides (Arnold 1976, fig 4; 1980, fig 3). They are also the same as those that caused carpenters to change from the logboat to the plank boat in order to obtain boats longer than 12-15 m and capable of loading more than 3-5 tons.

Three groups of plank boats can be distinguished on the basis of the limiting element of the logboat (Fig 6.5).

The polygonal barques (box-shaped) make up a first group (A). These belong to the ‘bottom-based construction type’. The bilge strakes correspond to this fundamental element, and the length of the boat as well as its shape depend on the number of pieces used.

The second group (B) comprises boats with the bottom, carved from a single vast piece of wood, in the shape of a spoon (Velsen; Utrecht-Waterstraat), sometimes complemented at the extremities by the addition of other pieces (Utrecht). The dimensions of these boats and any developments towards shapes of larger dimensions, remain very limited. Only Zwammerdam 3 1973 (2nd-3rd century; de Weerd 1977, pl 14/l) can be attributed to this group which is, above all, illustrated by medieval boats: Velsen 1974 (11th-12th century; Vlek 1987); Utrecht-Waterstraat 1974 (12th century; Hoekstra 1975; Vlek 1987); and Utrecht 1930 (11th century; Vlek 1987).

The third group (C) is characterised by boats of an often slender shape, constructed either on a massive axial element or on two axial planks which are thicker than the rest of the planking. Examples of the former are the Mainz 1, 3 and 9 boats 1982 (4th century; Höckmann 1982), but we could also name the modern Bodenschanenboot of Rostock (Rudolph 1966, pl 2). An example of the latter is the Blackfriars 1 boat of the 2nd century (Marsden 1966; this volume).

Polygonal boats

The shapes of the polygonal boats, regardless of the number of pieces per bilge strake or chine-girder, vary

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Figure 6.5 Typology of the Gallo-Roman boats and especially the polygonal ones (A). This latter group may be sub-divided with regard to the number of pieces per bilge-strake: 1. rectangular; 2. hexagonal; 3. octagonal. (Diagrams: Author).
types can be identified, but the most remarkable is that consisting of a single massive piece of wood. Several surmounted by a breast-hook (Yverdon 2).

In the second case may be included extremities which, in themselves, constitute the extremities; perhaps perhaps may be constituted by the extremities of the ship in the general line of the boat, they have a marked tendency to correspond either to the extremities of the ship in the general line of the boat, they have a marked tendency to persist. Thus, it is probably with their help that the ensemble or regional groups can be identified.

Other parameters

The analysis of other parameters such as techniques of assembling the side planking (either clinker or carvel (flush-laid) built), the pattern of the framing (eg pairs of frames in L shape), the mast-steps (essentially transverse), and also the caulking (Arnold 1977) allow us to continue these typological approaches. Although these parameters have but little influence upon the general line of the boat, they have a marked tendency to persist. Thus, it is probably with their help that the ensembles or regional groups can be identified.

Evidence for standardised measurements

De Weerd (1988) has tried, from a consideration of the planks of Zwammerdam 2 as well as the arrangement of the frames of different Gallo-Roman boats, to demonstrate the presence of a standardised unit of measure, ie, pedes monetales (PM = 0.296 m). Without delving here to the very root of the problem, it nonetheless seems essential to draw attention to the following points: ships may only be considered which have been preserved, restored or not too deformed; have been the subject of meticulous drawings; and have been published at a reasonable scale (for example, 1:50). One must also know the extent of the variation of the dimensions discerned in order to determine, by their comparison, if the results are compatible with the use of a precise measurement (for example, 296 mm).

Moreover, the use of the extremities of the surviving remains as points of reference for measurement is doubtfully valid if these do not correspond either to the extremities of the ship in the underparts of the hull at the time of its construction, or to a major functional element of the vessel. It is thus dangerous to use the value of the standardised unit that is sought to be established in order to reconstruct one or
Figure 6.7 Metric data Bevaix boat (after restoration). ■ location of the row of rounded wooden pegs; ▼▼ horizontal floor; A, D, bent area of plank A and perhaps D. (Diagram: Author).
both missing extremities, and subsequently use this or that position to prove the application of that measure in the construction of the boat.

In the case of the Gallo-Roman boat of Bevaix, it is only valid to use measurements of the distances between a pair of frames in the absence of numerous destroyed frames (Fig 6.7). These results and those obtained on the basis of the beams forming the stocks at the building site (as indicated by rows of round treenails) do not constitute any proof for the use of any system of precise measurement when making and positioning the diverse elements of the boat: the distances obtained vary widely from 0.74-0.90 m (in fact, 0.81 ± 0.06 m). This value, being between 2.5-3 PM, can therefore have no simple relationship with the PM. Reliance on the Bevaix boat to prove the use of PM in ship and boat construction seems to us ill-justified (de Weerd 1988, fig 142).

As for the interpretation of the boat Yverdon 1 (de Weerd 1988, fig 143), it is even more problematic, given the small portion of the boat that is preserved. This holds true even more so when taking into account the presence of secondarily added frames (Arnold 1978, 159, Fig C/R), with a mean distance between two pairs of frames being 0.92 ± 0.06 m).

Conclusion

The Gallo-Roman boats known to date can be classified into three groups: polygonal boats; boats with a dugout bottom; boats set on a massive axial plank. These groups are characterised by their origin in the logboat tradition: one or more planks are obtained by carving successive amounts of material out of a massive piece of oak.

By their number and arrangement, the sculptured bilge strakes limit the dimensions of the boat — at the same time they constitute the essential element ensuring its rigidity — and directly influence its general shape.

An analysis of several transverse sections (1.8-2.0 m in length) sliced through the large sheathing planks of the Bevaix boat, built in AD 182, demonstrates that these planks were carved from massive pieces, if not whole trunks, in order to obtain the desired longitudinal profile. One, or possibly two, was secondarily bent by heating a small portion of the plank, the carpenters, therefore, must have known very precisely where each carved piece was to go, not only in plan, but also in elevation, which effectively excludes a standardised pre-cutting of the oak trunks into planks. This three-dimensional conceptualisation of each plank of a given boat is remarkably well illustrated by the Yverdon 2 boat.

There is no statistically-valid evidence for the use of Roman standard units of measurement in either the Bevaix or Yverdon 1 boats.

Footnote

1 Bilge strakes or chine-girders may also be known as transition strakes.

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7 A re-assessment of Blackfriars Ship 1
Peter Marsden

Abstract
The New Guy’s House and Blackfriars ship 1 vessels found in London are two of the three known Romano-Celtic vessels from Britain. The latter was a sea-going ship with constructional characteristics similar to those of the Bruges boat, also Roman, found in 1899. They were built with flush-laid planking fastened to the frame by large iron nails clenched in a distinctive manner, and the mast-step was cut into a frame with medial ridges. It is likely that the Blackfriars type of ship was similar to that used by the Veneti of north-west Gaul, but it is argued that it is unlikely that coins of Cunobelin depict these native ships. It is suggested that the Blackfriars ship may have been built on the Rhine or the Thames.

Introduction
Of the three Romano-Celtic vessels found in Britain, two were found in London and date from the latter half of the 2nd century AD. Discovered in 1959 and 1962, they were, respectively, a river barge abandoned in an ancient creek at New Guy’s House, near London Bridge, Southwark, and a sea-going merchant ship sunk in the bed of the River Thames at Blackfriars, City of London (Blackfriars ship 1). They were the first Romano-Celtic vessels to be studied in detail in Europe. Another sea-going vessel has been found recently off Guernsey, Channel Isles, to add considerable new information about the form and construction of at least the Blackfriars type of vessel (see Rule, this volume).

Little was known of the significance of the Blackfriars and New Guy’s House vessels at the time of their publication (Marsden 1965; 1967). However, it did seem that they were of a Celtic shipbuilding tradition, and that the former appeared to resemble Caesar’s description of the ships of the Veneti, a Celtic tribe in north-west Gaul. Subsequently, other vessels were found in the inland waters of central and northern Europe which not only show that there was a considerable variety of form and construction in the Romano-Celtic tradition, but also show that they were unlike contemporary Mediterranean and Scandinavian ship construction (McGral 1981, 24-5, 30-1). It is now possible to assess the London finds in the wider context of later discoveries (McGral 1981, 22-4). Moreover, as facilities for archaeological examination have improved since 1962, the parts of the original ships that were preserved have been subjected to more detailed study, particularly dendrochronological analysis, to establish how the vessels were constructed, and where and when they might have been built. Furthermore, the discovery of contemporary waterfronts and trade goods in Roman London (Milne 1985) have made it possible to assess how the ships might have been used (Marsden in prep).

Of the British finds, Blackfriars ship 1 was most intact, and a partial reconstruction is possible. Furthermore, following the discovery that the Bruges boat, found in 1899, originally had a mast-step timber similar to that in Blackfriars ship 1 (Crumlin-Pedersen 1965, 99) it is now clear that that vessel too was of Blackfriars type, and it seems likely that it was capable of sailing at sea. Its surviving timbers were recorded at the National Scheepvaartmuseum in Antwerp, and a radiocarbon date of the 2nd century AD obtained (HAR-472). Since details of its construction are very similar to other features in the Blackfriars ship, it seems likely that major features that survived in the Bruges boat are a useful guide to missing parts of the Blackfriars ship.

Originally pointed at both ends (Fig 7.1), the Blackfriars ship had a flat bottom, and instead of a keel it had two broad central planks alongside one another, each about 0.66 m wide and 0.076 m thick, which were held to massive floor timbers by iron nails clenched by turning through 180°. The outer bottom planks were 0.05 m thick, as were the side planks which were held to side frames by similar nails. The midships part of the vessel was originally lined with a cutting of oak planks, 0.025 m thick, forming the hold. Just forward of this, and about one-third of the length of the vessel from the bow, was the mast-step. This rectangular socket lay in the central part of a floor timber, which had medial ridges extending along the centre of its upper surface (Fig 7.2).

Building sequence
There are difficulties in reconstructing the building sequence of the ship, for the function of some features cannot be explained. For example, small holes filled with pegs in the planking fragments may be the remains of a system of temporary fastenings used during the building process. That fittings of this type were used during the construction of at least some Romano-Celtic vessels is shown by the barge from Bevaix, Switzerland (Arnold 1978, 33-4 and this volume, also Rule, this volume).

Before the ship could be built it was necessary to convert logs into frames and planks. The floor timber frames were hewn from substantial logs, and the side-frames were cut from grown timbers of the appropriate shape. The planks had been tangentially cut by adze, axe or, more likely, by very large saws, as shown in a Roman tombstone relief from Gaul (Meiggs 1982, fig 14d). This tombstone depicts two men sawing a large log raised upon a trestle, and the saw, a long blade with a handle at each end, was held by one man below the log and one man above. There is some evidence to indicate that
Figure 7.1 Plan of Blackfriars ship 1, 2nd century AD. (Drawing: Museum of London).
Roman military sawmills also existed in Germany (Meiggs 1982, 186).

For the two central thick planks to be shaped they must have been laid on stocks with sufficient access below to allow them to be nailed to the floor timber frames. Floor timbers, excluding the two at the bow, after being shaped, had limber holes cut to enable bilge water to flow, and had vertical nail holes drilled, after which they were placed on the central planks (Fig 7.3(1)). These floor timbers were up to 0.457 m wide and 0.229 m thick in cross section, and were in pairs about 0.14 m apart, the space between the pairs being about 0.38 m.

Oak treenails, 0.019 m in diameter, were placed in the nail holes in the frames, and smaller holes were bored through them and through the bottom planking. Iron nails were then driven through the planks and frames from outboard and clenched by turning through 180° on top of the frames (Fig 7.4). These nails had shanks circular in section and 0.017 m in diameter, with points square in section. Their hollow cone-shaped heads contained a fibrous caulking material, not yet identified, whose purpose was presumably to stop seepage into the planking and frames.

The stem and stern posts were positioned at the ends of the two central planks and were fastened by nails to the undersides of floor timbers. The remainder of the bottom planks were nailed to the floor timbers and to the stem and stern posts (Fig 7.3(2)). Frames at the bow were then nailed into position over the stem post, and strakes were nailed to the angled ends of the floor timbers to form the first plank of each side (Fig 7.3(3)). Side frames were then fastened to these strakes, usually by two clenched nails, but as these were probably an insufficient support it is thought that temporary transverse timbers were probably fastened at a high level to make the side frames more stable while attaching the side planking (Fig 7.3(4)). The side frames, up to 0.241 m wide and 0.127 m thick in section, were spaced 0.19-0.406 m apart, and their lower ends were fastened to the first strake above the chine, between the ends of the floor timbers. The side planks, 0.05 m thick, were attached to the side frames by clenched nails, and similar nails fastened them into rabbets in the stem post. The ceiling planking was then fastened to the frames by only a few iron nails, as if the shipwright intended to make it easy to replace damaged planks from time to time.

Although this is the most likely sequence of building the ship, it must be remembered that in recent times, in some forms of shipbuilding with flush-laid planking, temporary wooden battens were nailed to adjacent strakes to hold them to each other before the strakes were nailed to the frames (Hasslof 1977, 74, fig 8.2). It is just possible that this ‘shell’ construction technique could have been used on the Blackfriars ship, for this would explain the small bungs which filled drilled holes in broken planks.

The final stages in building the ship are less clear, but it seems that they included constructing a deck, a hatchway over the hold, and accommodation for the crew probably in the stern. The mast was stepped, probably during a ‘ceremony’, for a votive coin of the Roman emperor Domitian was placed with its reverse uppermost in a recess in the mast-step before the mast was lowered into position. This enabled the reverse image of Fortuna, goddess of luck, to touch the foot of the mast.

When completed the Blackfriars ship was 12.8 m in length between the foot of the stem and stern posts, and probably 19 m long overall. Since its beam was
Figure 7.3 Conjectured stages in the construction of the Blackfriars ship. (Drawing: Museum of London).
about 6.12 m, it had a length to breadth ratio of 3:1. This contrasts with the similarly constructed Guernsey ship of the late 3rd century, whose hull is believed to have been c 23-25 m long and 5-6 m wide, a ratio of about 4:1 (Frere 1987, 359; see also Rule, this volume).

**Suggested evidence from coins**

As the Blackfriars ship was of a Celtic tradition of shipbuilding its ancestry presumably dates back long before the Roman invasions of northern Europe in the 1st centuries BC/AD. It might be thought, therefore, that the Blackfriars ship could have resembled the ship depicted on pre-Roman Belgic coins of Cunobelin (McGrail, this volume, Figs 4.11 and 4.12), found at Canterbury and Colchester. These had been minted in south-east England probably during the first quarter of the 1st century AD (Muckleroy et al 1978, 439-44; McGrail 1987, 234, 236).

The coins show the same side view of a ship with angled stem and stern posts, a quarter rudder on the starboard side, a projecting forefoot, and a mast with a yard from which a square sail was apparently to be hung. Muckleroy suggested that the vessel was similar to the Veneti ships described by Caesar, and thought that the forefoot was a projecting timber to assist in beaching. In support of this view he drew attention to the projecting keels and gunwales shown both in Scandinavian prehistoric rock carvings, and in the actual remains of the Hjortspring boat of the 4th century BC, found in Denmark (Åkerlund 1963, 133-5).

However, this interpretation is doubtful, for the citing of parallels from the quite different Scandinavian tradition as comparative evidence is somewhat stretching the interpretation of the archaeological data, particularly as the Scandinavian craft appear to be rowing boats, and the vessel on the coins was apparently a large sailing ship. Moreover, there are other important aspects that cast doubt on the view that the ship on the coins was Celtic, and instead suggest that it could be Roman. Firstly, the representation is unlike any of the Romano-Celtic ships discovered in central and north-western Europe, none of which have been found with a forefoot or with stem and stern posts rising at the angle depicted; secondly, the representations on Belgic coins tend to show Romanised rather than British features (Mack 1975, 70; Allen 1978, 69-71) and the ship shown could well have been a normal Roman merchant ship with a ram bow of the type that is commonly represented in Roman art (eg Meiggs 1960, pl xxii, xxiv). The reverse of the ship coin, for example, shows a standing winged Victory holding a ring or wreath, and is clearly based upon a Roman prototype; and thirdly, Caesar considered the Belgae as separate from the Gauls, but he linked the ships he was describing only with the Gauls. In this context it is important to note that although he crossed to south-eastern Britain in the area being occupied by the Belgae, he did not mention their ships.

Since trade with the Roman world as early as the 1st century BC, is demonstrated by Roman objects on Iron Age sites in Britain (Peacock 1971), it seems likely that the depiction of a Roman ship on the coins could,
like the figure of Victory, be a political boast by Cunobelin extolling the trade links with the Roman world across the Channel. Indeed, such trading links before the Roman invasion of AD 43 are highlighted by the discovery of a Classical lead anchor stock, probably of the late 2nd century BC, in the sea off the Lleyn peninsula, north Wales (Boon 1977, 10-30). Whatever the truth behind the ship representation on the coins, therefore, it is clear from the discussion above that they should not be regarded as probable representations of Celtic ships trading around southern Britain, and therefore cannot be considered as a clue to the hull form of Blackfriars ship 1 (but see McGrail, this volume, for an opposing view).

Rig
The rig of the Blackfriars ship is suggested by the position of the mast-step which lay about one third of the length of the ship from the bow. Although several types of rig were used in Roman times (Casson 1973, 239-45; Efllmers 1978, 11) the most common type was the square sail. However, there are problems in using such a sail on a mast so far forward (McGrail 1987, 216-8) and it is just possible that the Blackfriars ship had a fore-and-aft sail such as a sprit. It is fortunate that much of the mast of the Bruges boat had survived for this perhaps provides a clue to the height of the mast in the Blackfriars ship (Marsden 1976, 40-1). The Bruges mast was at least 9.3 m high, and had a maximum diameter of 0.16 m. Since it is likely that there was a relationship between the beam of a vessel and the height of its mast, the conjectured beam of 4.7 m of the Bruges boat and the 6.12 m beam of the Blackfriars ship suggests that the mast in the latter might have been about 12.5 m high.

Steering
No trace of a steering mechanism had survived in the Blackfriars ship, but a large oak rudder found with the Bruges boat may be indicative of the type of steering used. The publication of 1903 (Marsden 1976, 26) shows that it was at least 4.1 m long, and its blade was 0.7 m wide. A tiller hole recorded in 1903, at a right angle to the blade indicates that this was either a quarter rudder or perhaps a steering oar with a transverse tiller. A slight narrowing of the shaft just above the blade suggests that it might have had a sleeve, perhaps of leather, by which it was fastened to the hull, or this could be where it was pivoted had it been a steering oar. The discovery of just one rudder may suggest that the Bruges boat did not have a pair of quarter rudders as used in Classical ships in the Mediterranean.

Crew’s quarters
During the excavation of the forward half of the Blackfriars ship a search was carried out for evidence of occupation by the crew, but none was found except for two adjoining sherds of the same coarse ware pot (Marsden 1967, fig 18, no 39). The after half of the ship was hardly excavated, and it is presumably there that the crew’s quarters lay.

Use of the ship
There is clear evidence that the Blackfriars ship was a sea-going vessel, for the planks contained Teredo and Limnoria borings. A sample of planking had slight signs of attack by Limnoria, represented only by two or three characteristic holes amid the numerous Teredo channels. Since the position of the Teredo infestation in the ship is an important indicator of the draught of the vessel, the presence of borings in two side frames 1.22 m above the bottom of the vessel shows that the waterline lay above this level and that the ship was probably leaking.

The most obvious evidence for the use of the ship was its cargo of building stone, presumably being transported from a depot close to the quarry, to Roman London. A pile of stone rubble, up to one metre thick, was situated aft of the mast-step: between the floor timbers where it had broken through the ceiling planks. Many of the lumps of stone were large, weighing between 27 and 31 kg (60-70 lbs) each. In view of this it is likely that the stones were lowered rather than dropped into the hold, for they were angular, and the oak ceiling planks were only 0.025 m thick.

Samples of the stone were found to be of ragstone, probably from the Hythe Beds of Kent, in south-east England. This Cretaceous blue-grey sandy limestone outcrops from the Sevenoaks area through Maidstone to Hythe and Folkestone. One fossil in the same sample did not match exactly outside west Kent, and, as the River Medway is the only navigable river through the outcrop area, the neighbourhood of Maidstone, on its east bank, is a likely quarry source. Since ragstone was used extensively in Roman London it is probable that the stone on board the Blackfriars 1 wreck was cargo rather than just ballast.

The last voyage of the Blackfriars ship would appear to have been down the winding River Medway from the Maidstone area, past the Roman town of Rochester, and into the Thames estuary. As the voyage up the Thames was both against the prevailing wind and against the river current it is likely that the ship used flood tides to help it reach the city of London. It is significant that recent environmental analyses on the Roman waterfront at London have demonstrated that the river was tidal there at that time (Milne 1985,81-4). A large unfinished millstone was found, lying convex side uppermost, on top of floor timbers in the bow. It was a ‘blank’ awaiting finishing, for it had no hole in the centre, and no grooves to spread the grain evenly when used. As such it would seem most likely that it was collected near the place of manufacture, though this should be considered as by no means certain. Its location within the ship shows that it was not being used in the vessel, though its position forward of the mast-step suggests that it was intended that it should not be damaged by or mixed with the ragstone cargo. Also, as it was a single stone, it was unlikely to have been part of a larger consignment of millstones.

The stone is Millstone Grit, perhaps from the Pennine area of the Yorkshire region of north-east England or from the Namur region around the Meuse valley, Belgium. Even though the area in which Millstone Grit outcrops is known, it is not precisely clear where the stone was worked in Roman times. Its presence on board the Blackfriars vessel suggests an earlier voyage.

It seems unlikely that London was the planned destination of the millstone, for a recent study of Roman millstones and querns from that city (King 1987) shows that of the 32 examples found, excluding the millstone from the Blackfriars ship, only three (9.4%) were of Millstone Grit. The remaining 29 (90.6%) were of lava imported from the Continent, probably from the Rhine. In contrast, however, the millstones and querns found at the inland Roman city of Verulamium (St Albans), show that British products were apparently far more
Figure 7.5  Finds of ships of the main shipbuilding traditions, 4th century BC - 4th century AD (sources: Marsden forthcoming). (Drawing: Museum of London).
important there than at London. Of the 33 Roman querns and millstones found at Verulamium, 54% were from a variety of British quarries, of which 10 (30%) were of Millstone Grit and thought to be from Britain too. Although the number of identified and dated objects is small, the difference between St Albans and London is sufficiently striking to suggest that the Blackfriars millstone was not to be offloaded in London.

Where was the ship built?
At present there are two important clues to where the Blackfriars ship was built: firstly, the distribution of ships of that tradition and of neighbouring traditions in central and northern Europe; and secondly, the distribution of vessels with the constructional characteristics of the Blackfriars type. In due course dendrochronology may contribute further indications.

The sea-going ships of the Romano-Celtic tradition, from Blackfriars, Bruges and Guernsey, could have been built in many parts of northern Europe. However, the distribution of sites where river vessels of Romano-Celtic type have been found is a valuable indicator of the extent of the tradition overall, for they would have remained on the river system where they were built (Fig 7.6).

In north-eastern Europe and Scandinavia, roughly contemporary vessels have been found of the clinker shipbuilding tradition, in which each strake overlaps its neighbour and is riveted or pegged together. These are the boats from Nydam, in northern Germany (Akerlund 1963), and from Halsenoy in southern Norway (Christensen 1972, 163); and, dating from the 4th century BC, there is a sewn clinker built boat from Hjortspring on the island of Als, Denmark (Christensen 1972, 162; Greenhill 1976, 178-82; Akerlund 1963, 134-5). It was only after the end of the Roman period, in the early 5th century AD, that peoples from northern Germany introduced this type of clinker shipbuilding tradition into southern Britain, as illustrated by the Sutton Hoo ship of the 7th century AD (Evans & Bruce-Mitford 1975).

In southern Europe, around the Mediterranean basin, all Roman ships found so far dating from the 1st-4th centuries AD were built with flush-laid planking using mortise and tenon joints to hold the planks together edge-to-edge (Casson 1973, 202-6). Examples of the Mediterranean tradition have also been found in northern Europe, particularly the County Hall ship, London (Marsden 1974), the Vechten boat, Netherlands (de Weerd 1988, 184-94), and part of a boat found at Zwammerdam, Netherlands (de Weerd 1988, 162-73). A curious hybrid structure found at Zwammerdam, however, was a steering oar of Rhenish type in the Roman-Celtic tradition which had been constructed with mortise and tenon joints as in the Mediterranean tradition (de Weerd 1988, 162-73). The Romano-Celtic river craft are found in central and north-western Europe between the areas dominated by the Scandinavian and Mediterranean traditions, from the Rhine westwards, on both sides of the Channel (de Weerd 1988), on the Thames, in northern Belgium (de Boe 1978, 22-30) and, it seems, on the Somme (Traille 1809). (For full references to boat finds, see McGrail 1981, 23; de Weerd 1988).

One of the most distinctive features of the sea-going Blackfriars ship type is the mast-step frame with its central socket and raised surround, and medial ridges along the upper face (Fig 7.3), which may have strengthened these frames. The discovery of yet another mast-step frame of this type in a river craft of the 4th century AD at Mainz (vessel no 9) shows that vessels with this distinctive feature were being built on the Rhine (Rupprecht 1983, 81; Crumlin-Pedersen 1985, 90, fig 13D), and suggests that the sea-going ships may have been built there.

The former presence of other ships of Blackfriars type in this northern region is also suggested by the discovery of their distinctive iron cone-headed nails. Two were found at the Roman fort site at Richborough, in eastern Kent (Cunliffe 1968, pl Ivi, no 284); one in the 1st century AD legionary fort at Inchtuthil, Scotland (Healy 1978, pl 64b; Manning 1985, fig 86F, 290); and two in London (Guildhall Museum 1908, 55, no 139-40. Now catalogue no 1643).

A possible clue to where the Blackfriars ship was built are the hazel twigs used as caulking, for this material does not seem to occur generally as a caulking in Romano-Celtic vessels, although it was used in the New Guy’s House boat, a river barge which must have been built beside the River Thames for it was not a sea-going type. It is possible, therefore, that the Blackfriars ship was recaulked at London, but built elsewhere. However, a recent study of the tree-rings of the ship’s timbers shows that the vessel had probably been built about the middle of the 2nd century AD and that, as the tree-ring pattern is similar to that of contemporary local timbers from the London area, it is possible that the ship was built in south-east England.

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8 Barges of the Zwammerdam type and their building procedures
M D de Weerd

The six boats from the Roman period at Zwammerdam (de Weerd 1978) have recently been published by the author as his thesis, defended at Amsterdam University (de Weerd 1988b). The conclusions are summarised in de Weerd (1989) which runs parallel to the thesis' Zusammenfassung.

After a petite histoire of the ship-archaeological excavations 1971-4, de Weerd (1988b) gives a full description of the three logboats (one extended); the steering oar displaying mortise and tenon technique; and one of the three big barges (no 2). Barges 4 and 6 — still being conserved with PEG 4000 — await a full description. The thesis also included a discussion of the 1893 Vechten boat, of which the old excavation plan was recently rediscovered in the archives.

Full evidence is given — and is open to criticism and further analysis — to conclude that:

A Barges of the Zwammerdam type (3x Zwammerdam; 2x Woerden; Kapel-Avezaath; Druten; Abbeville; 2x Pommeroeul; Cologne; Mainz; Bevaix; 2x Yverdon, see also Arnold 1989; and Avenches) are not rooted in a Celtic shipbuilding tradition. The flat-bottomed rivercraft with flush-laid planking show a shift in technology from that used in the North Adriatic coastal craft (Ljubljana; Comacchio; Cervia; Pomposa Borgo Caprile; and Nin). To stiffen the boat in the transverse direction, the edge-joining by sewing planks in sutiles naves of the North Adriatic was replaced, in the Zwammerdam boats, by bridging the full width of the flush-laid bottom planking with a system of floor timbers running from side to side. This procedure was made possible by the massive use of big iron nails (see also de Weerd 1988a). The characteristics of the type — 'celtic' to use Marsden's (1977) term — are not Celtic in terms of archaeological attributes. In the last 15 years a number of newly discovered boats have contributed much evidence; vessels of the Zwammerdam type with L-shaped chines or transition strakes (Eilnors 1984: chine-girders) which cannot be seen as an evolutionary development from split logboats — intruded into the Northern Provinces along with the Romans in the 1st century AD (de Weerd 1987a; 1988b).

B The individual planks are sawn/scarfed at lengths in round numbers of Roman feet (pedes monetales). Full discussion of the Roman roots of the 'Zwammerdam type' (Marsden 1976) barges appears in de Weerd (1987a; 1988b). An analysis has also been undertaken of drawings of all known Roman river barges (Blackfriars 1; Marsden 1976); of extended logboats of the Utrecht type (Utrecht 1 and 2, Antwerp and Velsen (medieval) and (Roman) finds from Zwammerdam and Woerden; Vlek (1987) and de Weerd (1987b and c)); and of a 14th century cog-like boat from Flevoland (Reiners 1980). This has revealed a variety of methods for the sequence used to place floor timbers in position but generally it seems to have been:

(a) two or three master floor timbers were placed on top of the bottom planking at the midship station and at bow and stern. Hulst (1985) has reconstructed this procedure in the building of cogs. Upon analysis these floor timbers were spaced (measuring from faces) at round numbers in Roman feet, eg ½ or ¼ an actus.

(b) The bottom planking was then fastened to the master floor timbers. In this way, the flush-laid bottom planking was held in position to 'behave' as a shell in which the other floor timbers were inserted in the remaining phases of the sequence. Further floor timbers were placed in position — halving the spaces between the earlier inserted floors — and fastened.

Schemes and types of schemes are discussed in de Weerd (1988b and 1989). Höckmann (1988) has concluded that the Zwammerdam type of floor spacing — in pedes monetales — can also be found in the plans of the two Nemi boats published by Ucelli (1950). This proves once again that the uses of standardised floor spacing in boats of widely varying types and period can be seen as a traditional building procedure, which represents ongoing traditions at the level of boatbuilding handicraft.

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9 The Romano-Celtic boats from Druten and Kapel-Avezaath
L Th Lehmann

Abstract
Knowledge of the Druten boat comes from a three-day rescue dig. She is dated to the 2nd century AD and originally may have had a trapezium-shaped bottom. It is also possible that a timber picked up among scattered remains was once a stem post. Her bottom was probably made of irregularly shaped slabs of wood, Quercus robur; oak common all over Europe. Her cargo had been of slate, probably brought from the Eiffel mountains in what is now Germany. Two pieces of Quercus petraea in a secondary position may indicate that she had been much further up the Rhine.

The Kapel-Avezaath boat had the 'punt' shape that is still very common, but with irregular bottom planks. It is possible that this planking may have been re-used from another boat. All wood was the ubiquitous oak. A few potsherds dated her c AD 200.

The Druten boat
In 1973 the alarm was raised by Mr van Dinteren that a conglomeration of wood, possibly an ancient ship, had been found in the sand of a building site near Druten (Fig 9.1) and an emergency excavation, directed by Mr R S Hulst, was begun by the Archaeological State Service, Amersfoort. A contractor had, by this time, already taken up and scattered about 11 m of it.

The remaining 16 m of wreck lay in a west northwest-east southeast direction (Fig 9.2). The north side showed a rounded, pre-moulded chine. In the places where it was best preserved it was c 0.80 m high. Towards the east a series of rusty spots in the sand just above the preserved wood suggested an upper strake nailed on, or a repair. At the west end the outside of the chine curved inward, the underside upward, while the hollow at the inside became shallower more abruptly, probably to become flush with the inside edge that lay against the bottom. The latter had a breadth of 2.80 m in the east, tapered to 1.70 m and was 60-80 mm thick. It could still be seen that the bottom planks had curved upwards together with the underside of the chine. There were 25 frames, each consisting of two floor timbers, each with an integral knee which functioned as a futtock. Counting from the west, each floor timber with an even number had its knee on the north side; some vestiges were left showing that at least some floor timbers with uneven numbers had their knees on the south side, as is logical. No trace was found of separate futtocks.

As to her shape, the sides tapered to the west with no sign of a curve in them. Centuries after the date of this wreck and at least until the end of the 17th century, there was a class of vessels on the Rhine, the bottom of which had the shape of a very long trapezium, with the

Figure 9.1 Map showing location of Druten and Kapel-Avezaath. (Map: Author).
Figure 9.2 View of Druten wreck from west-north-west. (Photo: R O B).
narrower parallel side forward; these were known as oberländers. There is no evidence however of a straight development from Roman times to oberländers. Prints showing the latter, and two small examples found near Krefeld in Germany (Ellmers 1976, 47) and near Meinerswijk in the Netherlands (Remders et al 1983, 21-33), show them to be much higher than the Druten boat, with much steeper swimheads and considerable tumblehome. There is no evidence of the latter in antiquity, A trapezium shape for the Druten barge, with the bow to the west, is not unthinkable however, and to make her stern end in a simple transom is a solution taken not only from the small boat of Krefeld, but also from Zwammerdam boats 1 and 5 (de Weerd 1988, 55-68, 83-92).

The boat depicted on the 1st century AD monument to Blussus (Ellmers 1978, fig 5) now in Mainz museum, looks somewhat like the prints of oberländers, but we do not know the ship it represented. Some mistrust is justified towards Roman ship representations. Sculptors were very much inclined to inflate lengthwise and to make disproportionately large heads (as in Victorian caricatures) stick out of them. Examples of this abound on Trajan’s Column.

A trapezium shape in plan is not the only possibility. Van Dinteren, inspecting the scattered wood of the eastern part of the Druten boat, found a piece looking very much like a solid stem post, about 1.75 m long, without rabbets. A ship with a stem post at the bow and an upcurving swimhead for a stern might seem fanciful, but a photograph (Newekloeksky 1952-68, II, fig 29) shows that similar barges plied the Danube until recently. These boats apparently did not exist before 1850 (J Sarrazin, pers comm), but there are other examples of ancient ideas surviving to surface again much later.

Over floor timbers 4 and 5, c 0.20 m north of the longitudinal axis of the bottom, a piece of wood was housed, with a square mortise in the middle. Floor timber 7 showed a ridge over its western edge, about 30 mm higher than the general height of the floor timbers (50-60 mm). In the northern half of this ridge two oblong mortises were cut. The ridge continued over the breadth of floor timber 7’s northern end and on to timber 8, where it formed a ‘step’ under a knee grown to shape. Whether this arrangement was repeated on the southern side could not be observed due to the condition of the wood.

On top of, and parallel to, floor timber 14 lay a batten, crossed by some narrow planks that seemed to pass underneath it. They also looked as though they had been deliberately finished at their eastern ends, not broken off. Between timbers 8 and 14 some plank fragments of the same size were scattered.

Floor timbers 7 and 8 were partly covered by a fragment of a panel made of planks only 5 mm thick, sharpened down on one edge and up at the other, so that they overlapped and made a smooth surface. On top lay two transverse pieces, one of which was co-incident, but the other was a batten connecting the planks. Underneath this fragment was an articulated iron hook, attached to floor timber 7.

The eccentric position of the block with mortise between timbers 4 and 5 suggests it formerly had a nearby partner (Fig 9.3). Stanchions for a deck in bow or stern might have ended near these mortises or at timber 7. It is possible that these mortises were formerly fastened to two bitts, between which a steering oar could be slung, as on the foredeck of the big oberländer in a print by Antonius Woensam (Remders 1983, fig 55).

This idea is especially attractive as, at the time and place of the Druten boat, steering oars could be expected forward as well as aft (cf Tacitus, Annales II, 6).

Now for the thin wood construction. At Pommereucl in Hainault the remains of a cabin were found in Roman barge I. Situated aft, it was 2 m from the end of the swimhead and was 2.30 m long. It covered the whole breadth of the barge and was fixed by tenons in mortises cut in the covering board and in one frame. The walls were made of thin, overlapping oak planks.

At Druten there was no trace of a covering board and the swimhead was incomplete, the surviving curve suggest strongly that there was not much more than 2 m to the west of floor timber 7. From the centre of floor timber 7 to the centre of 14 is c 2.30 m. The little planks on top of timber 14 may have been the remains of limber planks, those to the west being kept in place by the ridge on timbers 7 and 8. Putting a connecting batten on top of the limber planks instead of underneath, between the floor timbers, is a good way of tripping up your crew, unless it marks the end of a working space and the beginning of a cargo space. Most disturbing is the hook, unless it was a means, admittedly unusual, to delay a rope, eg to keep the steering oar within reach. This may seem to cancel out the cabin, unless there was shelter over the steering oar, as on the ‘Leonardic’ ferry (one like it appears in a ‘bird’s eye view’ by Leonardo da Vinci) on the River Adda at Imbersago near Milan. The presence of a cabin would point to the bow being east, and a further argument for the presence of a cabin is the fact that the Roman-age vessel from St Peter Port, Guernsey had the remains of a cabin connected to a floor timber by mortises (Rule, this volume).

It is clear that some of the possibilities suggested by the Druten wreck are mutually exclusive.

The dating material found in the ship at Druten consisted of a worn coin, two pieces of amphora and some samian and Castor ware. They all pointed to a period around AD 200 (Hulst & Lehmann 1974, 18-21).

The Kapel-Avezaath boat

An even more star-crossed emergency dig had been conducted five years earlier, in 1968, near Kapel-Avezaath (Louwe-Kooijmans 1968). It could only last two days and was much hampered by water (Fig 9.4). Little was left apart from a bottom 30.50 m long. The greatest breadth was found, chiefly by prodding, to be 3.20 m. Across this bottom lay the now familiar pairs of floor timbers, about 200 mm wide and 50 mm thick.

Figure 9.3 Hypothetical reconstruction of the Druten barge. (Drawing: Author).
Their spacing was not quite regular but the average length of the bottom occupied by a frame plus the distance from the next frame, was 0.70 m. This should mean that there would have been 43 timbers in all, but photographs show only 31 and, alas, the draftsman was not able to go beyond timber 19. Before being driven off by water, he managed to draw a section of the wreck, at floor timber 8, from the west, which shows that there was a pre-moulded chine, rounded but much less than its Druten equivalent. Not a trace was left of knees. The 13th floor timber from the west (the barge was lying east-west) showed a ridge like the 7th timber at Druten, but had no mortises.

The onset of the chine could be followed at the western end for 3.50 m. Towards the west it came nearer to the longitudinal axis of the ship. So it probably had the familiar (certainly at Oxford) punt or 'aak' shape.

Some hardware was found on the barge. One piece, probably a sleeve around the handle of a bargepole or boathook, had a piece of pottery sticking to it of a kind that Professor Brunsting has dated to the 2nd century AD (Brunsting 1937, 155-6). Other sherds were found in the layers that had piled up over the ship. One of them was of 12th century date (Louwe-Kooijmans 1968, 6).

What was rescued from the fray was a radiocarbon date of AD 130 ± 30 (GrN-5382; Vogel & Waterbolk 1972, 100). In consequence of the rescue dig situation the diggers of Druten never saw what was left of the bottom without the frames. There was some puzzling over photographs trying to make sense of seams and/or cracks, but no satisfactory conclusion ensued. With hindsight we may say that the Druten barge may have had an irregular mosaic bottom (Lehmann 1987, 29). At Kapel-Avezaath there was no uncertainty; the bottom was composed of rather disorderly slabs of wood fitted together. The vast size of these slabs suggests that the oak forests had not been decimated by the scale on which Muri Gallici had been built, but something did suggest thrift. There were depressions in the bottom that might have fitted in the spaces between the frames, but frames were fastened halfway over them, suggesting that this might have been a bottom re-used from another boat.

### The context of the boats

In Roman times the Rhine was the frontier of this part of the empire, but in the Roman conception it had more of the character of territorial waters. These large cargo ships must have played an important part in the logistics of the limes.

The middle east-west strip of the Netherlands is the Rhine delta, with the Meuse joining from the south. The northernmost arm of the Rhine, running past Leiden and discharging into the sea at Katwijk, was then the most important and carried the limes on its shore. The Zwammerdam boats were found, as it were, on the doorstep of a fortress (de Weerd 1988, 22-3).

The Druten boat was found in a silted-up meander of the Waal, which is the southernmost arm and was already perfectly respectable. Caesar knew it as the
Vacalus (Belli Gallici IV, 10) and Tacitus as the Vahalis (Annales II.6). Druten is the successor of a Roman settlement but there were other reasons to sail westward through the lowlands. In the south-west, where now is the northern half of the island of Walcheren and water, there was probably an estuary with a temple of the goddess Nehallenia on each bank. Remains of at least one were found at Domburg on the west coast of Walcheren and another one in the water north-east of Walcheren. Of the nature of the temples themselves, nothing is known, but many votive altars were retrieved, that had been erected by tradesmen who brought wares from the hinterland (ie, parts of the present Germany and France) to this place and had them shipped over to Britain (Louwe-Kooijmans 1971).

In the Druten boat there were traces of cargo; stones from the Ardennes or from the German mountains, but chiefly slate. This was, and is, mined in the Eiffel (Hulst & Lehmann 1974, 20). The wood of the boat was common oak (Quercus robur) that grows all over Europe but there were some accessories made of another oak (Q petraea Lieblein) which grows south from the Eiffel mountains (Hulst & Lehmann 1974, 18). It is possible that she had been up as well as down the Rhine, but where she was built and had her home port we do not know.

Why the Kapel-Avezaath barge was deposited where it was found is not so self-evident in the light of modern maps. The site was a silted upstream channel in the lower course of the Linge, a small river that has its source a little west of the place where the Rhine splits up, and which ran westward between the two Rhine arms before joining the Waal. At one time it was shorter, the lower course being a loop of the Waal. In that state it was a stream on which one could expect long distance barges. In fact, Linge and Waal were only separated in AD 1304 by a man-made dam, well above Kapel-Avezaath (Henderikx 1986, 458, 462-3, 468, 512). Before dykes were thrown up everywhere the delta was a very unstable area, with streams madly meandering. Interfering with the landscape was begun at least by the Romans. Drusus, brother of the emperor Tiberius, campaigning intensively north and east of these parts, where he had his base, had a canal dug (Tacitus, Annales 11.8) or perhaps more than one (Suetonius V.I.2) and maybe a dyke built (Willems 1985, 52). The canal, under the names Fossa Drusiana and its translation (Drususgracht) especially haunted Dutch scholars. Much ink was split, many guesses made, but still nobody knows where it was. Gnaeus Domitius Corbulo went empire building north of the Rhine until the emperor Claudius blew the whistle on him, calling him back to the Rhine, thus consolidating the limes. Corbulo too had a canal dug somewhere (Tacitus, Annales XII.8).

A last question, that may never be answered: were these barges, and others (most of which were found in waters with access to the Rhine) Celtic or not? The late Victorians added the noun ‘twilight’ to the adjective Celtic, the combination historically and archaeologically makes sense. Mr de Weerd’s paper on the measurements of these vessels suggests that they were, or had been, made part of a Roman system (de Weerd 1988, 210-79): but see the paper by Arnold in this volume for an opposing view.

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10 Maritime traffic between the Rhine and Roman Britain: a preliminary note
Gustav Milne

Abstract
Merchandise from many parts of the Roman Empire reached the province of Britannia via a complex system of trans-shipment centres. At these ports, cargoes were transferred from river barge to sea-going ship at river estuaries, and then offloaded onto coastal or river craft at the British trans-shipment ports. It is suggested that the River Rhine was a principal artery in this network, and evidence for the location of some of the British ports which indirectly handled these Rhine cargoes is considered.

Since 1973, an extensive programme of rescue excavations on the Thames waterfront in London has produced a detailed picture of a Roman provincial harbour, with its quays, warehouses, bridge and boats (Milne 1985; Miller et al. 1986). These investigations also produced evidence for the importation of material from many parts of the Roman Empire; pottery from Gaul, wine from the Mediterranean, fish sauce from Spain, marble from Italy, olive oil from north Africa. Such material has been interpreted as showing direct links with those provinces, producing an accompanying vision of the harbour in Londinium crowded with ships from many different countries. However, further study suggests that such direct long-distance maritime ventures were the exception and not the rule. Ships designed to sail in the tideless Mediterranean would not necessarily be suitable for the battle around the Atlantic coast of western Europe, the Channel and the North Sea. The winds, swells and tidal harbours of these northern seas demanded a different nautical technology.

That Londinium did receive much exotic material is not disputed: how that material arrived in Britannia is a more complex question, for it involved the setting up of a long chain of trans-shipment centres. At these centres, cargoes would be laboriously transferred from cart to river barge, or from river barge to sea-going vessel, the process involving much double or treble handling of loads. The vital supply network stretched over the whole Empire of necessity, and was used for military supplies and administrative communications as well as for commercial traffic. Strabo mentions four crossings commonly used in getting from the continent to Britannia, from the mouths of the Rivers Rhine, Seine, Loire and Garonne (Strabo IV, 5.2). For much of the Roman occupation of Britain, it is suggested, there may have been more traffic arriving in or being exported from the province utilising the arteries serving the Rhine garrison than the other rivers (du Plat Taylor & Cleere 1978).

Rome and its trans-shipment ports
Perhaps the best-known examples of Roman trans-shipment centres are those which directly served Rome itself. Before the great harbourworks were built at the mouth of the Tiber near Ostia in the mid 1st century, some merchantmen could be rowed upriver to Rome while other shallow-draft vessels were towed by teams of men trudging along a towpath (Casson 1965, 32). But the standard size of merchantmen was approximately 340 tons, and these large vessels had to anchor offshore in the open sea, and transfer their cargoes to shallow-draft lighters, probably known as lenunculi auxiliarii. Alternatively, they sailed to the well-protected harbour at Pozzuoli (Puteoli) where their cargoes could be loaded on coastal vessels small enough to negotiate the Tiber. Once the ambitious artificial harbour project was completed however, merchantmen could be berthed against the deep water quays in relative safety, and their cargoes could be manhandled into the neighbouring warehouses or on to special boats designed to be towed up the non-tidal Tiber to Rome. The complexities of the routes employed in sending exotic cargoes from Rome to Britain are recorded in Suetonius’s description of the Claudian invasion of that province. He describes how the new Emperor himself was shipped from Ostia to Massilia, and was nearly wrecked. He was then marched overland through Gaul to Boulogne, from whence he was shipped to Britain, presumably to Richborough, without further mishap (Suetonius, The Twelve Caesars; see Graves 1957).

Traffic from the Rhine to Britannia
A similar system of trans-shipment centres was in operation on the Roman Rhine. Archaeological excavations have shown that the contemporary Rhine barges were quite different from the vessels which worked the Tiber. Northern European vessels such as those recorded at Zwammerdam in the Netherlands (de Weerd 1978) were flat-bottomed barges up to 34 m long. Their structure is described by Arnold and by Lehmann in this volume. The mast on these barges was the bows and may have been used to support a sail or for towing.

Barges of this and related types must have been among the most common working boats of northern Europe. However, their shallow draft and keel-less profile meant that they were not suitable for service on the North Sea. As a consequence, the produce they carried must have been transferred to or from round-
hulled&sea-going ships in harbours situated on the coast. The two trans-shipment centres at Colijnsplaat and Domburg on the River Scheldt in the Netherlands (Fig 10.1) are of especial interest since they provide clear proof of contact with British traders (Hassall 1978). Both had shrines to the goddess Nehalennia, a 'guardian' goddess, to whom altars had been erected by merchants to commemorate safe sea crossings. Study of the dedications on these altars had shown that pottery and wine destined for Britain and salt, fish and possibly woollen cloths imported from there were handled at these ports, presumably being transferred between ship and river barge at this 'point.

There are also some incidental references to the practice of trans-shipping merchandise from sea-going vessels to Rhine barges in the documentary record. For example, Strabo (IV, 5.2) mentions that in the 1st century the principal port for sea crossings was not on the Rhine estuary itself, but further west at Boulogne. This suggests that there was a considerable traffic in river and coastal vessels discharging or taking on their cargoes at Boulogne at that period. In the mid 4th century, when Julian was appointed Caesar in charge of Britain, he began campaigning to reopen the crucial supply route along the Rhine. Commenting on this episode, Libanius records how corn had formerly been shipped over the sea from Britannia on the first stage of its journey, after which it was sent up the Rhine. When the Rhine waterway was closed by barbarian action, the few grain carriers that still plied the sea route continued to discharge their cargoes at coastal ports. However, the grain had then to be transported by waggon, a system considered to be far more expensive than the barges used previously (Libanius, Oration 18, 82-3).

Trans-shipment ports in Roman Britain
The location of the principal British ports which were part of the Roman supply network will now be considered. Regretably, few harbour sites have been excavated by archaeologists (Milne 1987), and so the form (or absence) of the facilities associated with the different types of river and coastal port are not clearly known. Each port requires its own study since the local topography, ancient river and sea levels, tidal effects, and rate of silting or erosion all need to be determined before a meaningful evaluation of the potential of the port can begin. Then a closely-dated sequence of development must be established, after which comparison with the neighbouring ports in the network can be made. There is also a need to examine more of the contemporary vessels themselves, since only four Roman period wrecks have been recorded in Britain in

Figure 10.1 Maritime traffic between the Rhine and Roman Britain. (Map: Chrissie Milne).
any detail, and three of those are from the Thames (Marsden 1981; and this volume).

Until this work is done, only superficial surveys can be attempted, to provide a useful starting point and indicate directions for future research. For example, in 1978 Cleere identified the general location of some 45 possible harbour sites based primarily on an assessment of the Roman road system and its associated coastal and riverside settlements (Cleere 1978). These sites were then subdivided into 'military' or 'civilian' harbours. However, it is now suggested that such a distinction may be neither valid nor valuable for our present purpose. After all, a harbour used to accommodate the troop transports and supply vessels plying to and from the Rhine would enjoy a location and range of facilities equally suitable for purely 'commercial' traffic.

In addition, there is little evidence to suggest that the Romans themselves drew such a clear distinction between military and civilian harbours when considering the bulk handling of cargoes. It is therefore argued that the harbours known to have been used by the Classis Britannica should be seen as the ones most likely to have sheltered the bulk cargo carriers serving the civilian market. The identification of the fort for the Classis Britannica at Dover, for example, marks that port out as a principal British trans-shipment centre in that period, and therefore worthy of military protection.

The suggestion that most harbours in Britannia could and were used to serve the needs of both military and civilian cargoes has several important implications. First and foremost, it renders their identification the more easy, since the more important ports will have been conspicuously fortified with masonry walls, at least during the later Roman period. For example, the so-called 'Saxon Shore forts' (Johnson 1977) could now be seen as principal fortified ports of the Saxon Shore, rather than naval police stations.

A preliminary study of the development of these ports on the southern and eastern coasts suggests that Richborough, protected by the Isle of Thanet, was seen as the major trans-shipment centre in the 1st century, with Dover and London developing in the late 1st and early 2nd (Philp 1981; Milne 1985). By the late 3rd century, however, the London harbour was not being maintained, and the harbours at Domsburg and Colimsplaat on the Scheldt were no longer used. At this period other British ports such as those at Dover, Richborough and Reculver were being refortified. That the Rhine axis seems to have seen less traffic in the late 3rd and 4th centuries is perhaps borne out by the development of Garrianonum on the French coast together with Portchester and Clausentum in Britain, marking a pronounced westwards shift of the main Roman cross-Channel supply lines.

To sum up, the Roman supply network comprised many trans-shipment centres spread out along long lines of communication, crossing land, rivers and seas. An attempt has been made to identify some of those centres used by the traffic from the Rhinelands to Britannia. Of the British ports, Richborough, Reculver and Dover were, at various times, the major ports of entry, seeing the trans-shipment of cargoes to and from a second string of ports, of which London was one of the more important centres from the late 1st-mid 3rd centuries.

This hierarchy of centres would have been marked by the differing types of vessels used on the various stages: river boats, coastal craft and sea-going ships. It therefore follows that for every one ship of c 500 tons there would have been at least 10-20 smaller vessels needed to move the same cargo on to the next port. Although some of the ships built in the Roman period were of a considerable size (Casson 1971, 171-2, 183-200), the wealth of the Roman world would have to be carried at some stage in its long journey by one of the armada of much humbler craft which comprised the bulk of the Roman merchant fleet, a conclusion supported by a recent study of literary, epigraphic and comparative material (Houston forthcoming). Although the vessel excavated at Blackfriars, London in 1962-3 had sunk while carrying a mundane cargo of ragstone from Kent (Marsden, this volume), there is every reason to suspect that, on previous journeys, it may have carried more exotic cargoes derived from the Mediterranean and beyond, brought to London via the Rhine through the series of trans-shipment centres which were such a feature of the laborious Roman supply network.

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11 On the use of the word ‘Frisian’ in the 6th-10th centuries written sources: some interpretations
Stéphane Lebecq

Abstract
As they appear in the 6th-10th centuries written sources, the name and adjective ‘Frisian’ raise a question among historians of the Dark Ages and early Middle Ages: were the so-called Frisian merchants, Frisian seamen, Frisian-shaped ships, Frisian Sea, Frisian clothes … really Frisian? If not, what were they? This paper examines written sources and other evidence from the 6th-10th centuries in an attempt to answer such questions.

Everyone remembers the famous dispute between Henri Pirenne and other scholars about the Pallia or Saga fresonica, the so-called Frisian cloths: according to the former they were Flemish; according to the latter they were English … I think that they were authentically Frisian (for further information about the question see Lebecq 1983a, 131-4). There was just as much controversy about other occurrences of the word ‘Frisian’ in written sources from the 6th-10th centuries.

When a diploma of Louis the Pious for the Bishop of Worms mentions in AD 829 the negotiatores artifices et Frisiones (Lebecq 1983b, 422), are these ‘Frisians’ Frisian, or are they a synonym for ‘international traders’? When the author of the Anglo-Saxon Chronicle juxtaposes the word FRIESA with the name of three important personalities involved in a sea battle in 896 (Lebecq 1983b, 244-5), does it mean they were Frisian, or is not it a title referring to the steersmen of the English boats, as has been suggested by some scholars? And when, in the same year, the Chronicler refers to a new type of ship different from the Fresisc pattern, what does he mean? And finally, is the Frenessicum or Fresicum Sea of the Historia Brittonum (Lebecq 1983b, 239-40) a ‘Frisian Sea’? If so, what does it mean? The Firth of Forth? The Irish Sea? Or the North Sea?

Frisian settlement
The first Frisian merchant who appears in a text is the Freso quidam who bought slaves on the London market in 679 (Bede IV 22; see Colgrave & Mynors 1969,404). For an Englishman such as Bede, he was a Frisian; for us too. But was he a Frisian from an ethnological or from a linguistic point of view? We must remember that, from the 5th-7th centuries, the Frisians knew an expansion that led them from their original land, located on the eastern shores of Lake Flevo or Almere (the Zuyderzee of Ijsselmeer), eastward to the mouth of the Weser and, sporadically, beyond; and westward to the great delta of the Rhine, the Meuse and the Scheldt (Fig 11.1). This included all the Zeeland Islands (Lebecq 1983a, 105-11; Halbertsma 1982). Probably the London Frisian mentioned by Bede was from the part of Great Frisia which Bede called Friesia citerior (Bede V 10; see Colgrave & Mynors 1969, 480). Here was located Domburg, or Walcheren, as the written sources call it (Lebecq 1983a, 142-4), an emporium for trade between the continent and south-east England from the end of the 6th century. Half of the 1600 so-called sceattas, minted between 670 and 750, recovered from Great Frisia, were discovered in the Walcheren/Domburg area alone. The Frisians only occupied the lower Rhineland and the Zeeland Islands from the 6th century onward. While no sign of settlement can be found in Walcheren between the end of the 2nd century and the 6th (certainly because of a great flood), such was not the case for the lower Rhine, where essentially Germanic populations, famous for their seamanship, can be found from the 3rd-6th centuries. A great part of these populations sailed away to Britain, others went by land to the inner part of Gaul. But there is no denying that some of them remained in the lower Rhine region, in touch with the great rivers and the sea.

Such was the case, in particular, for those small nations from the lower Rhine whose kings Theodoric the Great wrote to in 507 to conclude a treaty against the Franks of Clovis; the Herules, the Thuringians and the Varnes (Wood 1983,7). Most of them were branches of populations who had come from the Baltic and settled mostly in central Europe. For example, a branch of the Varnes, a great part of whom settled in the Carpathians ‘extended as far as the Northern Ocean along the river Rhine’ (Procopius VIII 20; see Dewing 1928,252, and when they were at war with the so-called Brittia (generally identified as Great Britain; see comments by Thompson 1980), ‘they were encamped not far from the shore of the ocean and the mouths of the Rhine’ (Procopius VIII 20; Dewing 1928,262). Procopius goes on to say that ‘all the men [from Brittia, but also the Varnes] rowed with their own hands … They have no sail, and they always navigate by rowing alone’ (Procopius VIII 20; Dewing 1928, 260). Most of these nations appear in 6th century sources dealing with their struggle with the Franks, who were beginning to expand along the North Sea shores (Wood 1983). But this eastward Frankish expansion was stopped by the westward Frisian conquest. When the period of great commercial development began, at the end of the 6th and beginning of the 7th centuries, the Frisians ruled the
Figure 11.1 Great Frisia during the Dark Ages. (Map: Author).

In my opinion, there must also have been some Franks (more exactly some Chamaves, some Amsivarii, together with some Batavians) involved in this first commercial development. From the 3rd-5th centuries — until Sidonius Apollinaris — the Franks had been sailors and plunderers of some repute, both in the western seas and in the western shores (de Boone 1954; Wood 1983; Pépin and Feffer 1987) but, later on, they were never mentioned as being sailors. What became of these Frankish sailors from the great Delta area, in the 6th/7th centuries — possibly they became Frisians?

Frisian merchants and seamen
In the beginning of their commercial development, the ‘Frisian’ merchants were probably mainly Frisian but they may also have been Franks, Varnes, Chauks, and so on. As the Varnes described by Procopius, until the end of the 7th century, they used only oars to propel their ships. Then, and mainly during the 8th century, they began to use sail (Lebecq 1983a, 177-81). At first, this was probably the case in the great Delta area, where the Celtic sail and rigging tradition may have survived (Ellmers 1969); and later in all the waters they navigated. Thanks to the use of this sailing rig, Frisian trade reached its climax at the end of the 8th and turn of the 9th century.

What had become of the Frisians by this time? They had lost their independence and they had fallen under the domination of the Franks (Lebecq 1978; 1983a, 111-17; Blok 1979; Halbertsma 1982). Then the Frankish elite, mainly the Austrasians and the family of the Pippinids, encouraged their sea trade with the obvious purpose of drawing and economic and fiscal...
In its heyday this Frankish/Frisian trade revolved mainly around the Frankish/Frisian port of Dorestad (Fig 11.2). The first development of this harbour began during the time of Frisian independence, and it is c 675 — that is to say before the Frankish conquest — that the famous wooden harbour complex excavated by Van Es and Verwers began to be built (Dorestad 1978; Van Es & Verwers 1980). The harbour’s heyday, however, coincides with the Frankish domination around the year 800, when the most important mint of the Carolingian Empire (second only to the one of the Imperial Palace) was operating in Dorestad (Volckers 1965; Morrison & Grunthal 1957,90-1; Lebecq 1983a, 60-6). In Dorestad also was the main customs office of the Empire, where a decima toll was payable on every cargo (see Louis the Pious’ Praeceptum negotiatorum dated 828, in Lebecq 1983b, 436-7); and many texts show the movement in and out of the harbour of ships, goods and men (see Vita Bonifatii, Alcuin’s Letters, Vita Anskarii in Lebecq 1983b). It is interesting to note that, whilst undoubtedly many merchants of Dorestad were Frisians, who had come from the northern terpen area (they continued to sail to Scandinavia from Dorestad, just as they had done in the past from their terpen and their Handelsterpen), the only Dorestad merchant whose name is known, thanks to a poem written by Alcuin in 780, was called Hroberct, which is an authentically Frankish name (Lebecq 1983b, 21). At that time (around 800) the Frisians mentioned in the texts (ie, the Frankish/Frisian traders from Frisia and the mouths of the Rhine, mainly from Dorestad) were the most famous merchants, not only in the Frankish Empire, but in the whole western world. They became so notorious that their name could give rise to a genuine semantic extrapolation. This seems to be the case in the diploma by which, in 829, Louis the Pious confirmed the concession to the Bishop of Worms of the rights to all the tolls levied in his city on the negotiatores, artifices [craftsmen] et Frisiones (Lebecq 1983b, 422), as if the Frisians — clearly distinguished from the negotiatores (certainly the local merchants) — were the only foreign traders who had business in this great Rhenish wine-market. In fact, this term was certainly being used as a synonym for ‘international traders’. Their fame died hard. In a West-Saxon poem in the Book of Exeter (compiled at the end of the 10th century; but maybe the poem itself was older), the Frisian sailor became the literary archetype of the long-distance seaman (Whitbread 1946; Lebecq 1983b, 37-9).

However, I do not believe one can derive from legitimate scepticism an argument against historical importance of the Frisians’ role in stimulating maritime exchanges during the Dark and early Middle Ages. On the contrary, if their name had become a synonym for a long-distance merchant and sailor both in Anglo-Saxon poetry and in a Rhenish diplomatic formula, the Frisians must have justified this identification by their activities. In my opinion, two testimonies confirm this Frisian

Figure 11.2 Frisian trade routes during the 7th-9th centuries. (Map: Author).
Lebecq: Use of the word ‘Frisian’ in the 6th-10th centuries written sources

nautical superiority: the use of the word ‘Frisian’ applied to the North Sea, and to one of the most common types of ships in the waters of northern Europe. I shall more particularly dwell on these last points, which are highly controversial.

The Frisian Sea

A Mare Frenessicum or Fresicum is mentioned in chapter 38 of the Historia Brittonum, ascribed to the so-called Nennius, and partly inspired by an old Kentish Chronicle (Lot 1934; Morris 1980; Lebecq 1983b, 239-40; Dunville 1985). We have two families of manuscripts. The first, the more ancient of which is the Harleian (early 9th century), relates the movements of Saxon ships up to the Orkneys, and the Saxon occupation of regiones plurimas mare Frenessicum. The other family of manuscripts — particularly the Vatican one — does not mention the mare Frenessicum, but the mare Fresicum. Fresicum is very explicit, but what does Frenessicum mean? In his translation, John Morris writes the ‘Frenessican sea’; this is an overcritical interpretation, which has no meaning. I think that Frenessicum is a mistake — inverting two consonants produces Fresenicum mare, which sounds like the Pallia Fresonica. If it really is the Sea of the Frisians, it cannot mean the Irish Sea — as Poelman thought (1906, 49); nor the Firth of Forth — as Ferdinand Lot (1934, 177, 222) or John Morris (1977, 61) believed. It can only be the North Sea, because there were neither important Frisian sailing, nor significant Saxon settlement on the shores of the Irish Sea or of the Firth of Forth. Indeed, in the 11th century, Adam of Bremen refers to the North Sea as the oceanum Fresonicum (in the Gesta Hammaburgensis Ecclesiae Pontificum IV 1; Lebecq 1983b, 195); and in the 12th century Nicolas of Liege calls it the mare Fresonum (in the Vita Landiberti V; Lebecq 1983b, 55). So the identification of the North Sea as the Sea of the Frisians died hard — at least until the period when the Frisians were no longer dominant in the North Sea.

Frisian ships

In a well-known text (Lebecq 1983b, 244-5) the Anglo-Saxon chronicler writes that ships were built on Fresisc, that is, in the Frisian fashion. In 896 King Alfred wanted to build a new type of vessel in order to fight the Viking ships. The new boats would be tu swa lange tha othru (1.3) — ‘twice as long as the others’ — but which others? Then they would be swiftran, unwealtran and hierran (ran is a comparative form in the plural); this means ‘swifter’, ‘steadier’ and — more interesting for my purpose — ‘higher’ in the water. Higher than which kind of ships? The rest of the text says that ‘they should not be built according to the Danish pattern, nor the Frisian pattern’ (Appendix I). It means that, for the English shipbuilders, only two patterns of big ships (the beginning of the text mentions langskipu) existed in the south-western waters of the North Sea at the end of the 9th century. It is not necessary to describe the well-known pattern of the Danish long-ship and, thanks to Ole Crumlin-Pedersen (1965) and Detlev Ellmers...
(1985), we know the Frisian origin of the flat-bottomed cog, the main type of ship which sailed between the Rhine Delta and Scandinavia, particularly in the sandy waters of the Wadden Sea. But the main kind of ship used in the south-western waters of the North Sea was not the cog but a round-bottomed ship — in fact a kind of extended, or heightened, logboat — generally considered as the hulc or, rather, the proto-hulc, after Detlev Ellmer’s suggestion that the word derived from the old German verb hohlen or hölken, meaning ‘to dig’ or ‘to hollow out’ (Ellmers 1972, 60-1).

We can see this kind of boat on the coins of Quentovic and Dorestad struck in the beginning of the 9th century (Fig 11.3), and later on the tons of Winchester Cathedral and the Flemish church of Zedelgem near Bruges, certainly carved in the Tournai area in the 12th century. Later still they appear on some seals of ports in south-east England, in particular on the seal of New Shoreham, which carries the word hulc to define the ship. The ‘Frisian pattern ship’ of the Chronicle cannot be a cog because the cog was not a major type of ship in 9th century Britain, it is more likely the extended logboat (the proto-hulc) which was very common in these waters. Is not the first occurrence of the word hulcus in the London toll-list of King Aethelred in the beginning of the 11th century (Lebecq 1983b, 443)?

The best proof is that the new ships built by King Alfred’s builders must be ‘higher above the water than the others’. Now the freeboard of the cog was already very great, whilst the freeboard of the hulc was very low, just like that of the Viking ships. As Crumlin-Pedersen (1972, 186) wrote about the wreck of Utrecht 1, the proto-hulc was a ‘banana-shaped’ boat. Of course, it has often been noted that the hulc-type coinage was first minted in Quentovic (close by Montreuil-sur-Mer) and only later in Dorestad. But all ancient hulc-wrecks were discovered in the lower Rhine area, even though Robert Vlek thinks that they were not exactly hulks (Vlek 1987, 143-5); these are the two Utrecht wrecks, which date to the 11th/12th centuries, particularly the famous boat found in 1930, which was long considered as dating to the end of the 8th (Vlek 1987, 67). There is also the ship which was excavated at Velsen (near Ijmuiden), which is an extended and heightened logboat from the 10th/11th centuries (de Weerd 1987).

Conclusion
A certain kind of vessel — probably the round-shaped one generally considered to be a hulc — was called a ‘Frisian pattern ship’ by the Chronicler — which proves that the Frisians were, if not their creators, at least their main users. Similarly the ‘Frisian’ merchant was not necessarily a Frisian, but surely an international trader; as was also the case of the ‘Frisian’ steersman was not necessarily a Frisian. This is another proof, and not the least, of the importance of Frisian seamanship in the Dark and early Middle Ages — the importance surely, the monopoly maybe. (But see Ellmers, this volume).

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Appendix I: Anglo-Saxon Chronicle a° 896

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Then King Alfred had ‘long ships’ built to oppose the Danish warships. They were almost twice as long as the others. Some had 60 oars, some more. They were both swifter and steadier and also higher than the others. They were built neither on the Frisian nor the Danish pattern, but as it seemed to himself that they could be most useful.

Then on a certain occasion of the same year, six ships came to the Isle of Wight and did great harm there, both in Devon and everywhere along the coast. Then the king ordered [a force] to go thither with nine of the new ships, and they blocked the estuary from the seaward end. Then the Danes went out against them with three ships, and three were on dry land farther up the estuary; the men from them had gone up on land. Then the English captured two of those three ships at the entrance to the estuary, and killed the men, and the one ship escaped. On it also the men were killed except five. These got away because the ships of their opponents ran aground. Moreover, they had run aground very awkwardly; three were aground on that side of the channel on which the Danish ships were aground, and all [the others] on the other side, so that none of them could get to the others. But when the water had ebbed many furlongs from the ship the Danes from the remaining three ships went to the other three ships which were stranded on their side, and they then fought there. And there were killed the king’s reeve Lucuman, Wulfheard the Frisian, Aebba the Frisian, Aethelhere the Frisian, Aethelfrith the king’s geneat, and in all 62 Frisians and English and 120 of the Danes. Then, however, the tide reached the Danish ships before the Christians could launch theirs, and therefore they rowed away out ...
12 The Frisian monopoly of coastal transport in the 6th-8th centuries AD
Detlev Ellmers

Abstract
On their way west the Slavonic tribes at c AD 560 interrupted the transcontinental trading routes which led from Byzantium via the eastern parts of middle Europe to Scandinavia. From that time on the only trade connection between Scandinavia and the Mediterranean was maintained by the Frisians who, in their coastal vessels, sailed cargo from England as well as from the Merovingian empire along their shores to Scandinavia, and vice versa. This paper deals with this monopoly situation of Frisian trade.

Maritime Frisians
The strongest impulse to the coastal seafaring of the Frisians was given by an event far outside Frisia (Ellmers 1985a; 1985c). In the middle of the 6th century Avaric and Slavonic tribes invaded large parts of eastern Europe and interrupted the trade connections from Byzantium to Scandinavia. At this time nobody was able to cross the North Sea directly from the British Isles to Scandinavia and the latter depended for its whole supply of goods from western, central and southern Europe completely on Frisian coastal trade. In all Scandinavia for 200 years or more before the Viking Age, there is not one single find of foreign origin that came there without Frisian intermediate trade (Bakka 1971).

At the beginning of this phase of Frisian monopoly in trade they had no towns which could serve as trading centres. Frisian traders were peasants, skippers and merchants in one person and lived throughout their country in small farms erected on top of artificial hills (terpen) near tidal creeks and streams. In a 7th century layer in one of these, excavated at Hessen in the town of Wilhelmshaven, there was found a slipway on which flat bottomed boats could be built (Ellmers 1972). Another important find was a side rudder of the firrer type which, today, is still in use on the traditional sailing boats of Steinhuder Meer, a lake north of Hannover. This type of rudder was specific to smaller vessels within the shipbuilding tradition of the cog. In the late 12th century, Hanseatic cogs replaced the firrer by a stern rudder (Ellmers 1985b, 15ff).

The firrer of Hessen tells us that the farmer-merchant there intended to build boats of the cog type on his slipway. A flat bottom was essential on Frisian craft which were designed for the special conditions encountered when sailing the shoals of the Wattenmeer along the Frisian shores.

The economic base of the farm at Hessen was sheep of two different breeds with different types of wool. From this raw material cloth of very high quality was woven in many different varieties. Provided with this excellent home-made commodity our farmer-merchant sailed to the beach markets along the Frisian borders to meet neighbouring merchants or customers. One of these rural beach markets has been excavated on the Jutish (Jutland) west coast near Dankirke, south of Ribe (Thorvildsen & Bendixen 1972). Located near the farm of a rich customer, this market place lay close to the shore where flat bottomed boats could beach and dry out at low tide and where merchandise could be sold to visitors to the market. The presence of Frisian merchants is confirmed by stray finds of not less than 13 coins which, among other small objects, had been lost during the process of buying and selling.

Frisian landing places
From c AD 650 Frisian merchants started to settle at these beach markets along their borders and thus founded the first trading centres with permanent settlement east of the former Roman empire, on the shores of the North Sea. Dorestad on the Rhine, south of Utrecht, near the border with the Franks, is the best known example (van Es & Verwers 1980). Around AD 625 there was nothing but an official manor house and some fortification, under the protection of which a beach market was organised and coins were struck for use there. Some 50 years later abundant finds indicate the first permanent settlement.

Southern goods were brought by riverboats along the River Rhine to Dorestad and transferred to coastal vessels bound for England, on the one hand, and for the eastern parts of Frisia and Scandinavia on the other (see Lebecq, this volume). Due to this key position Dorestad, in a short time, became the most flourishing of the Frisian trading ports. The houses of the merchants were built in a long row along the riverbank so that ships of the merchants and of their customers could beach in front of the appropriate house. For this pattern, the German historian Waller Vogel created the, not very suitable, term Einstrassenanlage. All trading towns of the early Middle Ages are laid out after this pattern — as a long row of houses along the waterfront. At Dorestad, in the course of time, the River Rhine shifted away from this row of houses, leaving a considerable area of open beach between houses and riverbank, where ships landed by beaching. The gap was bridged by carefully made causeways, which led from every merchant’s house to the ships’ landing places, thus demonstrating that a lot of the trade was carried out directly from ship to house and vice versa. In addition to this trade within the houses there was a second significant area of trade and other activities at the landing places. The ever growing distance between
houses and ships made it possible for archaeologists to distinguish between the finds from both areas and to prove money exchange near the ships, from stray finds of coins, weights and balances. Not less than six suspension lugs for cauldrons and one cauldron handle bear witness to the cooking of hot meals for the ships’ crews who, after weeks of sailing in cold and rainy weather, wanted to have their first warm meal at the landing place. Of course, the sailors had to repair their ships at these landing places, as the recovery of many lost tools indicates. Stones, which had been used as sinkers for nets or fish traps, provide evidence for fishing.

To sum up, even in those Frisian ports with permanent settlements, especially of merchants in a row of houses along the waterfront, the old beach market with all its activities along the ships’ landing places played a continuing role.

Frisian ships
In the late 8th century Charlemagne struck coins at Dorestad depicting a sailing vessel of banana shape side view (see Lebecq, this volume, Fig 11.3). This type of ship is an early version of the hulc in which the Frisians sailed to England and English merchants sailed to Frisia. At Utrecht an 18 m long hull of this type has been excavated and dated to the 8th century. And as the word hulc means something being hollowed out, the hulc of Utrecht was constructed on top of a huge logboat (Ellmers 1972, 59ff, but see Vlek 1987 for an opposing view). After the prototype of the Dorestad coin, another coin was struck in the early 9th century by illiterates at Hedeby (near Schleswig on the shore of the Baltic) where Frisian merchants settled in large numbers to organise the transit trade from the North Sea to the Baltic. The ship on this coin differs very much from the hulc of the Dorestad coin. Instead of the round side view of the hulc, she has an angular one, with flat bottom, long and straight stem and stern posts, a side rudder of firrer type and side planking in clinker technique (the heads of the clinker nails are to be seen on some issues). All these features are typical of early cogs. Some of the coins even show the broken line of the flat bottom with both ends being bent upwards some degrees. Ships of this construction are designed for sailing the Wattenmeer in between the dunes and the shore. At low water the cog would take the ground; as the tide rose the water could get underneath the bent-up ends of the bottom to make the ship float again. Without these bent-up ends the flat bottomed ship would stick to the ground. The Wattenfahrt is the reason why the Frisians used two different types of ship for their trade; the hulc for trade with England, and the cog for trade to the east, that is, to the Continental Saxons and, especially, to Scandinavia (Ellmers 1972, 63ff). Though the first evidence for Frisian contact with the Slavonians is not earlier than the late 8th century, we cannot completely exclude earlier Frisian trade even to them.

Frisians in the Viking Age
For Scandinavia this cog-route, especially in the 7th and 8th centuries AD, was the only trade connection to western, middle and southern Europe. We can hardly imagine what a relief it was to the Scandinavians when, towards the end of the 8th century, for the first time, they discovered an alternative sailing route from Norway via the Shetlands to the British Isles. In the early 9th century they opened a third trade connection from Sweden along the Russian rivers to Byzantium and to the Islamic world. Thus the Scandinavians ended the Frisian monopoly and initiated a new chapter in the history of shipping: the age of the Vikings.

In spite of the loss of the monopoly and in spite of all the Viking raids in Frisia, the archaeological sources available do not give the slightest hint at a decline of Frisian trade. Only Dorestad, in the course of the 9th century, lost its predominance, but Tiel inherited its English trade and Utrecht its trade to the east. Other Frisian ports began to flourish even in Viking times. There is some very interesting evidence for Frisian presence in one of the centres of the Viking world. As we know, the clinker seams of cogs and related boats were not fastened by iron rivets like Viking ships but by ‘I’-shaped iron nails, which are much smaller than those of Celtic ships (see, for example, Marsden, this volume). By these small nails we are able to identify the shipbuilding tradition of cogs even when all timber has rotted away.

At Birka, near Stockholm, the nails of a 10th century cog have been excavated. We learn from them that Frisian merchants at that time sailed to Birka in their own ships. And when, in 1159, the Hanseatic league was founded at Lubeck, Frisian merchants became members of the league and provided the merchants from Westfalia with the necessary ships for their trade with Gotland. Thus the Frisian cog became a Hanseatic one: but that is a new chapter in maritime history (Ellmers 1985b; 1985c).

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The history of the Channel in the late and post-Roman periods is usually seen in terms of Saxon raids and, ultimately, of the Saxon settlement of England. Close attention to the texts suggests a rather different picture. In the late 3rd and early 4th centuries it was the Franks who were regarded as the chief threat to the Channel, and this threat was largely thought to affect the German and Gallic coasts, and not the coast of Britain. It was only towards the end of the 4th century that raids on the north side of the Channel were clearly recorded, with the Saxons as the raiders. Although it is not clear from the literary sources that there was a firm distinction between the Franks and Saxons at this time, the evidence does, therefore, imply that the Saxon Shore was only so named around the year 400, and it also provides a context out of which later Frankish interest in England could emerge.

Communication and piracy

The history of the Channel in the Roman and post-Roman world is dominated by two issues. The first concerns peaceful communication between Britain and the Continent. This can be explored through the evidence for the imperial administration of Britain, through the history of the classis Britannica, and in the few indications of civilian seafaring that survive, including references to the early career of Carausius as a paid navigator (Aurelius Victor, XXXIX, 20), and his recruitment of Gallic mercatores as troops (Pan Lat, IV, 12). Evidence for official contacts between Rome and Britain trickles on through Constantius's accounts of the visits of Germanus to Britain (Vita Germani, III, 12-18; V, 25-7) to the appeal to Aetius in c.446, recorded by Gildas (DEB, 20, 1). In the 6th century the nearest equivalent to this is to be found in the interest shown by the Merovingians in the kingdoms of south-east England; the same material also includes references to a traffic in dead souls, which may be a garbled account of trade between Francia and Kent (Wood 1983, 12-13; 1984, 24).

The second issue concerns the role of the Channel as a route for piracy and invasion, from free Germany and the Rhine mouth, directed both against Britain and against the shores of Gaul and even as far as Spain (Pan Lat, X, 17, 1). Such activity was clearly endemic in the late Roman period, but probably reached a peak in the 5th century, possibly tailing off thereafter, although the slave trade ensured that piracy did not die out completely (Pelteret 1981). Looked at in this context the Saxons might be said to provide a constant factor in the history of the Channel, at least in modern historiography, which has tended to move from consideration of the Litus Saxonicum to the Adventus Saxonicum, and finally to the creation of the Saxon kingdoms of England.

Saxons and the Litus Saxonicum

In these considerations there are, inevitably, uncertainties, not least the question as to whether the Litus Saxonicum was the shore defended or the shore attacked by the Saxons, and although the weight of opinion seems to have settled on the latter interpretation, the matter is by no means resolved (Johnson 1976, 7-10; Bartholomew 1984, 185). Certainly there were plenty of Germanic troops in Britain during the 3rd and 4th centuries, as can be seen in the 297 panegyric on Constantius Chlorus (Pan Lat, IV, 17, 1-2) and in the narrative histories of Ammianus Marcellinus (XX, 1, 1; 3, 4, 2), although it has to be admitted that none of the barbarian units recorded there is said to be Saxon.

It is, however, possible that the question of the nature of Saxon involvement in the Litus Saxonicum is one that is badly posed, and that, as currently interpreted, it depends too much on the knowledge that by 700 southern England was largely Saxon. In short, the emphasis on Saxon involvement in the Channel may be one created by hindsight, and not by a proper evaluation of the sources in their own context. Before offering an interpretation of the history of the Channel in this period, it is as well to reconsider precisely what our sources have to say.

The Frankish threat

The accounts of the rebellion of Carausius in the contemporary panegyrics dealing with Maximian and Constantius Chlorus, and in the narratives of Aurelius Victor, writing in the 360s, his contemporary Eutropius, writing in 370 (Aurelius Victor, xvi), and Orosius writing shortly after 417, provide a convenient starting point. These last three texts, which are closely related, are best taken first, since the panegyrics, by their very nature, are allusive works, which are often ambiguous. According to Aurelius Victor, Carausius was appointed to drive away the Germans who were infesting the seas (XXXIX, 20; propulsandis Germanis maria infestantibus). Eutropius is more specific, in defining both the area infested, the tractus Belgicae et Armorici — essentially the coastline from the Rhine to the Loire on the south side of the Channel — and the Germans involved, the Franks and Saxons (Eutropius, IX, 21). Orosius's account is derived from this (Orosius, VII, 25, 3).
The panegyrics are less clear, not least because they are concerned to give no credit to Carausius for clearing up the seas. Indeed he is himself transmogrified rhetorically into a pirate (Pan Lat, II, 12, 1; IV, 12), just as Maximus would later be transmogrified after his usurpation in Britain (Pan Lat, XII, 26,4). The label in the former case, however, is particularly confusing, since it allows the panegyists to equate Carausius with the threat he had been sent to tame. Hence it is not altogether clear whether Maximian’s defeat of the piratical Franks mentioned by Mamertinus involved Carausius’s supporters or the raiders against whom he had originally been sent (Pan Lat, III, 7,2); it may even be that the latter had turned into the former (Pan Lat, IV, 17). The important point, however, is that in speeches delivered in the 280s and 290s the chief maritime threat to the Empire was perceived as being Frankish, not even as Frankish and Saxon, as claimed later by Aurelius Victor and Eutropius. Further, this perception is backed up by the statement of the panegyrist Nazarius, speaking in 321, that the Franks had ravaged the Ocean coast as far as Spain (Pan Lat, X, 17, 1).

Franks and Saxons
This picture of Frankish piracy is both extended and modified by the historian Ammianus Marcellinus, writing in the 360s or 390s. Here, for the first time there are raids on the coast of Gaul associated exclusively with the Saxons, dating to the year 370 (XXVIII, 5, 1; XXX, 7, 8); there may even be a reference to a Saxon raid on Britain, although this is questionable (Ammianus Marcellinus, XXVI, 4, 5; Bartholomew 1984, 173-5). Nevertheless, in the introductory comments to his account of Theodosius the Elder in Britain, Ammianus refers generally to the raids of the Franks and the Saxons on the Gallicanos tractus (XXVII, 8, 5). Moreover, Ammianus’s exact contemporary, Ambrose, bishop of Milan, also talks of the Franks and Saxons as being active in this period, since he alludes to defeats suffered by Magnus Maximus at the hands of both of them (Ambrose, ep LXIII, 23).

In other words, late 4th century writers looking back on the period of Carausius’s rebellion saw the Franks as acting in collaboration with the Saxons, whereas the late 3rd and early 4th century panegyrists mention only Franks. Such collaboration, however, is recorded for the 360s and later, and it may be that Aurelius Victor and Eutropius were putting their own perceptions on earlier events. The relative increase in Saxon piracy, and consequent diminution of the role of the Franks, might be associated with the punitive campaigns directed against the latter by Julian, during the reign of Constantius II (Ammianus Marcellinus, XVII, 2, 1-4; 8, 3; XX, 10, 2). Nevertheless, even in the late 4th century there is a tendency not just to group the Franks and Saxons together, but also to place the Franks first in any reference to their joint activity. The natural conclusion of this is that up until the last decade of the 4th century the Franks were regarded as the major threat to the coast of Gaul, and the coast of Britain is scarcely mentioned (Bartholomew 1984, 175-7).

The Saxon Shore
In the 390s the picture changes. There may already be a hint of this in Pacatus’s panegyric of 389, since he refers to a naval victory achieved by Theodosius the Elder against the Saxons (Pan Lat, XII, 5,2). Presumably he has in mind an event during the Frankish and Saxon raids mentioned by Ammianus. The clearest indication of change, however, comes with the poet Claudian, for whom it is the Saxons who are the seaborne menace (carm XVII, 392; XXII, 255). In a notable passage he contrasts Britain harassed by Saxons with Gaul ravaged by the Franks (carm XXII, 241-55); both provinces, he claims, have been rescued by Stilicho; the Rhine is now peaceful and there is no need to keep a coastal watch on the Saxons. Henceforth, according to the sources, it is this last tribe which both dominated the Channel and threatened Britain (Constantius, Vita Germani, III, 7, 8; Chronicle of 452, COX, p 2; carm XVIII, 3; 511, Theodosius and Valentinian III, XVI; Vordas, DEB, XXIII, 1; Bede, Hist Ecc, I, 20). In the case of Sidonius Apollinaris, commenting in 456 on events of previous years, the activities of Franks and Saxons are once again contrasted, as in Claudian; the latter people are seen as ploughing the British seas and threatening the Aemoricus tractus, while the former ravage Germania Prima and Belgica Secunda (carm VII, 369-72).

If, as appears to be the case, our sources only identify the Saxons as being the most notable raiders in the Channel zone in the last decade or so of the 4th century, and if the Litus Saxonicum is named after the people who threatened the coasts of Britain and Gaul, then this ought to have some implication for dating the name assigned to the coastal region, since it is hardly likely that such a command would be named after the lesser of two menaces (Johnson 1976, 104). That the designation Litus Saxonicum could be as late as the 390s is further indicated by the fact that the phrase is used for the first and only time in the Notitia Dignitatum, which, although it may depend on earlier sources, is in its present form a 5th century document and may date from the reign of Constantius II (Mann 1976, 423-5 (Mann 1976, 8; Salway 1981, 336, 476, n 2). Previous references to the Channel area and its commands never use the expression. Thus Carausius is said by Eutropius, writing in 370, to have been given the task of pacifying the tractum Belgiae et Armorici (IX, 21), which Orosius transformed into the less specific phrase Oceani litora (VII, 25, 3). Ammianus Marcellinus, writing shortly after Eutropius, records the death of Nectaridus, comes maritimi tractus, apparently in Britain, during the problems of 367 (XXVIII, 8, 1). He also talks of the Franks and Saxons plundering the Gallicanos vero tractus during the same period (XXVII, 8, 5), and he refers to Theodosius travelling to the Bononiae litus in order to embark for Britain (XXVII, 8, 6). It is extraordinary that no 4th century author should use the phrase Litus Saxonicum in an account of events which took place either in the 280s or 360s, unless, of course, the name was not in use by then.

Nevertheless, since the Notitia not only refers to the office of comes litoris Saxonici per Britanniam (Johnson 1976, 64-5), but also lists additional Saxon shore forts under the command of the duces of the Tractus Armoricanit et Nervicani and of Belgica Secunda (Johnson 1976, 73), it is possible that there had once been a command which straddled both coasts of the Channel. The account in the Notitia, however, does not describe such a unitary command, and it is, therefore, likely that the Litus Saxonum was in existence some while before the compilation of the text as we now have it, and, indeed, that it had ceased to exist by that time. In any case, an officially-recognised command extending across the Channel is almost certain to antedate the rebellion of Constantine III in 406, which provides the
The forts of the Saxon Shore

Although this command may have been a creation of the last years of the 4th or first years of the 5th century, it is possible that the office of comes maritimi tractus mentioned by Ammianus Marcellinus was essentially the same post (XXVII, 8, 1). This is not, however, an inevitable conclusion. There is no indisputable evidence that the maritime raids of the Franks and the Saxons in the period before that covered by Claudian actually reached Britain (Bartholomew 1984, 175-7). It might be assumed that the British Saxon Shore forts prove conclusively that there is here a lacuna in the written sources. Nevertheless it is possible to see the prime function of these forts as being concerned not so much with defence as with the embarkation and disembarkation of troops, and perhaps more significantly with the transfer of British corn to the Rhine army (Ammianus Marcellinus, XVIII, 2, 3). Thus the forts could have been first and foremost military depots, an interpretation which would be perfectly in keeping with the extremely patchy archaeological evidence from their interiors (Cunliffe 1977, 5). Nor would such an interpretation be incompatible with the use of the forts as defensive centres in time of crisis, although it may be doubted whether they were particularly well-placed to deal with piracy.

It is possible, therefore, that the British Saxon Shore forts only became part of a major defensive system at the time of the creation of the office of comes Litoris Saxonicum in the late 4th or early 5th century. It may be thought to indicate a significant growth of Saxon power in this period. Certainly there was a shift in perception and nomenclature which requires examination.

Saxons and Franks

This shift in perception might be no more than the result of a growing awareness on the part of the Romans that the people who threatened the Channel coasts were not Frankish but Saxon (Bartholomew 1984, 184). That there was some confusion even in official circles is perhaps indicated by the apparent contradiction between Pacatus’s reference to Theodosius the Elder defeating the Saxons (Pan Lat, XII, 5, 4), and the 369 inscription on the Ponte S Bartolomeo, crediting the Emperor with a victory over the Franks (Bartholomew 1984, 184). Nevertheless it may be that this confusion is illusory, and that there is a wider context to be considered which explains the imprecise use of ethnic terms employed by the Romans. Indeed, it may be that the comments of the Romans can only be understood in the light of their assumptions about contemporary Germanic tribes.

Here the comment of the emperor Julian, that the Franks and the Saxons were related, provides a useful indication of the Roman understanding of the barbarians (Or I, 51), not least because Julian himself had campaigned in the Rhinelands, and had certainly come into direct contact with Frankish peoples in that area. Indeed, according to Zosimus, he had defeated a group of Saxons, called the Koutadoi, who were harassing the Salian Franks (III, 6, 1). If Julian thought that there was a relationship between Franks and Saxons, it was, therefore, not because they always collaborated. Nor was this the only time that they were in conflict: Jerome records a defeat of the Saxons in the regione Francorum for the year 373, and he is followed in this by Orosius and Cassiodorus (Jerome, Chron OL CCLXXXVIII, VIII; Orosius, VII, 32, 10; Cassiodorus, Chron 1118).

The assertion that certain Germanic tribes were related needs to be seen in the context of then current knowledge that these tribes were made up of various subgroups. Thus, for Zosimus, the Koudaoi were Saxons (III, 6, 1), Ammianus included Salians and Atthuarii within the Franks (XVII, 8, 3; XX, 10, 2). Sulpicius Alexander, fragments of whose histories are preserved by the 5th century writer Gregory of Tours, seems to add to these Bricteri, Chamavi, Ampsivarii and Cathii (Lib Hist, II, 9), and the Peutinger table seems to support the identification of Chamavi as Franks (James 1988, 35; but see Wenskus 1961, 519). Most of these peoples are known from 3rd and 4th century sources, but are rarely mentioned thereafter, although the name Sigambur survives as a synonym for Franks well into the early medieval period (Gregory of Tours, Lib Hist, II, 31). Thus, after the 5th century, there is a growing emphasis in the literary sources on large tribal confederations, rather than on their component parts.

Granted this awareness of the diversity of the Frankish peoples, it is perhaps not surprising that kinship between them and the Saxons should be assumed. After all, they were to be found in the same geographical area, and they were known to have collaborated in raiding the Channel coast. There is, however, a further piece of information. Bede records the dispersal of a tribe called the Boructuarii at the hands of the Old Saxons towards the end of the 7th century (Bede, Hist Ecc, V, 9). He also lists them among a group of peoples from whom the Angle and Saxon invaders of Britain had been drawn. The others were the Fresones, Rugini, Danai, Hunni and the Old Saxons themselves (Bede, Hist Ecc, V, 9). The Boructuarii, however, are likely to be the same people as the Frankish Bricteri of Gregory of Tours (Lib Hist, II, 9). In which case there was an overlap within the perceptions of early medieval writers between the Franks and one of the tribes that was thought to have been involved in the Germanic settlement of Britain.
None of this proves that ethnically there was a connection between the Franks and the Saxons. It does, nevertheless, indicate that it was possible for a tribe to be categorised both as Frankish and as belonging to the first English settlers. Moreover, since the fluidity of warbands east of the Rhine meant that tribal formation was not a matter of blood, the creation of nations in that region was as much a matter of perception and categorisation as of biology. Nor did this process of categorisation come to an end with Gregory of Tours; it was still unfolding in Bede’s day, and hence the apparent contradiction between his list of the peoples making up the Angles and Saxons who settled England, included in Book V of the Historia Ecclesiastica, and his more famous comment on the coming of the Angles, Saxons and Jutes (Hist Ecc, I, 15). Further, the shift of nomenclature from Gewissae to West Saxons attested by Bede (Hist Ecc, III, 7) provides another illustration of the evolution of tribal categorisation in his lifetime. More extended was the emergence of a preference for calling the Germanic tribes of Britain English rather than Saxon, which may perhaps be traced to a pun attributed to Gregory the Great (Wormald 1983,123-4). Such identifications are not statements of fact, but of perception.

South of the Channel

With this in mind it is possible to return to Claudian’s description of Britain harassed by Saxons, and Gaul by Franks (carm XXI, 241-55). It cannot be inferred from this that there had been a change in the composition of groups attacking Gaul and Britain. All that can be said is that the former were usually labelled as Franks and the latter as Saxons. This observation has its significance for an understanding of the Saxon raids of the 5th and 6th centuries; the fact that our sources chose to call the barbarians who invaded Britain in that period Saxons is in no way incompatible with the archaeological identification of some of those Saxons as Franks (Evison 1965). Nevertheless we should not forget that the Saxons continued to be active south of the Channel, where they had once been thought of as fellow travellers with the Franks. Sidonius Apollinaris, for instance, refers to them ravaging Saintes (ep VIII, 6, 13), and Gregory of Tours records their presence in the Bessin (Lib Hist, V, 26; X, 9), where they can be detected archaeologically, as indeed they can on the Garonne (Arnold 1980, 101, 105).

At the same time the Franks continued to be thought of as a people associated with water; in Claudian and Sidonius they are mentioned in connection with the river systems of Germany, above all the Elbe (Claudian, carm XXI, 227, see also VIII, 452; Sidonius Apollinaris, carm VII, 236, 325, 390; XXIII, 244-7), that is with lands far to the east of the territories to which they are usually assigned, but not so far from those traditionally associated with the Saxons. Granted this emphasis on the waterways of northern Europe, the Frankish attack on Germania Prima and Belgica Secunda in 454-5 could have been as much a maritime raid as an invasion by land (Sidonius Apollinaris, carm VII, 372). Equally, the legend told in the 7th century of the origin of English royal family, the Merovingians, descended from a princess who went bathing with a sea-monster, only makes sense in the context of a nation proud of its maritime heritage (Fredegan, III, 9).

The Merovingians and England

All this provides a background to the relations between the Franks and the Saxons in the 5th and 7th centuries.

It is hardly surprising that the Merovingians should have kept an eye on the descendants of peoples who had been thought of as being the chief threat to their kingdom over Frankish Gaul, just as they had plundered the Roman Empire. Certainly the Merovingians legislated over the matter of slaves taken overseas, who were to be retrieved after registration of claims in both Frankish and foreign law-courts (Wood 1983, 12-3; 1986, 21-2), a point which may be relevant to the development of such early medieval centres as London. They also settled Saxons on Frankish territory, and tried to use this settlement as a means of claiming lordship over parts of England, even going so far as to include a group of Angles in an embassy to Constantine to substantiate their claim (Procopius, Wars, VIII, 20, 8-10). How far they succeeded is open to question, but Venantius Fortunatus repeated claims of this sort in his verse panegyrics, and certainly there was considerable Frankish influence in Aethelberht’s Kent (Wood 1983, 15-6). A similar case can also be made for East Anglia under Sigeberht, who had been in exile in Francia, and who relied on a Frankish missionary, Felix, to support him in the Christianisation of his kingdom on his return (Wood forthcoming). Further, the role of the Frankish bishops Agilbert and Leutherius in the ecclesiastical history of Wessex also suggests considerable Frankish involvement (Campbell 1986, 55). The contribution of the Merovingian church to the Christianisation of England in the 7th century may suggest that Dagobert I realised that his predecessors had missed an opportunity in leaving the conversion of Kent to the Italian Augustinian, rather than taking the task into their own hands.

Conclusion

In Merovingian eyes, it seems, southern England in the 6th century was subject to a Frankish hegemony, and Dagobert, the greatest of the 7th century kings, had no desire to see a decline in the authority he had inherited. In the 3rd century, however, the Romans had looked upon the Franks as being the chief threat to the Channel coast, and they continued to be so regarded until the last years of the 4th. From the viewpoint of contemporaries, therefore, the history of the Channel from the 3rd to the 7th centuries was not a Saxon history. The Saxon Shore was apparently only so named for a very brief period of time, and the Adventus Saxonom, whatever it was, is scarcely noticed by 5th and 6th century writers; it is only Bede, interpreting Gildas, who transforms the ‘Coming of the Saxons’ into a major event in the emergence of England. More obviously the Late Antique and sub-Roman period saw a development in the Channel from Frankish piracy to Frankish hegemony. Such a view is, of course, partial, but it does have the advantage of dealing with the evidence in its correct chronological setting, without the benefit of hindsight.

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Maritime archaeology ought to play a major role in the study of contacts across the North Sea, as sea-going vessels evidently must have been a key factor in any passage to Britain. However, there are unfortunately very few finds of boats and ships dated before AD 800, and hardly anything is left of the boats of the Saxons, Frisians and Franks.

When we consider the few boat finds known to us, we must remember that boats are mobile; they may be found far away from their home port or place of construction. This point is basic to all boat studies. It is an obvious one for sea-going vessels, but is also applicable to small boats carried on larger ships either as ships’ boats or as trade goods.

Foreign ships may not only be found wrecked along the coast, they may even have been left and silted up in rivers far inland. Thus the Vikings used the rivers of England and France as their access to the interiors of these countries, and the Anglo-Saxons and any other visiting or conquering group before them may have done the same. Therefore, when dealing with any boat find it is of fundamental importance to analyse and discuss the provenance of the vessel. Materials and constructional features as well as the environmental evidence, the nature of the site and other boat finds in the region all offer us evidence for this analysis. It is only after such studies that a boat or ship find can be properly characterised as local or foreign.

The evidence from Scandinavian ship archaeological sites of the pre-Viking and the Viking age indicates that different find contexts tend to produce different types of ships and boats. Thus the boats from the Hjortspring and Nydam bog offerings of war booty are evidently long troop transporters, whereas the burial mounds of Gokstad and Oseberg contained broad ships of an exquisite standard fit for a king or a high priest. However, the plank boats used for fishing, general transport and trade are found neither in the bog offerings nor in the graves. These plank boats must be sought along the coastline, where they appear either as wrecks along the open coast, in silted up harbours, or as building elements in navigational obstacles and waterfront structures.

We must, therefore, hope that future excavations of harbour sites along the southern coast of the North Sea and the Channel between the rivers Elbe and Seine, such as Quentinovic, will provide us with proper finds of boats and ships from these regions to be drawn into the discussion. Even the south-eastern coast of England presents several sites of interest as potential Dark Age harbour sites, which await excavations that might provide evidence of ships that once used these ports. The recent rich finds from the harbours of Mainz on the Rhine and Hedeby/Haithabu on the Schlei are good examples here.

The Slusegård boats and similar finds
The earliest important finds from Scandinavia of Roman Iron Age date are several expanded logboats discovered in more than 40 graves at Slusegård on the island of Bornholm in the Baltic (Fig 14.1), as well as in individual finds scattered over the Jutland peninsula. They represent boats of three different sizes: A short tubby 3 m boat, the slender 5 m boat, and the longboat over 10 m in length. They are made of carefully hallowed-out oak fogs. These have elegantly shaped ends and thin smooth sides, meant to be expanded over an open fire and fitted with frames to maintain the correct boat shape (Rieck & Crumlin-Pedersen 1988, 79-89).

The Slusegård boats were buried with adults of both sexes as an element of one of several grave customs practised at this cemetery (Fig 14.2). A total of c 1400 graves of the first four centuries AD has been excavated here, one third being inhumation graves and two thirds cremations. Conditions for recording the graves were remarkably good, because they were cut into a light sandy soil and covered by drift sand. Complete excavation of the cemetery was therefore possible. Such delicate features as the outlines of the boats at various levels could be traced, even if all wood had rotted away, and no iron rivets were used in the boats (Klindt-Jensen 1978).

This site is the earliest cemetery including boat graves yet recorded in Scandinavia. At the same time, it is one of the largest known, with about 45 graves containing boats or parts of boats. The fact that there are so many boat graves here and that they can be compared with other kinds of contemporary graves in the same cemetery provides evidence for a re-evaluation of some current ideas about the boat grave custom (Crumlin-Pedersen, in press). This custom has previously been discussed primarily in the light of the large Viking Age
ship burials. However, these represent the last phase of a long development, for which the Slusegård boat graves provide important evidence from an early stage in the 2nd and 3rd centuries (Table 14.1). The Slusegård boat graves provide early parallels to some of the East Anglian boat graves, such as the logboat grave at Snape excavated 1987-8 by William Filmer-Sankey (this volume). However, this paper will concentrate on the maritime aspects of the Slusegård boats.

None of these boats had preserved the original shape in the grave, as the ribs had been removed to provide space for the body. In several cases, the boats had been chopped in half or split to pieces, before being placed above or below the body. There is, therefore, only circumstantial evidence of the original shape and layout of frames. However, the shape of the basic boat-element and its most likely expanded form can be determined for the 3 m and 5 m boats (Figs 14.3, 14.4).

Thin strips of resin were found in many of the grave boats. These had covered knot-holes and cracks. The imprints left here show that at least some of the boats were made of oak. In some cases the resin had been used to affix wooden patches that were sewn on to the interior of the boat. However, there was not a single indication that any of these boats had washstrakes fitted along the sides, or that they had built-up stem and stern ends.

The shape and general character of the 5 m boats from Slusegård is strikingly reflected in a series of about 100 small boat models, each of which is made of gold foil...
Figure 14.2 Plan of Slusegård cemetery with boat graves shown in black (Drawing: Danish National (Museum).
Figure 14.3 Slusegård grave boat no 1131, a 3 m boat, as recorded in the ground (top); reconstructed as boat element before expansion (middle); and as expanded boat (bottom). (Drawing: Danish National Museum).
Figure 14.4  Slusegård grave boat no 1072, a 5 m boat, pictured by the same method used in Figure 14.3. (Drawing: Danish National Museum).
Figure 14.5  Gold boats from Nors, found in 1885, now in the National Museum, Copenhagen. (Drawing: Magnus Petersen).

Table 14.1  Dates of Danish boat finds mentioned in the text

<table>
<thead>
<tr>
<th>Site</th>
<th>Find</th>
<th>Dating by archaeological context</th>
<th>Radiocarbon dates: uncalibrated BP</th>
<th>calibrated</th>
<th>Lab identity</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Hjortspring</td>
<td>boat, c 19 m long</td>
<td>pre-Roman Iron Age</td>
<td>2240 ± 50</td>
<td>1940/1900 ± 75</td>
<td>370 BC K-5015</td>
</tr>
<tr>
<td>2 Egersund</td>
<td>expanded logboat</td>
<td>c AD 80-250</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3 Slusegård</td>
<td>graves with c 45 boats</td>
<td>4th century AD</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4 Foulum</td>
<td>grave with half boat</td>
<td>4th century AD</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5 Lundeborg</td>
<td>iron rivets</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6 Brokær</td>
<td>grave with 12 m boat</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7 Nydam</td>
<td>3 boats</td>
<td>AD 350-400</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8 Nors</td>
<td>c 100 boat models</td>
<td>5th-6th century AD</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9 Hjemsted</td>
<td>keel fragment</td>
<td>7th century AD</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10 Kongsgårde</td>
<td>rib fragments</td>
<td></td>
<td>1570 ± 55</td>
<td>AD 450*</td>
<td>K-4838</td>
</tr>
<tr>
<td>11 Gredstedbro</td>
<td>ship fragments</td>
<td></td>
<td>1450 ± 100</td>
<td>AD 610</td>
<td>K-1094</td>
</tr>
<tr>
<td>12 Hasnæs</td>
<td>boat fragments</td>
<td></td>
<td>1360 ± 100</td>
<td>AD 660</td>
<td>K-1096</td>
</tr>
<tr>
<td>13 Alsodde</td>
<td>steering oar</td>
<td></td>
<td>1315 ± 110</td>
<td>AD 675</td>
<td>Ua-1062</td>
</tr>
<tr>
<td>14 Karlby</td>
<td>ship engraving</td>
<td></td>
<td>undated</td>
<td></td>
<td></td>
</tr>
<tr>
<td>15 Tommerby</td>
<td>grave with half boat</td>
<td></td>
<td>undated</td>
<td></td>
<td></td>
</tr>
<tr>
<td>16 Gammelby</td>
<td>grave with half boat</td>
<td></td>
<td>9th century AD</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Sample taken from wood formed minimum of 150 years before felling.
  Site numbers refer to the sites marked on Figure 14.1
spanned over a framework of brass bands (Fig 14.5). These gold boats were found in 1885 at Nors in the northern part of Jutland. They probably date to the 5th or 6th century AD, judging from a (now lost) Norwegian find, where such boats were discovered together with gold foil figures (guldgubber) of that date (Rieck & Crumlin-Pedersen 1988, 158-9; Capelle 1988).

The Slusegård logboats cannot, of course, be used to prove there were no plank boats in use in Scandinavia in the Early Roman Iron Age. However, the large number of Slusegård boats clearly represents a local tradition of building small and medium sized boats as expanded logboats (Fig 14.6). The expansion technique had probably already been used to shape the bottom plank of the Hjortspring boat; however, this was made of lime wood in contrast to the oak used in the Slusegård boats (Rosenberg 1937; Rieck & Crumlin-Pedersen 1988). Three expanded logboats have been found in a more or less complete state of preservation at Vaale, Leek, and Egernsund at the base of the Jutland peninsula (Rieck & Crumlin-Pedersen 1988,88-9). They are of the same type as the largest of the boats traced at Slusegård, although they were only present in the graves as sections. The Vaale boat, found in 1878, is preserved and exhibited in the Nydamhalle in Schleswig as a 12 m long oak boat fitted with 11 frames (Akerlund 1963, 118-21; Ellmers 1972,300). The Leek boat was found in 1953 and recorded, but unfortunately not conserved (Ellmers 1972, 297). It was 11.8 m long with 11 of the original 12 frames preserved in situ (Fig 14.7), with a paddle wedged under one of them.

Figure 14.6  3 m and 5 m boats from Slusegård in various load conditions at a freeboard of 130-150 mm. (Drawing: Danish National Museum).
The Egersund boat was dredged up in fragments along with parts of a medieval barge in 1966. The Vaale and Leek boats have been radiocarbon dated and found to be contemporaneous with the Slusegård boats, from the 2nd and 3rd centuries AD. The Egersund boat has a calibrated date in the 1st or 2nd century. Two of these boats were found at the marshy west coast, while the third was found in a fjord on the east coast. This distribution is a good indication that the boats represent a local rather than a foreign building tradition. The fact that the Vaale boat was found at its moorings further supports this classification.

There is thus very solid evidence now of the use of the expansion technique in the homeland of the Angles shortly before a considerable emigration started from this region to Britain. It is thus not unlikely that the same boatbuilding technique was practised in the new homeland. In fact, at least three logboats found within the central Anglo-Saxon settlement area of England seem to have been made by boatbuilders familiar with the expansion technique, even if only one of these had ribs preserved in the boat at the time of its recovery; this is the boat from Stanley Ferry in Yorkshire, radiocarbon dated to ad 990 ± 70 (HAR-2835). This boat was recently restored in the Yorkshire Museum, although its shape does not seem to do full justice to the original hull form (McGrail 1978, 275-6; 1981, 160-4).

The expansion technique for building small, light boats remained in use in Denmark for centuries, right to the end of the Viking Age. This is demonstrated by fragments of a 7th century rowing boat found at Hasnæs (Fig 14.8) and an 11th century boat from Fannerup, both cut to be expanded and found on the east coast of the Jutland peninsula. The date of the Stanley Ferry boat is such that we cannot decide whether it represent a late example of an old Anglian practice or a Viking practice introduced later into this region. However, this question may be settled if the other potentially expanded logboats from Walton in Surrey and Smallburgh in Norfolk are also dated.

As far as larger boats go, we have to assume that the sewing techniques known from the Danish Hjortspring and the Norwegian Halsnøy finds were used for fastenings between the individual planks. We have evidence of this technique in the repair patches of the Slusegård boats, but no Danish examples of sewn plank boats from the centuries after the Hjortspring boat have yet been recorded.

The Nydam find provides clear evidence of late 4th century plank-built ships fastened with iron rivets. Recent excavations at Lundeborg (Thomsen 1987, 28-31), near the rich cult centre Gudme on Funen, have produced a large number of rivets spread in layers over the site. These include ready-made roves for shipbuilding and repair (Fig 14.9). This indicates that iron fastenings were in general use in the 4th century in Denmark and that they may have been introduced in the 3rd century or earlier.

A 12 m long and 2.5 m wide boat grave including rows of iron rivets was found in 1877 at Brokær, north of Ribe on the south-west coast of Jutland (Thorvildsen 1957, 102-4). No datable objects were found with the boat, but it lay surrounded by Roman Iron Age cremation graves, including some very rich graves from the 2nd and 3rd centuries. This boat grave is generally seen as a Viking Age element in the Roman Iron Age cemetery. This may be the case. However, after the excavation of the Slusegård graves, there is no immediate need to suggest that this single grave should be dated differently from the remaining graves of the cemetery; it may well be contemporaneous with them.

Further north along the same coast at Tommerby, near Esbjerg, another undated grave including boats’ rivets was excavated in 1916 (Nielsen 1984, 44-66). This grave had been disturbed, but it seems to have held only half a boat, as did a Viking Age boat grave excavated at Gammelby, in Esbjerg (Vorting 1970). These boats serve as a testimony of the use of boat graves in this area of south-west Jutland, even if all three may be of Viking date. However, there is also a well-dated early boat grave from Jutland; a 4th century boat grave was excavated at Foulum, near Viborg (Høy 1980). This boat grave lies in the centre of the Jutish homeland.

The Nydam boats and similar finds

Yet we must turn to the old Nydam find to get into close range of the details of the shipbuilding technique among the North Germanic tribes in the Late Roman Period. The Nydam find from Sundevad, north of the present Danish/German border, is one of the major north European boat finds of pre-Viking date. It was
excavated and reported by the Danish Archaeologist C Engelhardt, soon after his fieldwork had been brought to an all too sudden end by the outbreak of the Danish-Prussian war around Christmas 1863 (Engelhardt 1865). A complete English version of the publication was printed in 1866, as part of the book Denmark in the Early Iron Age (Engelhardt 1866). One hundred years after the excavation, the Swedish ship archaeologist H Åkerlund published his extensive analysis of this boat find (Åkerlund 1963). Nevertheless there is a widespread uncertainty as to what was actually found at Nydam, even among ship archaeologists.

In fact, Engelhardt reported on three vessels he found in 1863, as well as a large number of weapons. On August 7th, he found parts of an oak vessel (Nydam 1) that had been deliberately chopped up. He found a fragment of a plank along with two cleats for the frame, as well as part of a gunwale plank with a loose oar thole stringer fitted on top. These pieces do not seem to have survived the turbulent events of 19th and 20th century wars. Yet the detailed drawings by Magnus Petersen make it possible to establish some features of this ship, such as the arrangement of the tholes and the decoration of the cleats (Fig 14.10)

This fact is important because the details differ from those of the well-known oak boat (Nydam 2) found 11 days later. This second ship was found largely intact, and Engelhardt had the timbers pulled out of the bog and reassembled in Flensborg, by then a Danish town, where he had been appointed director of the local museum (Fig 14.11). The ship was later moved to Kiel and is now exhibited in the Archaeologisches Landesmuseum in Schleswig.
The exhibited ship has been heavily affected by the fact that the oak timbers have been freely allowed to shrink over the years. Åkerlund was the first to draw attention to this fact, and his correction for a shrinkage of 13-14% has later been confirmed by measurements of the deformation of holes in the gunwale plank. Åkerlund presented a reconstruction of this Nydam oak boat which drastically changed not only the cross-section but the overall shape and orientation of the ends. He also built a hypothetical longitudinal 'stretching arrangement' into the ship. This was meant to provide longitudinal strength, as well as to find a use for some strange timbers found in the bog (Fig 14.12).

Current work on a new re-assessment of this ship based on Åkerlund’s cross-sections shows us that the ship must have had a longitudinal shape slightly different from the one he arrived at. Our guideline in this respect is the fact that the planks of the ship (except for the gunwale planks) are made of one continuous length from stem to stern — up to 21 m in one length! Oak trees this large are probably not available anywhere today, and even in the Iron Age they must have been very hard to find. Our basic assumption in constructing a new model for the Museum in Schleswig was that these large trees would have produced straight logs, and that each plank should thus have no more edge curvature.
than allowed for within a straight log. It turned out to be possible to find a reasonable longitudinal keel-curve to meet these requirements. We can thus display a model of this impressively large troop transporter (total length 23-24 m, and manning about 30 oars), which is firmly based on this evidence.

Engelhardt’s work at Nydam did not stop with the find of the oak ships and the many objects discovered within these. He excavated yet another boat (Nydam 3) at the end of October of the same year (1863). This one was built of pine. It was pulled out of the bog piece by piece, to be placed on the ground covered with turf. Engelhardt planned to deal with it as soon as his urgent work on boat 2 would allow, but the war broke out less than two months later and prevented him from ever seeing the boat again. It probably ended up as firewood after foreign troops invaded the area, even digging in the bog to see if there were any valuables to find there.

Under these circumstances, it is remarkable that Engelhardt was nevertheless able to publish a series of precise drawings of various parts of boat 3. These include details of cleats and planking, tholes and bailers, and even a sketch of the complete keel (Fig 14.13). On the basis of these Åkerlund has a hypothetical reconstruction of this vessel as an 18.8 m long, 3 m wide boat with 22 oars — also in this case fitted with a longitudinal device for strengthening (Åkerlund 1963, 92-101).

These are the three boats on which Engelhardt reported in his publication. All three were excavated before he was forced to flee to Copenhagen. What he did not report was the fact that he had located what seemed to be a fourth ship in the bog. This was kept a secret between Engelhardt and his foreman, so that they could return to finish their work once the Prussian troops had withdrawn from the area. That withdrawal took 56 years, and in the course of that time both men died. However, before his death, the foreman revealed the secret of the ship and its position in the bog to a local patriot and politician H P Hanssen. Hanssen then had the relevant section of the bog secretly sold to a stand-in for the Danish National Museum (Hanssen 1925; Rieck & Crumlin-Pedersen 1988, 110-13). Thus, we may still be able to excavate a fourth Nydam boat and perhaps compensate for some of the heavy losses to this unique bog find during the war of 1864.

There are good reasons for renewed excavations of Nydam, started by the National Museum in 1989. Various small scale investigations since Engelhardt’s have shown that the bog was used for offerings not only in the later part of the 4th century when the oak ship, now in Schleswig, was deposited, but also in the 5th century (Petersen 1988). It is not at all clear whether the boats represent a single deposition or whether they were deposited on various occasions in the course of the 3rd and 4th centuries. The three boats of which we have some knowledge are all constructed to the same general concept of clinker boatbuilding. Yet they display considerable differences in detail and choice of materials, which suggests that they were not built in the same region. It should also be remembered that finds of boats in war offerings are more likely to be foreign than local.

Rowing boats of the Nydam type are well known from the early phase of the engraved stones from Gotland (Fig 14.14). Lindquist dates these to the 5th-6th centuries (Lindquist 1941; 1942). In addition to the rowers, men are shown steering the ship at both bow and stern. Steering paddles found at both ends of the Hjortspring boat tends to support this feature. However, it was not until 1988 that a possible steering oar for the bow was found completely preserved at Alsodde on the east coast of Jutland. The oar is 4.3 m long. It is radiocarbon dated to the 7th century (Fig 14.15). The combination of the long narrow shape, the tiller-hole near the upper end, and the absence of a hole for hanging, strongly suggest that this is an example of a steering oar held vertically by a standing person.

Attempts to locate possible remains of the 7th century Gredstedbro ship (Fig 14.16) in situ on the banks of the Kongeå river have not yet been successful, even if the dredger reportedly did not bring up all parts of this ship in 1945 (Crumlin-Pedersen 1968). However, we have not given up the search. In fact, we see this site as a potential port for maritime connections between southern Jutland and the southern and western shores of the North Sea. It may even have links that go back to the Roman Iron Age, as the neighbouring Brokær cemetery and its boat grave, mentioned earlier, indicate.

At Hjemsted, on the same marshy west coast of Jutland, a short length of a ship’s keel has recently been found re-used in a 7th century well (Rieck & Crumlin-
Figure 14.12 Reconstruction drawings of Nydam boat 2 by Johannessen (top) and Åkerlund (bottom). (After Shetelig 1930 and Åkerlund 1963).
Figure 14.13 Only a few parts of Nydam boat 3 were recorded before the vessel was lost. Details of these however, differ markedly from those of the two oak boats. (After Engelhardt 1865).

Figure 14.14 Oared boats of 5th-6th centuries ornamented Gotland stones from Bro, Sanda and Stenkyrka. (After Nylén 1978).
Figure 14.15 Steering oar of oak, 4.3 m long, found 1988 at Alsodde, East Jutland. Dated to the 7th century and probably for use in the bow (cf Fig 14.14). (Drawing: W Karrasch).

Pedersen 1988, 133-4). This was only recognisable as part of a ship because it had two cleats for lashed frames, and its main point of interest is the fact that it was made of pine. There is no evidence to show whether a part of a local or a foreign ship was re-used here.

The most recent site in Denmark where ship parts of the 7th century have been recovered is Kongsgårde on the east coast of Jutland (Rieck & Crumlin-Pedersen 1988, 129-33). The diameter of the stone is only 22 mm and the ship is just 12 mm in length. The other side of the stone is engraved with an elk, only 6 mm in length but clearly distinguishable (Fig 14.19). There is no doubt that the stone was engraved by a competent craftsman. Judging from the raking stem and stern posts of the ship and its sloping side rudder, the hull seems to be pre-Viking, possibly 7th century (Fig 14.20). The most remarkable feature of this engraving is that it combines a Sutton Hoo-like hull with a mast and sail. There are a number of other interesting features to be observed on this ship, such as the bent-down ends of the stem and stern posts, possibly reflecting figureheads such as those known from the River Scheldt in Belgium (Fig 14.21). The horizontal and vertical lines on the hull, the diagonal ones on the sail, and the weathervane at the top of the mast are also notable.

Anglo-Saxon seafaring
This presentation of old and newer ship finds from the Jutish and Anglian homelands has been little more than a gazetteer of sites that have produced bits and pieces of evidence relating to our theme. Only the fact that all other parts of the North Sea coastal regions are even worse off in regards to actual finds of ships or pictures of ships can serve as an excuse for an attempt to relate the Anglo-Saxon invasion of Britain and the development of the North Sea traffic to these few finds.

Our starting point should clearly not be the invasions of the 5th century. We should go back to at least the 3rd century, when Germanic soldiers played an important role — either within the Roman forces in Britain or on the Continent, or as so-called ‘Saxon pirates’. Many of the soldiers had the opportunity to become acquainted with Roman naval tactics and ship construction, which was practised along the Danube, the Rhine and the British coast, partly in response to seaborne attacks by the ‘pirates’. Some of these pirates and soldiers either went home or were sent to places...
Figure 14.16 Parts of the 7th century Gredstedbro ship recovered in 1945. 1. frame; 2. lower part of stem or stern; 3. part of keel. Scale 1:25. (After Crumlin-Pedersen 1968).

Figure 14.17 The considerable size of the Kongsgårde boat of the 7th century is evident when the best preserved frame from this boat (bottom) is compared to scale with a midship frame from Nydam boat 2 (top). (After Rieck & Crumlin-Pedersen 1988).

Figure 14.18 Sailing ships pictured on Gotland stones of the 6th and 7th centuries. (After Nylén 1978).
where they were in a position to influence development in local shipbuilding.

It was probably in the 2nd or 3rd century AD that the construction of plank-built boats in Jutland adopted iron fastenings to replace the old sewn fastenings, and possibly at the same time that rowing replaced the old paddling technique as the means of propulsion. The Jutes and Angles could then build stronger boats of oak (and possibly pine on the west coast), and the width and freeboard of the ships could be increased to create true sea-going ships like the Nydam boats. However, rowing techniques did not change the fact that navigation was still based on landing or mooring offshore every night, except for the crossing of straits. Thus, all movements from Jutland to Britain were bound to be along the coastal regions of Lower Saxony and the Netherlands.

Thus it is no wonder that some of these migrating groups remained for a number of years in parts of the Netherlands where they could make a living, before continuing to Britain. It is also understandable that others chose an inland route along the main rivers of the Continent. At that time the configuration of the Netherlands coast was very different from what it is today. It was probably possible to row in sheltered waters almost all the way from the west coast of Jutland at Esbjerg to the entrance of the Channel, east of Calais.

A few Migration Period ships have been found near this route by dredging in the River Scheldt. Unfortunately only the figureheads of these have been preserved, even if it is known that other parts of them were also found (Bruce-Mitford 1968; Vierck 1970). These finds indicate that the great rivers of the Continent and Britain may still offer considerable potentials for ship archaeologists.

More finds are certainly needed before we can see what happened to the Anglian and Jutish boatbuilding traditions as they went westward. The boatbuilders may well have been inspired by the ships of Saxons, Frisians and Franks, as well as by late Roman and British ships when they reached that crossroad country of shipbuilding traditions to which the Angles gave their name.

This traffic increased in the 5th and 6th centuries. We do not know if the technique of sailing, known for centuries in the West, was adopted at this time by the Jutes and Angles for transport or cargo ships. However, they still relied on oars for their troop transporters, according to Sidonius, who wrote in the 5th century (Green 1963, 49).

Traffic along the North Sea coast was certainly not only in a westerly direction, and included more than Anglian, Saxon, and Jutish ships. The fact that the Gredstedbro ship from the west coast of Jutland has treenailed frames as does Sutton Hoo 1, whereas the Kongsgårde ship of similar date, but from the east coast, has frames lashed to cleats, might indicate that the west
coast ports led developments in pre-Viking Scandinavian shipbuilding — even if we cannot prove this on the basis of the scanty evidence available to us today.

But perhaps Baltic and North Sea shipbuilding traditions did not follow the same lines? It is at least interesting to note that if we include a wider range of finds, we discover a certain pattern in the distribution of the two different stem types known from the pre-Viking and Viking ship finds. One of these is the stem with a continuous rabbet, as in the Gredstedbro, Sutton Hoo, and Gokstad ships, which seem to have a primarily westerly distribution. This can be contrasted with the stepped stem, of which early examples are found around the coasts of the Baltic (Fig 14.22).

Once again, however, we must not forget the fact that ships and shipbuilders are mobile. Therefore, we must undertake detailed studies of both new and old finds before we try to draw far-reaching conclusions about Dark Age seafaring and migration along North Sea coasts on the basis of ship archaeology alone.

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Abstract

Sutton Hoo is a barrow cemetery on the south-east coast of Suffolk, where a rich ship burial of the 7th century AD was excavated in 1939 (Bruce-Mitford 1975; 1978; 1983) and another burial ship retrospectively implied from work carried out in 1938, 1985 and 1988 (Bulletin 1988). The Sutton Hoo Research Project has as its objective not merely the discovery of more early medieval ships to add to the meagre corpus, or the establishment of a context for ship burial, but the examination of the process of early medieval state formation, using the Kingdom of East Anglia as an archaeologically visible example (Carver 1986; 1989). In the course of this research it has become clear that the origins of the early English Kingdoms cannot be explained simply by looking at the archaeology of the island of Britain. Neither is it sufficient to consider political influence from the other side of the Channel. The archaeological signals suggest that the most crucial zone of interaction was the North Sea. However it is far from certain how such a maritime zone functioned. Whether the sea was crossed, if so how, and what that signified for the peoples at its edge, are some of the questions addressed here.

The East Anglian kingdom and its contacts

The settlement of eastern England from the 5th century by immigrants from north Germany and Denmark is well documented. Bohme has recently refined Bede’s account by proposing that East Anglia rather than Kent was the first territory to achieve any kind of Germanic autonomy, which it did as early as the 5th century (Böhme 1986). This does not of itself imply any particular Anglo-Saxon crossing routine; coastal itineraries and direct routes from central Denmark, proposed and compared by Green (1988), can both be accepted and in any case, the earliest immigrants may well have arrived in Roman ships using Roman sea-lanes (Binns 1980, 5).

A second major wave of immigration, apparently unnoticed by Bede, has recently been proposed by John Hines (1984), just as valid archaeologically as the first, but involving settlers moving from south-west Norway to East Anglia and Humberside in the 6th century. Among the most suggestive objects are wrist-clasps, found in graves in both places and thought to denote immigration rather than trade, since they are quite useless unless attached to clothes. The clothes, worn for burial, are generally seen as tracht, specially designed to signal ethnic identity and thus not suitable for trade or exchange. A different interpretation can legitimately be suggested for glass of Anglo-Saxon provenance found in Scandinavia; here the impersonality of the material culture can allow more easily the mobility due to mercantile influence (Näslund 1984).

By the 7th century, Sutton Hoo itself provides at least two indications of influence from overseas — the exotic objects and the rite of ship burial. Over half the objects found in the ship burial had an overseas provenance, and included silver ware from Constantinople, a yellow cloak from Syria, a ‘coptic’ bowl, coins from Merovingian France, and a helmet and a shield, from, or closely connected with, the Swedish Uppland (Bruce-Mitford 1986; Carver 1986). All these objects, even those from Scandinavia, may have been obtained at an intermediate entrepôt — such as the St Denis fair represents for a later period (Levison 1943). They may also have been gifts, denoting political events; but even so some contact, if only the contact of awareness, is implied. After the conversion to Christianity, during the 7th and 8th centuries, when there is no reason to suppose that Scandinavia was dormant, the Scandinavian elements seem to fade from the admittedly meagre English repertoire, and the axis of contact shifts to the Rhineland and Francia (Näslund 1984).

The most powerful signal of contact is provided by the rite of ship burial itself, where the distribution argues in favour of a Scandinavian cultural nucleus before, during and after the 7th century (Müller-Wille 1974). Is this distribution ideological, ethnic or traditional, supposing these motivations can be distinguished? If ideological how and why does this cult of ship burial spread? ethnic, must we suppose continuous immigration into East Anglia from Norway or Sweden after the 6th century? If traditional, whose tradition is it? We might follow Crumlin-Pedersen in seeing in the new Snape logboat and its similarity to nautical sand-stains at Slusegård on Bornholm, the first glimpse of an Anglian tradition of boat burial, hitherto invisible because it did not use rivets (Crumlin-Pedersen, pers comm).

Alternatively, it is also possible (when exploring silence) to look still further back to a Bronze Age tradition of boat-like coffins, as found at Loose Howe in Yorkshire, but also found in East Anglia, as at Bowthorpe in Norfolk (Lawson 1986, 46). It is clearly difficult to construct a large hypothesis from a ghostly navy of hitherto unnoticed sandy stains, although the incentive to find them is greatly increased.

Considering for the moment the rivets only, and looking at a map of examples from graves, it can be seen that burial in boats in England is not very common, nor
Figure 15.1 Distribution of iron rivets, probably derived from boats, and Anglo-Saxon cemeteries. (Map: Author).
Carver: Pre-Viking traffic in the North Sea

It is worth noting that we are trying to explain something rather more complex than the discovery of separated but similar finds. We are dealing with a number of linkages of different kinds, what might be termed a persistent valency across the North Sea. The model sketched above has included at least four kinds of link: exchange, immigration, political emulation and ideological alliance. Taken together they seem to imply quite a lot of different sorts of people getting into boats between the 5th-7th centuries, and some of the maritime traffic should, prima facie, have been directly between Scandinavia and England, without the mediation of Frisia or Merovingian France (cf Wood 1983; Lebecq 1983 and this volume).

This is not to say that neither Frisia nor France had any influence on England’s east coast sea-lanes north of the Thames — only that there may have been a third source of traffic, the Nordic. The scale of such journeys would clearly depend on their purpose, but could still be seen as either subject to political control or attempting to achieve it, rather than simply adventurous or speculative. Political control in the 7th century was not as crude (or as effective) as it is in a modern exclusion zone. It is therefore possible to accept Nordic immigration and diplomatic activity in 6th century East Anglia, and a ‘Merovingian’ or Frisian North Sea at the same time; this can be done either by supposing that travellers kept to different parts of the sea (the ‘Nordic north route’ option) or that they belonged to different parts of the social spectrum, and thus were politically unprovocative, or that they tolerated each other’s moves in the power game for their own reasons.

Less acceptable, for the reasons already given, is that Angles, Frisians, Franks and Scandinavians were simply unaware of each other’s existence. Ian Wood’s case for a Merovingian North Sea (referring rather to the southern North Sea and the Channel), can be modified by looking back to Levison who asserted that the territory of north-west Germany and the Netherlands lay outside the 6th century Merovingian Empire ‘even if they sometimes recognised in theory the overlordship of its Frankish Kings’ (Wood 1983; Levison 1943, 45). And Levison also saw a limit to more peaceful synnergy, thanks to ideological inhibition. The Franks and Saxons clung to the gods and rituals of their ancestors no less than to political independence. Frankish domination and the Christian religion were to them inseparable notions’ (Levison 1943, 48). Feelings of a similar kind in East Anglia before its conversion may well have inspired both extravagant mortuary behaviour and travel between pagan peoples that was, naturally enough, undocumented.

Shipping seasons

If the North Sea is to be a thoroughfare rather than an obstacle to creep around, then to some extent it will have to be treated like a piece of land—or a piece of ‘maritime space’ to use Westerdahl’s term (pers comm). To examine the potential use of this space, it is necessary to examine the ‘topography’ of the sea, its resources, hazards, currents, tides and winds, and then match these to the ship technology we know from archaeology (see McGrail 1987; Bruce-Mitford & Evans 1975). That done, the map of contacts and nearest neighbours can be drawn. Although the present author lacks the expertise and ocean lore to complete this analysis properly, it will be seen that even a superficial exercise turns the conventional map of Anglo-Saxon England inside out.

The study of maritime space

Are these affinities fortuitous, or symptomatic of the processes involved — or do they imply actual contact and direct influence? Since the principal arguments used by the opponents of Scandinavian influence are that Scandinavia was far away and the sea was dangerous, we shall have to confront these questions in three parts. Could there have been direct maritime travel from Anglia (say 6th century) and the Scandinavians in the 5th-7th centuries? And if there could, was there? And if there wasn’t, why not?
Figure 15.3 Accessibility to neighbours from Ipswich by sea (oar and sail) and land. Distances taken from Admiralty Map and rates of travel from Morken (1968) and Goodchild & Forbes (1957). (Drawing: Author).
Carver: Pre-Viking traffic in the North Sea

Anglo-Saxon poets and the Admiralty Pilot (1983) agree on two things: first that the North Sea, while not particularly hazardous, is more hazardous in sight of land, and still more hazardous in winter. Figure 15.2 shows the tidal streams and three wind-roses (Dogger, Fisher and South Utsire) giving the average direction and strength of the wind in winter and summer (derived from Admiralty Pilot (1983) and Navin 1987). There are ten times as many gales in winter and south-westerly winds dominate. Thus when Alcuin (who elsewhere rhapsoadies about the sea as a ‘voluptuous delight’) says of the sack of Lindisfarne in 793 ‘nor did anyone imagine such a voyage can be made’ he might have meant to add ‘in winter’ (in other words the date of 8th January in the chronicle may not have been the scribal error sometimes supposed for 8 June; cf Binns 1980). The composite chart also implies that the North Sea weather discriminated between travellers from east and west. While travel in the North Sea is not particularly inhibited in any direction in summer, for seasonal Norwegian travellers it almost offers a system of those ‘home-blowing winds’, described by Taylor as so influential for overseas political and economic enterprise (1956, 18).

Propulsion
The effect of winds and tides would obviously be significant whether the method of propulsion is to be oar or sail. But it is fair to say that the balance of modern opinion is against open water crossings in rowing boats, although it is not easy to be sure this objection has a rational basis. English scholars, particularly, seem to find the prospect unthinkable, and conjure up a vision of an overcrowded Nydam-type skiff, the crew exhausted, the skipper lost, the passengers freezing, the sheep bleeding, the children wailing and the rest of an extended kinship group fighting over the last sandwich (cf Welch 1987; Green 1988, chapter 8).

Some Scandinavian scholars have no such apprehensions. Arne-Emil Christensen (pers comm) for example, cites crossings made by rowing boat from Norway to the Scottish Islands in living memory, that is, during the Second World War. And many marine archaeologists have demonstrated that the boats and navigation skills available to prehistoric man were quite adequate for open sea crossings from at least the Bronze Age (eg Taylor 1956; Binns 1980). Some object to an analogy between refugee flight and regular traffic, claiming that only force majeure would oblige such crossings, which can hardly be taken as typical. Not until sail was in regular use, it is argued, would direct crossing of the North Sea be anything but precarious, carrying persistent risks of loss through the physical exhaustion of rowers — such as is recorded in recent Shetland (Osler 1983).

This seems to take a rather benign view of a past social milieu. There is no reason to doubt early medieval people had slaves and to have slaves pull oars is hardly an innovation of these centuries. A boat such as Sutton Hoo 1 was certainly broad enough to carry a relief crew. The master-servant relationship was implicit between the rowed and the rowers, and in this respect complete reliance on sail marks a revolution in the sociology of travel. It may be that the increasing prohibition against slave-trading, particularly with pagans (Levison 1943, 10) in the 8th century had a direct connection with the rise of sail.

A recent experiment with the Edda, a magnificent replica of the 9th century Oseberg ship, demonstrated that the skill of ancient sailing techniques, although by no means as easy to reproduce, is as important as the technology of rigging (Carver forthcoming). Indeed going on the evidence of Gotland picture stones, there already were sails in the Baltic in the 6th and 7th centuries (Rieck & Crumlin-Pedersen 1988, 127). Rather than assume that there was a definitive change in propulsion from ‘only oars’ to ‘solely sail’, it might be more appropriate to propose a gradual change in the way a sail was rigged and used. The ‘Viking revolution’ could then be seen as a revolution of skill, allowing small crews to travel and manoeuvre independently. This would be a social as well as a technical liberation.

Nearest neighbours
Figure 15.3 is an attempt to model the maritime world of south-east Suffolk in the 7th century. Rates of travel by oars and sail of 36 and 72 nautical miles per day have been taken from Morken (1968) and are contrasted with 15 miles a day for walking and carts recorded in the later middle ages (Goodchild & Forbes 1957, 527). These figures are of course average, approximate and notional; put with less spurious precision, the proposal is simply that sailing is twice as quick as rowing which is twice as quick as walking. If this may be accepted, the result is a dramatic remapping of the cultural zone to which East Anglia really belongs.

The diagrams suggest a new list of the nearest neighbours for Ipswich. Even under oars only, Quintovic is as accessible as Bury St Edmunds and Jutland is ‘nearer’ than Tamworth. East Anglia is surrounded, if that is the right word, by Kent, Northumbria and Frankia, rather than Mercia which, although physically next to it on land, has no comparable access. This ‘real geography’ seems compatible with the history and archaeology we have so far seen. With the adoption of sail, the map is skewed still more, since of course the land-locked communities stay where they are.

Further work
This preliminary analysis is only one among many that now needs doing more thoroughly. As well as more experimental work on the water, to bring the maritime Saxons to life. A Sutton Hoo replica should most certainly be built, as should small clinker-built boats and logboats after models derived from Caister-on-Sea (Rodwell forthcoming) Snape and Bornholm. But in these experiments, the trials may prove more informative than the manufacture. Are logboats sea-going or intended for river and estuary use? Are blue-water crossings feasible under oars, and what are the ergonomics of such voyages over 5-10 days?

Much more work is also needed in the ‘maritime space’ which Anglo-Saxons enjoyed, and there could scarcely be a more propitious time to explore the ancient coastline soon to be submerged beyond reach (Devoy; Tooley, this volume). Such exploration will require terrestrial and maritime archaeologists working together and in close collaboration with local scholars such as George Arnott, who has used maps and place names to reconstruct the ancient coastline of north-east Suffolk. Figure 15.4 is a tribute to his work and not necessarily an improvement, a strictly provisional attempt to resurrect the buried geography available to 7th century Anglo-Saxons in Suffolk through the simple device of notionally raising the water table. As with the analysis (above) of contacts across the sea, this smaller scale model greatly alters our perception of which places were really neighbours.
Figure 15.4 Coastline in the area of Sutton Hoo. Modern coastline in feint; bold line follows current 10 ft contour. Crosses show sites of medieval churches. Based on an idea by George Arnott. (Drawing: Author).
Conclusion

However the problem that this paper set out to solve has not yet been solved. Did Angeln, East Anglia, south-west Norway and the Swedish Uppland develop independently from each other, or did they, all through the 5th-7th centuries, use the North Sea to keep alive that ‘persistent valency’ and provide each other with economic, political and ideological nourishment?

Since ‘blue-water crossings’ are proposed for the Bronze Age and the Iron Age in British waters, crossings which involve extended periods out of sight of land (McGrail 1983), and since the technology for such crossings, whether by sail or oar, existed by the 6th century AD in the North Sea and Baltic, one might think it incumbent on the ‘coastal crawlers’ rather than the ‘ocean voyagers’ to prove their case. However there seems to be little doubt that the ocean-voyagers are in a minority. Maritime commentators in general have convinced themselves that ‘blue-water crossing of the North Sea between the 5-9th centuries is improbable, and even at the end of this period the favoured route is along the lines of latitude to the Northern Islands rather than via the direct diagonal.

Is this simply a prejudice, insidiously suggested by the imbalance of documentation? It may be, but for a number of reasons this imbalance cannot be decisively confronted at present by archaeology. Virtually all archaeological arguments for maritime contact derive from ‘trails’ of similar objects, monuments or behaviour, ‘trails’ which are, unsurprisingly, only discovered on land. They can therefore be used to argue direct or coastal movement, ad libidum. Archaeological theory does not seem to be sufficiently developed to deal with these ‘trails’, or the valency they imply. Generalised descriptions such as trade, exchange, immigration, emulation or diplomacy are inadequate; they do not account for the discontinuities in the ‘trails’ or the evanescence of material culture along them.

Archaeological survival aside, the reasons for the unevenness in the signalling of Anglo-Saxon or Viking contact must have to do with the use to which material culture is put at a particular conjuncture. If Norwegian migrants did move along the eastern coastlines of the North Sea (rather than crossing it) but left no material traces until they arrived in Norfolk or Humberside, this must be a symptom of their political relations with the peoples who occupied or claimed to control the space through which they passed. Discontinuity in the trail, the ‘vanishing footprints’ problem, is clearly a common problem for the migration period. The migrants carry the seeds of their culture wherever they go, but do not necessarily sow them. There comes a moment in the relations between indigenous population, immigrant population and the land, when one cultural portfolio or another must be opened and promoted. Archaeology reports on these moments, rather than the mapping of migration as such.

Modern writers would be wrong to dismiss direct pre-Viking crossing of the North Sea as impossible. But neither can we say that it certainly did happen. More interesting is to investigate the reasons for the preferential or exclusive use of maritime space whenever it is suspected. If the greater part of the pre-7th century traffic in the North Sea was directed along the coastal sea-lanes of eastern England, Frisia and Jutland, what kept it there was not terror of the open sea, or inadequate technology, but politics, allegiance and ideology. After the conversion to Christianity and the formation of the East Anglian Kingdom, allegiance and ideology changed, and so did the maritime traffic. Ports of trade such as Ipswich show the organising hand of royal control which canalised traffic for tax purposes, and turned away from the Scandinavian affiliation towards the Merovingian Empire. So, in the immediate pre-Viking centuries (7th-8th) the maritime traffic is largely redirected from the North Sea to the Channel and at the same time, perhaps reduced rather than increased in intensity.

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16 A new boat burial from the Snape Anglo-Saxon cemetery, Suffolk
William Filmer-Sankey

Abstract
The second boat grave to be excavated in the Snape Anglo-Saxon cemetery, Suffolk, contained the soil-stain of a 3 m logboat. This paper describes the methods used to excavate and record the stain, the details of the boat’s construction, and the body and grave-goods contained within the boat. It ends with a consideration of the significance of the find for the understanding of the origins of the rite of boat burial in England.

Background
The Snape Anglo-Saxon cemetery lies at grid reference TM 4059, in the north-east corner of the modern parish of Snape in Suffolk, 7 km inland from the North Sea at Aldeburgh and 2.5 km north of the present course of the River Alde. The site has long been known to students of both maritime and Anglo-Saxon archaeology for the excavation in 1862 of a mound containing a ship burial (Bruce-Mitford 1974, 114-40). The grave had probably been robbed, but enough remained and, equally important, was recorded by the excavators, to show that the ship was c 14 m in length and 3 m in beam, of clinker-built and riveted construction and that it had eight strakes a side. The finds from within the ship indicated that it had contained a male burial of high status, dating in all probability to the second half of the 6th century and thus predating the mound 1 ship burial at Sutton Hoo (Werner 1971, 197-8).

While digging the ship and other mounds in the same area, the 1862 excavators also found a number of cremation burials, which made it clear that the ship burial was part of a much larger pagan Anglo-Saxon cemetery. However, despite other later finds, such questions as the precise character, the state of preservation and the size of this cemetery remained unanswered, while agricultural activity and the subsequent enclosure of part of the area in a garden meant that, by 1951, even the location of the 1862 ship burial was no longer certain (Bruce-Mitford 1974, 115). For these reasons, it was decided in 1985 that further excavation was needed, if only to assess the suitability of the site for preservation.

For the past four years, therefore, there have been annual seasons of excavation on the site, organised by the Snape Historical Trust and the Suffolk County Archaeological Unit and directed by the author. These have concentrated on the total excavation of an area of 17 x 20 m, lying immediately adjacent to the presumed site of the ship burial, as deduced from the accounts of the 1862 excavation (Bruce-Mitford 1974, 121). This area has been found to contain 21 inhumation and 17 cremation burials of the second half of the 6th and early 7th centuries AD (Filmer-Sankey 1987). The subsoil is sandy, with few stones and a high acid content. This means that human bone only survives in close proximity to metal, although the position of the skeleton can usually be deduced from a ‘sand silhouette’ of the body.

On the other hand, organic preservation is unusually good, with such features as coffins being traceable from a high level within the grave.

During the September 1987 excavation season, one grave (excavation number 0328) was seen to be unusually long and narrow (3.70 x 0.80 m). After c 0.20 m of the fill had been removed, a V-shaped stain of a dark brown colour and an organic texture normally associated on the site with the decayed wood of coffins, appeared at the eastern end (Fig 16.1, + 71). It was only after a further 0.08 m of grave fill had been removed and the stain, now extended, was planned again (Fig 16.1, + 63), that it was realised that this was best interpreted as one end of a small boat.

If this were indeed a small boat grave, it would be the fourth pagan Anglo-Saxon boat burial to be found in England, and thus a find of considerable significance. Since the stain had appeared at a level well below that of potential plough damage, it was decided that further excavation of the grave should be postponed until advice and finance had been sought, in order to ensure excavation to the highest possible standard. The grave was accordingly covered with a plastic sheet and was backfilled, along with the rest of the site, until September 1988, when excavation recommenced.

The method of excavation and recording of grave 0328
At this stage it was not certain that the stain was indeed that of a boat. Nor was there any way of knowing whether, even if a boat, the stain would be sufficiently well-preserved to be understood. Accordingly, it was thought best to adopt a flexible approach to the excavation of the grave. It was decided to begin by excavating it (like all other graves on the site) in plan, removing everything including the stain. This would minimise the danger both of fabricating a non-existent boat and of missing important features.

The grave was therefore lowered in 10 mm horizontal splits. The surface was planned (at 1:10) and photographed at a maximum of every 50 mm, or more frequently if necessary. This method of excavation called for very precise excavation and recording, but it did allow the gradual development and extension of the stain to be accurately followed (Fig 16.1). At the eastern end, where it had first showed, the stain was up to 20 mm...
Figure 16.1 The Snape boat: plans of developing stain. Figures refer to height in centimetres above 15 m contour line. (Drawing: Author).
At the end of this process (which took one excavator and one recorder 21 days) we were left with seven main plans of the upper levels of the stain, eight detailed plans of the eastern end, and 54 sections across the base (Fig 16.4). Recording by photogrammetry had been impossible, on account of the method of excavation. However, by combining the plans and sections, it has been possible to produce a similar effect which enables the reconstruction of a complete section of any part of the stain. Figure 16.5 shows a long section and a representative selection of cross-sections, together with a composite plan of the highest surviving levels of the stain. It is this information which must be used to interpret the precise form and function of the wooden object which left this suggestively-shaped stain in the sand of Snape.

The interpretation of the stain
In interpreting this stain, it is necessary to distinguish between the form of the stain, as it survived and was excavated, and the form of the original wooden object. For it is clear from the cross-sections that the pressure of the earth on the decaying wood has in some areas distorted (and even destroyed) the lines of the object and this makes the task of reconstructing the original shape difficult. Thus the stain survived to a length of 3 m but the object would probably have been a little longer, since it is likely that the line of the top would originally have continued at full height, rather than following the line of the surviving stain, which drops to a height of only c 0.05 m near the western end. Its maximum surviving width was 0.70 m and this probably represents roughly its original width, since the actual grave cut is only 0.10 m wider. Its maximum surviving depth was some 0.40 m. It is also clear that the cross-sections have suffered from the weight of earth from above. This would have had the effect of flattening the base, thus tending to give a more squared profile than was originally the case (Bruce-Mitford 1975, 347). The fact that this object contained no metal fittings at all, combined with its narrow width in relation to its length (length/breadth ratio 4.3:1) and an apparent tendency to taper towards the west end, indicates that it was of dug-out construction, made from a single hollowed-out log.

Although the stain as it survived and was recorded is indisputably boat-shaped, the nature of its survival, as a dark brown sandy line, means that it cannot be proved that it was a boat, rather than, say, a boat-shaped coffin or even a trough. Nevertheless, all the indications are that it was an actual logboat. McGrail, in his work on logboats in England and Wales, dealt with the problems of distinguishing a logboat from among the various other uses to which a hollowed-out log may be put and this makes the task of reconstructing the original shape difficult. Thus the stain survived to a length of 3 m but the object would probably have been a little longer, since it is likely that the line of the top would originally have continued at full height, rather than following the line of the surviving stain, which drops to a height of only c 0.05 m near the western end. Its maximum surviving width was 0.70 m and this probably represents roughly its original width, since the actual grave cut is only 0.10 m wider. Its maximum surviving depth was some 0.40 m. It is also clear that the cross-sections have suffered from the weight of earth from above. This would have had the effect of flattening the base, thus tending to give a more squared profile than was originally the case (Bruce-Mitford 1975, 347). The fact that this object contained no metal fittings at all, combined with its narrow width in relation to its length (length/breadth ratio 4.3:1) and an apparent tendency to taper towards the west end, indicates that it was of dug-out construction, made from a single hollowed-out log.

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with the fact that it comes from an area, indeed a site, where boat burial is known to have occurred at this period, its identification as a boat seems wholly justified.

The bow and stern seem to have been similarly formed, with, appearing towards the waterline, a distinctive ‘fin’ (Fig 16.1, + 53; + 48; Fig 16.3). The evidence as to which end was which is contradictory and may indicate that the boat could be used in either direction. Thus the slight tapering of the log indicates that the western, narrower end was the bow (McGrail 1978, 86). On the other hand, if the grave fits the pattern from Sutton Hoo and Valsgärde, where the head of the corpse always faces the stern, then the bow is the eastern end (see below). This end, which showed from the very start, was far better preserved than the west end, which only became visible 0.10 m from the base and was, even then, obscured by iron-pan. The reason for this differential survival may be that the east end, pushed much more to the head of the grave and apparently supported by a turf, was more protected from the pressures of the earth.

No traces of any internal fittings were noted in the main body of the boat, but, at either end, a curved stain was clearly visible inside the line of the end. This was

![Image of the stain at level +43 with a protruding 'fin' and the western, narrower end labeled as the bow.](image)

Figure 16.3 Vertical view of east end of the stain at level +43. The protruding ‘fin shows as a dark triangle. (Photo: Author).

![Diagram showing the locations of plans and sections used in reconstruction of the stain.](image)

Figure 16.4 Diagram to show locations of plans (—) and sections (I) used in reconstruction of the stain (Fig 16.5). Vertical scale 1:10, horizontal scale 1:40. (Diagram: Author).
Figure 16.5  Plan of highest surviving level, long section and a selection of cross-sections of the surviving wall. Stippled area denotes possible hole in the hull. (Drawing: Author.)
It is therefore not possible to say precisely to which the original shape has been distorted during the process of decay. Thus the type of wood used is unknown, as is the extent to which the original shape has been distorted during the process of decay. It is therefore not possible to say with certainty whether the boat has been ‘expanded’, in the way that Crumlin-Pedersen has suggested for the very similar logboats from Slusegård (this volume, and see below).

The body and the grave-goods

The final function of the boat, as already indicated, was as a coffin (Fig 16.7). It had been placed in a grave that was rather too long, though none too wide for it. There was no trace of any covering or lid placed over the boat but, equally, there was no trace of any robbing. This was an intact grave. The body within the boat was very poorly preserved. As is usual on the site, the bone had completely dissolved but in this case the ‘sand silhouette’ which normally replaces the skeleton was, in most places, no more than a smear and very hard to distinguish from the base of the boat. Phosphate samples were taken, but have not yet been analysed. In the meantime, the meagre surviving stain seems best interpreted as a flexed burial, with the head to the west and, if this is correct, an approximate height of 1.40 m. It seems possible, therefore, that it is not the body of a fully grown adult. One could point to the fact that the boat is considerably longer than the body it coffins as yet a further indication that this is a boat, not a boat-shaped coffin.

The grave-goods accompanying the body can unfortunately give us no clue as to the sex of the person buried. An iron knife of unusual form was found at the west end and an iron buckle and stud (both from the same belt?) lay at ‘waist’ level. Of greater interest were two horns, which had been placed symmetrically on top of the other, at the feet of the dead person. At the tips and where they were pressed together, the horn was unusually well preserved, despite a complete absence of metal fittings (Fig 16.8). Elsewhere, a dark stain enabled the precise reconstruction of their original size (diameter of rim: 75 mm; distance between extreme points: 280 mm). Although they had no metal rim bindings or terminals, it seems best to see them as a pair of drinking horns and their presence may thus give a clue as to the status of the person buried. Pairs of drinking horns are exceptionally unusual finds in Anglo-Saxon archaeology, occurring only in such clearly rich graves as Sutton Hoo mound 1 and Taplow (East in Bruce-Mitford 1983, 385-95). Their lucky survival at Snape thus contradicts the impression of ‘low’ status given by the small number and humble materials of the other grave-goods.

Just as the grave-goods give us no clue as to the sex of the person buried, so too they give no clues as to the date of the burial (and thereby a terminus ad quem for the construction of the boat). We must rely, therefore, on the dates from the surrounding area of the excavation. As already noted, virtually all the graves date to the second half of the 6th century, though two (both surrounded by ring ditches) are probably early 7th century. By implication, therefore, this grave should also date from c 550 — the early 7th century, roughly the same time span as is allotted to the 1862 ship burial.

A preliminary assessment of the significance of the grave

The importance of this grave can be seen on two levels: as providing fresh evidence firstly about the boats of the Anglo-Saxon period and secondly about the rite of boat burial, and it is intriguing that the evidence in both areas
Figure 16.7 Plan of grave. (Drawing: Author).
leads towards the same source, the cemetery of Slusegård, on the Baltic island of Bornholm, where a cemetery of some 1400 graves was found to contain 43 logboat graves, dating from c. AD 100-250 (Klindt-Jensen 1978).

To take first the purely maritime evidence provided by the boat itself, it is an unusually well-dated logboat from an area which has hitherto produced few finds (McGrail 1978, fig 207). It thus broadens our view of the range of water-transport in use on the east coast at a period for which so much of the evidence derives from much larger (and arguably atypical) vessels such as the Sutton Hoo ship.

The details of the form and size of the boat, as far as they can be reconstructed, can be paralleled among the English and Welsh logboats. None of these parallels, however, are especially close. Most of the logboats are considerably longer, while the protruding ‘fins’ at each end of the Snape boat cannot be exactly matched. Infinitely more convincing are the parallels to be drawn with the Slusegård logboats. Had it been found in that cemetery, the Snape boat would have fitted perfectly into the category of boats of c 3 m (±10%) which have protruding fins at either end. It is particularly similar to the boat from grave 1131 which measured 2.80 x 0.70 m (Rieck & Crumlin-Pedersen 1988, 79-86). Other features noted at Snape can be matched in other Slusegård graves. The curved line just inside each end, for example, appears on the surviving end of the boat in grave 1224 (Klindt-Jensen 1978, fig 144).

Turning to the rite of boat burial, it is equally clear that the grave is more at home among the Slusegård finds than it is in its local context. The three previous boat burials from the pagan Anglo-Saxon period (Sutton Hoo mounds 1 and 2; Snape), though they all come from within a radius of 8 km, could not be less like the new Snape boat. They all make use of large, clinker-built and riveted vessels, and, even when robbed (as was the 1862 boat at Snape and mound 2 at Sutton Hoo), they still contained unequivocal evidence of very high status. On these grounds, they have always been compared with the high-status boat graves of Vendel and Valasgarde. The new Snape find shares none of these characteristics, but nor do the Slusegård boat graves. There, all of the boats were logboats and, although the average status of the boat graves was certainly higher than normal, there were other ‘normal’ graves of equal or greater wealth.

That, despite the substantial time gap between Snape and Slusegård, there should be such close links between not only the actual boats but also the method of their burial is remarkable. It must mean, at the very least, that the suggested Vendel Swedish origin of the East Anglian rite of boat burial should be called into doubt. At the same time, it would surely be a mistake to substitute Bornholm for Uppland. It may be that the most important factor linking Snape and Slusegård is the sandy, stone-free soil of both sites, which preserves the stains of boats built without metal fittings in a way that most soils do not (Müller-Wille 1968/9, 25). It could be, therefore, that similar boat graves existed in other coastal cemeteries in both England and Scandinavia, but have left nothing (except perhaps an unusually long grave) by which they may be recognised. The discoveries of boat graves, bits of boats and boat-shaped coffins of a later date at York (Kjølbye-Biddle forthcoming), Caister on Sea (Green 1963, 57) and Butley (Fenwick 1984, 37) certainly hint at a fairly widespread rite.

It would follow from this that the adoption of the rite of boat burial is not so much a sign of a specific link between south-east Suffolk and Vendel Sweden, but a far more general indication of the influence of Scandinavian settlers on the character of Anglo-Saxon England. Nevertheless, it is likely to remain the case that boat burial is not a common rite, if the 28:1 normal:boat grave ratio at Slusegård is typical. The new Snape boat, with its curious selection of grave-goods, contradicts the impression that this rarity is due simply to its use as an extravagant status symbol and thus requires a new explanation as to why only certain people in an area where we must assume that a substantial proportion of the total population owned a boat ended up buried in one.

This explanation may well be that the boat symbolised something very specific in pagan Anglo-Saxon religious belief, and thus was thought appropriate for only certain burials. Whether it symbolised adherence to a specific family of Germanic gods (Rieck & Crumlin-Pedersen 1988, 151-2), or the need to make a journey by water to the next world (Werner 1988), cannot be answered by the Snape boat alone. Its particular significance lies in the unusual preservation which enabled its recognition and in the unexpected new angle that it has provided on the appearance of the rite of boat burial in pagan Anglo-Saxon England.

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