

Mersea Island: the Anglo-Saxon Causeway

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Introduction

The Strood at Mersea is an artificial causeway about half a mile long which links the mainland to the island (Figs. 1 and 2). Its straight character and the presence of extensive Roman remains on the island have prompted the long-held belief that the Strood was probably of Roman origin (Christy, 1921, 211). However scientific dating methods applied to some substantial oak piles discovered beneath the causeway in 1978, when a water-main was being laid, indicate that the structure was probably built between **A.D.** 684 and 702.

The piles

Although the pipeline crossed the entire length of the Strood, piles were only discovered near the south end over a distance of about 60 m. (200 ft.) where the trench for the pipeline was at its deepest. Digging operations continued over many weeks so that not every pile could be recorded. Many were plotted approximately as reported by the workmen concerned and as shown on Fig. 2.

The piles discovered had been placed at irregular intervals in two rows which lay at an angle of about 1° to the line of the modern road. Although difficult to judge, the two rows of piles seemed to be about 0.7 m. (2.3 ft.) apart. In each row, the distances between adjacent piles varied between 0.4 m. (1.3 ft.) and 2.8 m. (9.2 ft.). The tops of the piles were about 1.6 m. (5.2 ft.) below the present ground level and were sealed by a series of road surfaces. Two sections were drawn, one of which (Fig. 3) is reproduced here. The layer descriptions are as follows:

1. Succession of layers of tarmac and hardcore including white chalky clay (modern road surfaces).
2. Succession of layers of white chalky clay, compacted stony silt and tar (modern?).
3. Compacted pale greyish brown sand and silt with gravel and small stones.
4. Compacted dark grey sand and silt with gravel and small stones.
5. Compacted very dark grey to black mixture of sand and silt.
6. Compacted pale brown silty sand with grit.
7. Grey clay with sand and gravel.
8. Grey clay (natural but much darker than surrounding marsh clay).

The piles were driven through layer 7 which would have been indistinguishable from the underlying natural clay but for its sand and gravel content. The earliest road surface was layer 6.

Preservation of the earliest surfaces has been the indirect result of the gradual subsidence of the Essex coast-line. The latter has had the effect of slowly raising the sea-level relative to the land

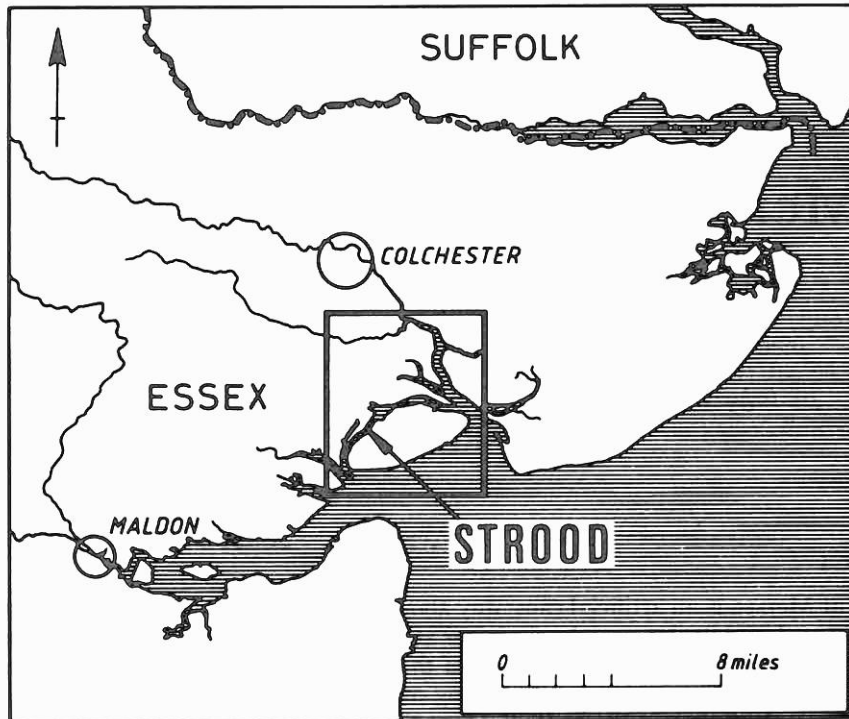


Fig. 1. Location of the Strood at Mersea Island. (The rectangle indicates the area covered by Fig. 1 in Nina Crummy's article following.)

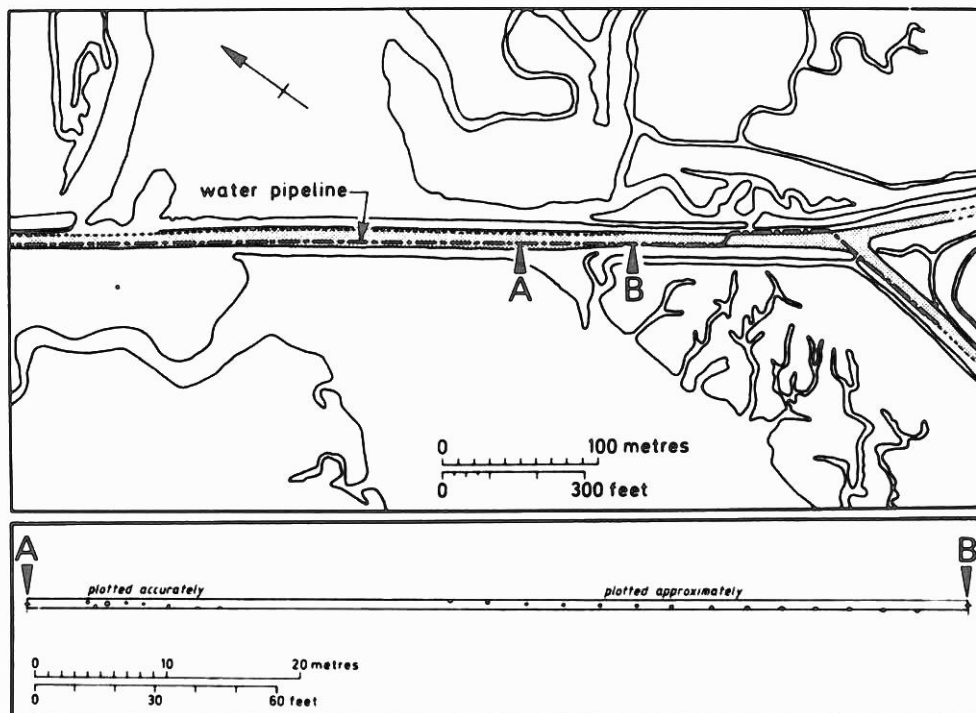


Fig. 2. Above: the Strood. Below: position of piles in the contractor's trench.

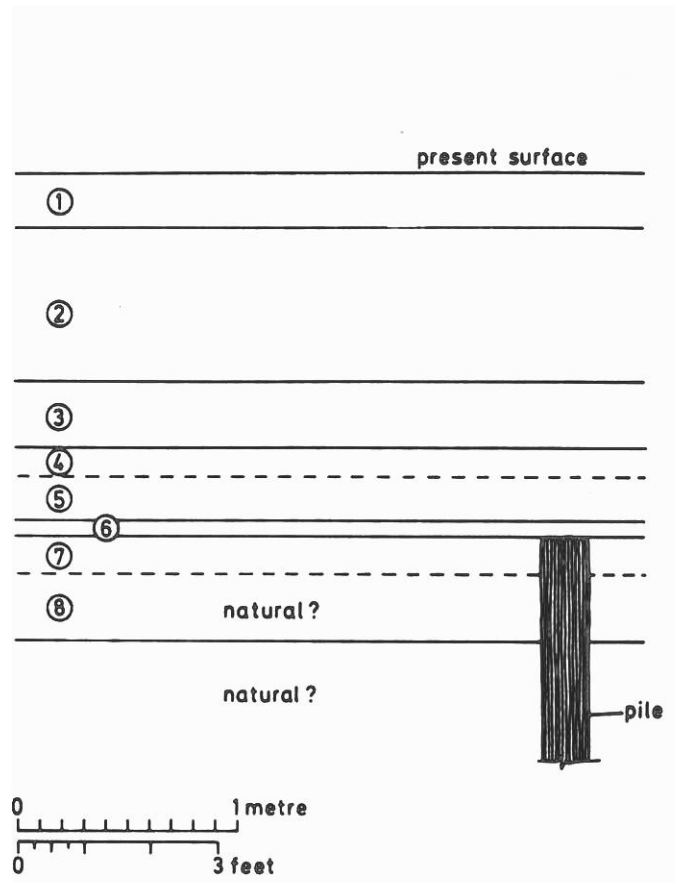


Fig. 3. Section.

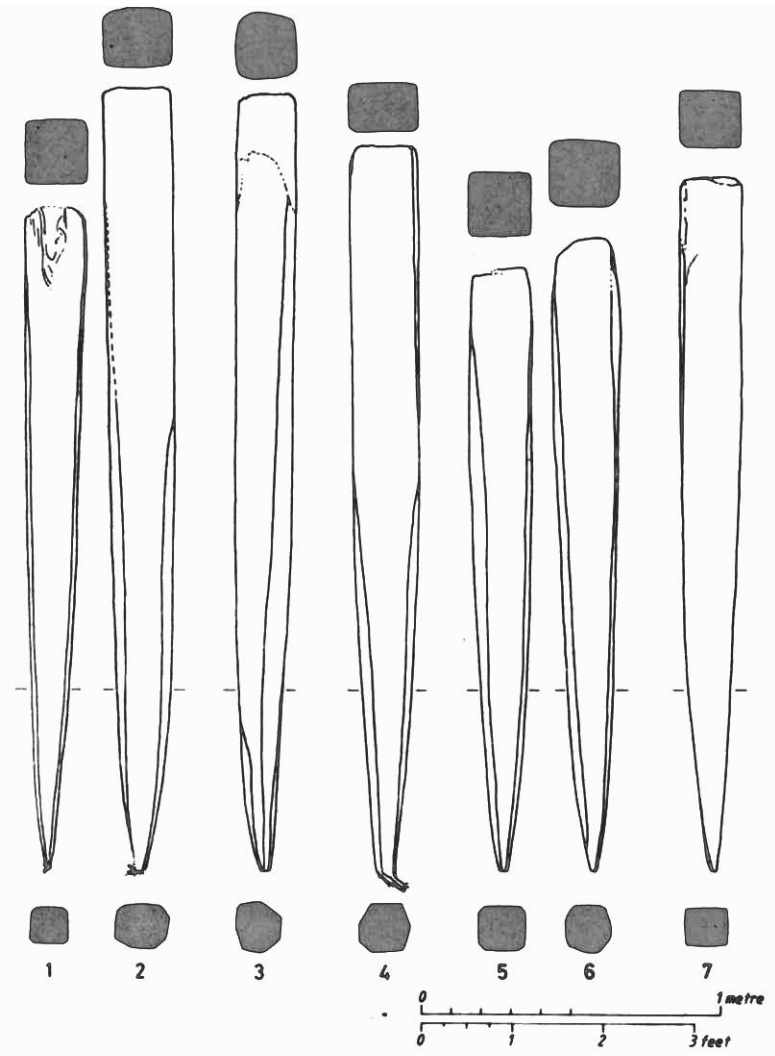


Fig. 4. Piles.

which in turn has led by way of compensation to the raising of the surface of the causeway and thereby the preservation of its earlier levels.

Of the piles excavated during the contractor's works, seven were removed from the site and drawn (Fig. 4). These consisted of squared oak timbers about 0.21 m. (8.3 in.) across with tapering ends. They ranged from 2.0 m. (6.6 ft.) to 2.6 m. (8.5 ft.) in length. The wood was well preserved and still retained a tough fibrous quality which was most noticeable at the tips (nos. 1, 2 and 4).

Sections across four of the piles (nos. 1 to 4) were extracted and submitted through the Department of the Environment to Miss Jennifer Hillam of the University of Sheffield for tree-ring analysis and radiocarbon dating; the remaining three piles (nos. 5 to 7) are now in the Colchester and Essex Museum.

Mr. Bland of the Anglian Water Authority recalls other piles being found in the early 1960s in a similar trench sited immediately west of the present one. No further information about these is available.

The dating of the Strood timbers (by JENNIFER HILLAM)






Archaeological timbers can be directly dated by two methods: radiocarbon dating, which gives only a rough estimate of a sample's age, and dendrochronology, which is very accurate. The latter method depends upon the synchronisation of the pattern of wide and narrow annual rings within a wood sample with tree-ring patterns of known age. Whilst the method is very accurate, it is not always possible to find similarities between the ring patterns; hence, not every sample can be dated (Hillam, 1979). The samples of the Mersea timbers, however, were dated with relative ease: firstly, their annual rings were measured and a site tree-ring sequence produced. The approximate age of this sequence was determined by radiocarbon and finally, the timbers were dated accurately by comparing their ring patterns with those of absolutely dated tree-ring chronologies from Germany. The study of the Mersea piles was valuable, not only because of the important archaeological dating, but also because it was the means of extending absolute tree-ring dating in England back to A.D. 416. Prior to this work, which was completed in March 1980, no dated reference curves existed for the period before A.D. 682.

Method

Five samples from four of the oak piles (*Quercus* sp.) were examined at the Sheffield dendrochronology laboratory. Samples 3 and 4 came from the same pile. The samples were deep-frozen to consolidate the waterlogged wood; the cross-sections were then planed so that the annual rings could be readily identified. The ring widths were measured to an accuracy of 0.1 mm. on a travelling stage under a low-power binocular microscope. Details of the samples are set out in Table 1. Samples 2 and 5 had few rings; the timber obviously came from young, fast-grown trees which must have been under 100 years of age when felled. The remaining samples, however, were most suitable for tree-ring dating. They had approximately 150 narrow, sensitive rings; these piles must have been converted from mature trees. It is unfortunate that it was only possible to sample four of the oak piles: analysis of a more substantial number could have revealed much information about the contemporary woodland and its use. As it is, very little can be deduced from five samples other than that the builders of the causeway had access to woodland containing a mixed stand of oak trees.

The ring widths were represented graphically on transparent semi-logarithmic recorder paper. The tree-ring patterns of the four piles were then compared together visually by sliding one curve over another until the position of best fit was found. Sample 1 agreed well with samples 3 and 4, although its rings did not cover exactly the same time span (Fig. 5). Instead, because sample 1 came from the centre of a tree (Table 1), its rings extended further at the older end of the sequence. Samples 3 and 4, on the other hand, were from the outer part of a tree, giving more rings at the

Table 1. Details of the Mersea timbers. The sketches are included to show how the timber was converted; they are not drawn to scale.

Sample no.	No. of rings	Sapwood rings	Average width (mm.)	Sketch	Dimensions (cm.)
	148		0.94		17 x 17
2	60	—	2.41		21 x 21
3	154	—	1.32		21 x 20
4	152	1	1.36		26 x 15
5	46	—	2.42		radius: 9-11

younger end. To quantify the degree of similarity between the tree-ring curves, the Belfast computer program CROS was used (Baillie and Pilcher, 1973). This compares two sets of ring widths at each position of overlap and calculates the value of Student's *t*. A value of 3.5 is significant at the $P < 0.001$ level; higher values would be even more significant. Computer matching must always be checked visually before it can be accepted, since spurious results occasionally occur. When curves 3 and 4 were tested against the curve from sample 1, t -values of 4.16 and 4.48 respectively were obtained. Comparison of curve 3 against curve 4 (from the same pile) resulted in a t -value of 7.10.

The transition between heartwood and sapwood could be seen on sample 4 (Table 1). Sapwood is the outer part of a tree and is easily differentiated from the heartwood by its colour. Because the amount of sapwood in a mature oak tree is relatively constant, it is possible to estimate the felling date, even if only a small quantity of the sapwood is preserved. The number of sapwood rings is taken to be 32 ± 9 years, where ± 9 is one standard deviation from the mean (Baillie, 1973). This figure was derived from a study of Irish oaks, but observations by the author on English timbers show that it can also be used here—at least until enough data have been collected to make

an independent calculation possible. Thus, the felling date for the Mersea samples can be estimated and is indicated by an arrow in Fig. 5.

The ring widths from samples 1, 3 and 4 were averaged together to produce a site mean curve of 217 years. The ring patterns from samples 2 and 5 were compared with this mean curve, but still no reliable crossmatching was found. This does not necessarily indicate that samples 2 and 5 are of a different age to the others, rather that their ring patterns were too short to give acceptable cross-dating.

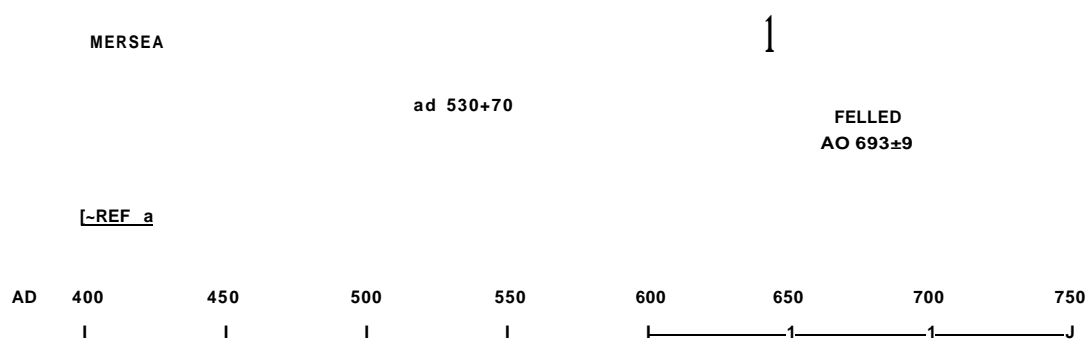


Fig. 5. Block diagram illustrating the relative positions of the years spanned by the Mersea samples and ref 8. The years sampled for radiocarbon from pile 4 are indicated by hatching; H/S—heartwood/sapwood transition.

The dating of the piles

Because the archaeological dating of the site was uncertain, samples of 20 rings each were taken from sample 4 and 5 and submitted to the Harwell laboratory for radiocarbon dating. The aim of this was twofold: first, it would determine the rough age of the piles and thus indicate which reference curves should be used to cross-date the Mersea timbers. Secondly, it would show whether the unmatched sample, 5, was of a similar age to those whose ring patterns were included in the mean curve, i.e. it could confirm that the piles were all part of the same structure. The exact position of the rings from sample 4 is illustrated in Fig. 5. Radiocarbon analysis gave a result of $ad\ 530 \pm 70$ (Table 2); this would make the estimated date of felling equal to $ad\ 670 \pm 70$. The result

Table 2. Dates for the individual timbers from the Strood.

Sample no.	Tree-ring dating		Radiocarbon dating	
	Date span	Felling date	Harwell no.	C14 result
1	A.D. 445—592	A.D. 693 ± 9	—	—
3	A.D. 506-659	A.D. 693 + 9	—	—
4	A.D. 510-661	A.D. 693 + 9	3369	ad 530 ± 70
5	—	—	3808	ad 690 ± 60

for sample 5, taken from years 13–62 of the 46-year sequence, was ad 690 \pm 60 giving an estimated felling date of ad 725 \pm 60.

The Saxon date was unexpected since no causeway datable to the 7th or 8th centuries is known in Britain. The result was also exciting from the tree-ring point of view since timbers of this age had been desperately sought for some time. Until this study, the oldest absolutely dated timber in England came from Tudor Street, London, and was dated to A.D. 682–918 (Hillam, 1981). For the earlier Saxon period, there were only floating tree-ring chronologies (e.g. ref 8 in Fletcher, 1977). Thus, the Mersea samples offered a chance, not only to date a unique Saxon structure, but also to extend absolute tree-ring dating in England back in time.

Comparison of the Mersea mean with ref 8 produced a very close visual agreement (Fig. 6); this was backed up by a t value of 8.36. Thus, the Mersea sequence was still floating in time but was now linked relatively to the timbers from Old Windsor and Portchester, which are the constituents of ref 8 (Table 5, Fletcher, 1977). The absolute dating of the Mersea/ref 8 sequence was not simple and took many hours of checking and cross-checking. Because the dating of this would provide a framework for all future Saxon timbers from England, extreme care was taken to provide reliable dating. Furthermore, several dates have already been quoted for Old Windsor and Portchester (Schove, 1979); none of these relied upon the synchronisation of tree-ring patterns, which is the only basis for tree-ring dating, and so could not be substantiated by dendrochronologists. It was the author's wish to avoid this sort of haphazard dating which is bringing dendrochronology into disrepute amongst archaeologists.

A detailed explanation of the absolute dating of English Saxon timbers is given elsewhere (Hillam, 1981) and includes other sites as well as the Strood. In brief, the Mersea sequence was compared by computer with two unpublished German chronologies: one, produced by D. Eckstein, from the Schleswig area of north Germany and the other, constructed by B. Becker, made up of timbers from the Danube valley in south Germany. When the rings of the Mersea mean were equivalent to A.D. 445–661, t -values of 4.78 and 4.88 were obtained with Schleswig-Holstein and the Danube respectively. These two results alone would be sufficient to date the Mersea curve, but further proof was found by cross-matching ref 8 with the Tudor Street sequence from London mentioned above. This additional check gave the same dates for the two curves: ref 8, A.D. 416–737 and Mersea, A.D. 445–661. Thus, the dating of the three Mersea samples (Table 2) is incontrovertible and could be used to override any conflicting evidence. In this case, however, the archaeological evidence was not clear and the radiocarbon dating is consistent with the dendrochronology. The years dated by radiocarbon to ad 530 \pm 70 are, in fact, equivalent to A.D. 547–566.

The estimated felling date for samples 1, 3 and 4 is A.D. 693 \pm 9 (Table 2, Fig. 5). This can also be taken as the construction date since, in the past, timber was not seasoned unless it was to be used for furniture or panelling (see e.g. Hollstein, 1965). Seasoning would be particularly unnecessary when the timber was to be used underground as foundation piles as was the case with the Mersea timbers. Instead, the timber would be felled as required and used almost immediately.

Conclusion

The Mersea mean curve (Table 3), produced from the ring patterns of samples 1, 3 and 4, was dated by dendrochronology to A.D. 445–661. Thus, the felling date of the trees and the construction date for the causeway's foundations is equal to A.D. 693 \pm 9.

The Strood was the first site of this period to be absolutely dated in England. Apart from its importance to the archaeology of the site itself, the Mersea curve was used to date ref 8 (Fletcher, 1977) to A.D. 416–737, so providing dates for the Old Windsor and Portchester timbers. (Ref. 8 was later dated by Baillie (1980) and Fletcher (1981).) These two chronologies, Mersea and ref 8, extend absolutely dated English reference curves back to A.D. 416; they thus give a dating framework for other Saxon sites, such as the 6th- and 7th-century wells from Odell in Bedfordshire

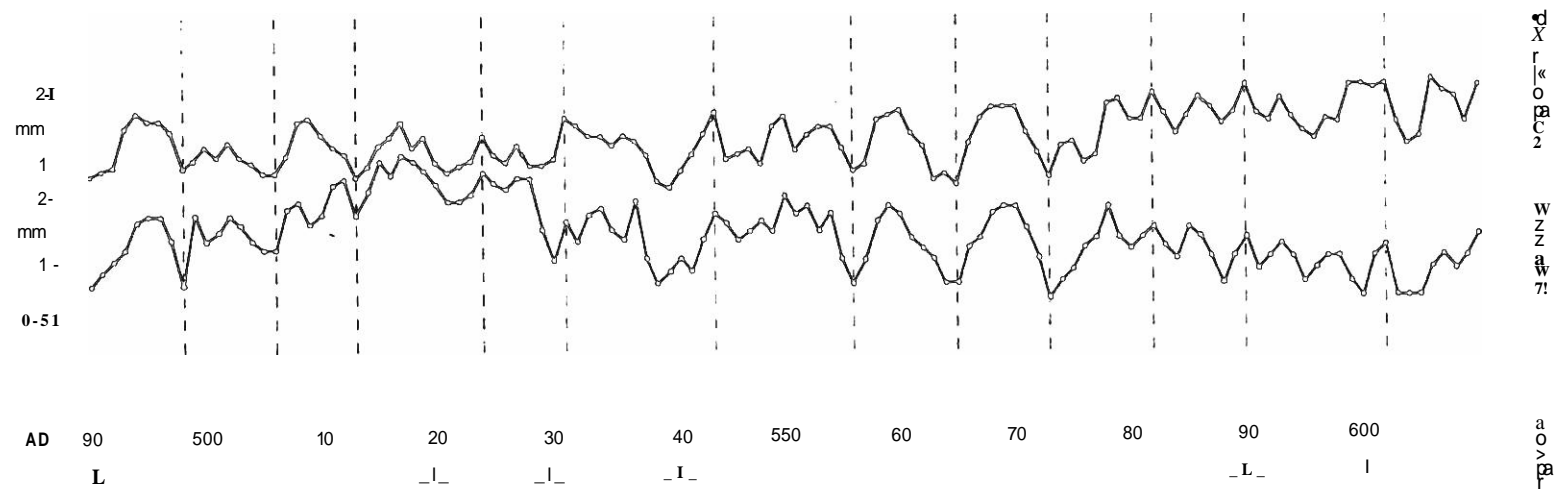


Fig. 6. Matching tree-ring curves: ref8, above (Fletcher, 1977), and the Mersea mean curve, below. Vertical dotted lines are included as an aid to visual comparison.

Table 3. Mersea tree-ring chronology, **A.D.** 445-661. The ring width values are given as indices, i.e. the raw data from each sample were converted to index values before being meaned. 'n' represents the number of trees per decade.

Year	Tree-ring indices										n
	0	1	2	3	4	5	6	7	8	9	
445						74	93	121	168	131	1
450	159	150	113	122	75	132	104	66	114	76	1
460	66	67	95	76	29	29	48	29	48	58	1
470	67	94	58	68	97	116	87	68	107	98	1
480	49	88	147	118	79	59	49	128	109	99	1
490	69	79	89	99	130	140	140	110	70	141	1
500	111	121	141	131	111	101	98	96	111	83	1
510	88	115	123	81	108	151	136	157	137	137	2
520	126	104	95	115	141	123	126	143	134	75	2
530	56	84	70	89	95	79	79	108	59	45	2
540	54	61	48	72	97	90	73	84	92	90	2
550	127	99	115	102	116	72	56	76	106	123	2
560	128	93	90	76	62	65	94	102	127	142	2
570	140	112	84	53	64	71	97	107	150	113	2
580	102	114	128	105	119	129	114	99	76	112	2
590	116	90	99	110	104	83	89	98	104	78	1
600	66	99	118	71	62	73	89	105	88	100	1
610	119	108	114	115	160	149	108	92	101	94	1
620	68	83	93	112	107	113	129	109	125	104	1
630	79	93	97	116	91	85	85	129	106	86	1
640	72	90	76	75	83	110	83	117	99	99	1
650	123	126	79	121	96	93	72	104	108	110	1
660	107	92									1

(Hillam, 1981). In time, it should be possible to find a link between these Saxon curves and the floating Roman chronologies and so obtain a complete English tree-ring curve for the last 2000 years.

Acknowledgements

The examination of the timbers was financed by the Ancient Monuments Branch of the Department of the Environment, to whom the Society is also indebted for a grant towards the publication of this article. I would also like to thank Drs. B. Becker and D. Eckstein for making available their data prior to publication. The Society also thanks the Council for British Archaeology for a publication grant.

Discussion

The construction of the causeway was a major undertaking. Although difficult to estimate on the basis of what in effect is a small and ill-recorded sample, it is possible that there are 15 to 20 rows of piles, each of which is 400 to 500 m. long. This would imply between three and five thousand piles. A project of this magnitude in *c.* **A.D.** 700 suggests the presence on the island of a sufficiently important feature to merit such a structure and also a substantial financial expenditure on the part of somebody or some organisation able to afford it.

The existence of a minster based at St. Peter's Church in West Mersea is implied in a group of three wills of c. 1000 (Whitelock, 1930, 6-9, 34-43; and the following article). Thus it seems possible that the causeway was built to provide the priests of the minster with easy communication with the mainland so that they could carry out their duties more effectively. In the wills mentioned above it is recorded that the minster and six hides of land in which it stood were in the possession of vEIfgar, Ealdorman of Essex. The association of West Mersea with the aristocracy suggests that perhaps a nobleman was responsible for the construction of the Strood. By an odd but possibly significant coincidence, the king of the East Saxons between c. 665 and 695 was the 'monk-king' Sebbi, of whom Bede wrote 'He devoted himself to religious exercises, frequent prayer, and acts of mercy, and he preferred a retired, monastic life to all the riches and honours of a kingdom' (Bede, IV, II). Perhaps it was Sebbi himself who ordered the causeway to be built?

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