RESEARCH NOTES – ROMAN

THE ROMAN INVASION OF BRITAIN, AD 43: RIVERINE, WADING AND TIDAL STUDIES PLACE LIMITS ON THE POSSIBLE LOCATIONS OF THE TWO-DAY RIVER BATTLE AND BEACHHEAD

In mid-June of AD 43 a Roman fleet, commanded by Aulus Plautius, sailed westwards from the European mainland in three divisions and landed unopposed somewhere in South-East Britain. Plautius then marched inland, successively defeating Caratacus and Togodumnus, before confronting a combined British army across a major river. Units of Plautius' auxiliary force, the *Keltoi*, trained to swim in full-armour, surprised the British by crossing the river and attacking them either in the flank or rear. Subsequently the main Roman legionary force crossed the river and, over a two-day period, caused the British to retreat across the Thames. After a brief, difficult pursuit, during which the *Keltoi* swam the Thames, Plautius halted his operations near the river before sending for the Emperor Claudius to participate in the final battle and the subsequent capture of Colchester, the seat of tribal resistance. Claudius, after only 16 days in Britain, returned triumphant to Rome, leaving Plautius to continue the conquest of Britain (Cassius Dio, *Roman History*, Book 60: 19-23).

Dio does not mention from where the invasion force sailed; where it landed; where Caratacus and Togodumnus were defeated; or where the two-day battle at the river occurred. Fortunately he mentions the river Thames on a number of occasions after the two-day river battle, for example:

> the Britons retired to the river Thames at a point near where it empties into the ocean and at flood-tide forms a lake.

Plautius' operational halt at or near the Thames, coupled with a logical geographical progression for the previous Roman advance, means that the sites of the beachhead, earlier battles and the two-day river battle were located south of the Thames and lay within South-East England.

Turning to the archaeological record for any confirmed evidence for the location of the beachhead, battle sites, river-crossing points, temporary marching camps, or any other physical relict of the fighting or invasion leaves only one conclusion: there is none (Hoffmann 2013). However, location information for the two-day river battle, and hence the probable area of the beachhead, may be identified by studying the implications of the *Keltoi* swimming.

The logic of the study

Dio writes that on two occasions the swimming abilities of the *Keltoi* gave the Roman army an advantage. These were exceptional events performed by uniquely-

trained soldiers. Exceptional to the extent that Dio emphasises that at the two-day river battle the British were not expecting to be attacked in the flank or rear by fully-equipped, swimming soldiers:

> The barbarians thought that the Romans would not be able to cross it without a bridge, and consequently bivouacked in rather careless fashion on the opposite bank; but he [Plautius] sent across a detachment of Celts [the *Keltoi*], who were accustomed to swim easily in full armour across the most turbulent streams. These fell unexpectedly upon the enemy, but instead of shooting at any of the men they confined themselves to wounding the horses that drew their chariots; and in the confusion that followed not even the enemy's mounted warriors could save themselves.

The *Keltoi* were unique in relation to the rest of Plautius' army for, although legionary recruits were taught and practised swimming (Vegetius, *De Re Militari*: Book 1), they were not trained to swim in full armour and its lack would have left them exposed and vulnerable.

Having a capability that was inherently dangerous, such as swimming in deep, swift water in full armour, means that it would only be used when other safer and easier crossing-methods were unavailable. To state the obvious for emphasis, a Roman army unit trained for swimming, armoured or not, was unlikely to do so if there was a bridge, boats or rafts available, or it could wade across; the *Keltoi* swam where they could not wade.

Therefore, the primary determinant of the method of crossing was the hydrological condition of the particular stretch of river. This study therefore examined the rivers of South-East England, identifying those stretches where only the *Keltoi* could have crossed by swimming.

The method

Briefly, the most likely month for the two-day river battle was determined; followed by the fluvial reconstruction of all rivers in the South-East for that month in AD 43; the wadeability of these rivers was assessed; relative sea-level changes since that time examined and applied to the fluvial regimes; and, finally, tidal influences were applied to the earlier findings.

The parameters of modern-day rivers cannot be casually retrofitted to past events because human activity has greatly altered rivers, such that a modern reach will have a different width, depth, velocity, etc., in comparison to its earlier self. In this study, therefore, the parameters for all rivers in AD 43 were totally reconstructed using geographical information system software (SAGA).

The study area enclosed the land between the river Test in the west, and the Thames in the north (**Fig. 1**); the area for the fluvial calculations was considerably larger to allow the inclusion of drainage basin data that contributed to the flow within the study area.

Dio did not supply dates in his account, therefore a number of pieces of circumstantial and logical evidence were concatenated to provide a likely month for the battle (Kaye 2014). This exercise resulted in a landing at the beachhead in mid-June followed approximately a month later by the two-day river battle. In this

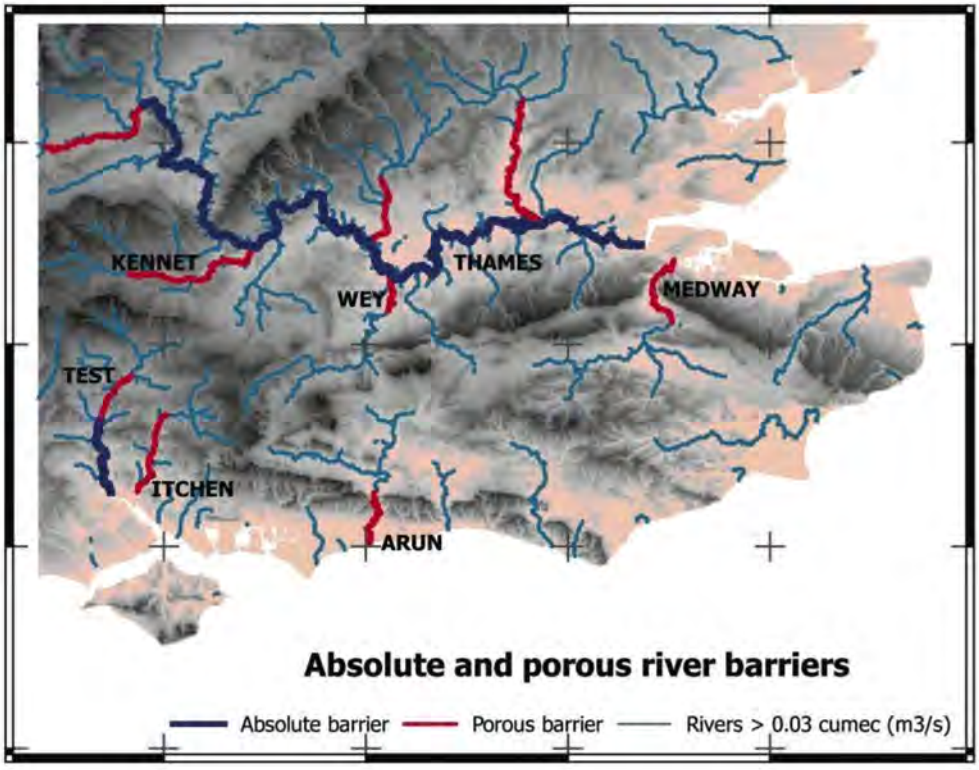

Fig. 1 Absolute and porous river barriers to wading. Based on fluvial calculations, tidal effects not included. The absolute barriers were the lower Test and Thames (thick blue); the porous barriers were the Kennet, Wey, Medway, Arun, Itchen and the upper reaches of the Test and Thames (thick red). The thin, light blue rivers and reaches were wadeable and also would have flowed sufficient water (0.02968 cubic metres per second [cumec]) to supply the minimum needs of the Roman army. Grid spacing at 50 km. (Note: rivers and reaches flowing less than 0.02968 cubic metres were calculated and examined).

study, therefore, all hydrological calculations are for July. It should be mentioned that because the bases for the fluvial calculations, outlined below, are conservative, the findings can be applied to June without requiring extraordinary weather or fluvial conditions.

The 'catchment water balance' hydrological method (Gustard *et al.* 1992) was used to calculate the natural channels created by the rivers in AD 43; these were then filled with the calculated discharge for July. From that exercise discharge rates, average depths, thalweg depths, widths and velocities for all rivers at the time of the two-day river battle were derived (Kaye 2014).

A study of published wading limits was conducted with the aim of discovering what the Roman soldiers could reasonably have been expected to wade. The limit set was the critical instability index value, hv_c (the product of depth and velocity), of 1.32m^2/s (Jonkman and Penning-Rowsell 2008), this being low in relation to

modern studies and historical testimony. Also adopted was a critical water depth limit of 1.25m; any reach greater than this could not be waded.

The hv_c limit differentiates rivers and their reaches between those with an hv equal or greater than 1.32m²/s that had to be crossed by bridge, boat, draining-trenches or swimming, and those with less that could have been waded. The study proposed that the *Keltoi* would only be required to swim a reach of a river of hv greater than 1.32m²/s and a depth greater than 1.25m.

Hence, combining the fluvial data with the wading limits allowed a differentiation between rivers that were:

1) wadeable
2) absolute barriers, i.e. those that could not have been waded anywhere
3) porous barriers, i.e. those that could have been waded but only at reaches where the thalweg was less deep (the thalweg is variable, typically deep at bends and shallow in straight reaches; the latter being sought for wading).

The Thames and Test were classified as absolute wading barriers but *all* the other *non-tidal* reaches in South-East England were either wadeable or porous to wading and probably not the site of the two-day river battle (Fig. 1 and **Table 1**).

TABLE 1. MAXIMUM DEPTH AND INSTABILITY MEASURES

	Thames	Test	Kennet	Wey	Medway	Arun	Itchen
River depth	1.96	1.35	< 1.25	< 1.25	<1.25	<1.25	<1.25
Thalweg depth	2.49	1.72	1.49	1.29	1.31	1.28	1.46
Instability – river depth	2.86	1.53	< 1.32	< 1.32	<1.32	<1.32	<1.32
Instability - thalweg	3.64	1.94	1.52	< 1.32	<1.32	<1.32	1.48

Note: Maximum depths (m) and Instability Indices (hv [m²/s]) for the average July river and thalweg depths that were absolute or porous barriers to wading Roman soldiers. Numbers preceded with a less than (<) symbol were below the chosen limits of 1.25m water depth and the 1.32m²/s critical instability index (hv_c). Only the lower reaches of the Thames and Test were absolute barriers, the other rivers were porous. All other rivers (not shown) in South-East England would have been easily waded at any reach. Tide values have not been applied.

The main findings of the combined fluvial and wading limits study were that:

1. Only the Thames and Test formed absolute barriers. However the former, according to Dio's account, was not the site of the two-day river battle. The latter could not be completely eliminated as a candidate battle site but it was an unlikely possibility, as it is far to the west and would have required a long convoluted march to bring the protagonists to the tidal Thames;
2. Similarly, the Itchen was far from the tidal Thames, a porous barrier and unlikely to be a candidate battle site;
3. Previously mentioned candidate battle sites, the Wey and Mole (Bird 2000), could be discounted as the former was just porous and the latter readily waded in any reach;

4. The Kennet had a maximum thalweg of 1.49m at its confluence with the Thames and a thalweg hv of 1.52m²/s. Both values could be considered high and indicate that the Kennet would have caused the Romans inconvenience in finding wading points (however, the author is not aware of the Kennet ever being previously considered as a candidate battle site);
5. Neither the fluvial Arun nor the Medway were likely to be the site of the battle because neither the limit for the river depth, nor the instability index, were exceeded and the thalweg depth just exceeds the limit, i.e. the two rivers were benign to wading soldiers;
6. Therefore, *based solely on fluvial characteristics*, none of the rivers in the study area required the deployment of swimming soldiers.

Tidally-influenced rivers in AD *43*

If tidal considerations are included then only the Medway and Arun could be considered as possible sites but both would then have had different physical characteristics due to post-glacial, relative sea-level changes and human agency.

In **Fig. 2** the broad scale and extent of the relative rise and fall of the British landmass is apparent, for example, South-East England has experienced a

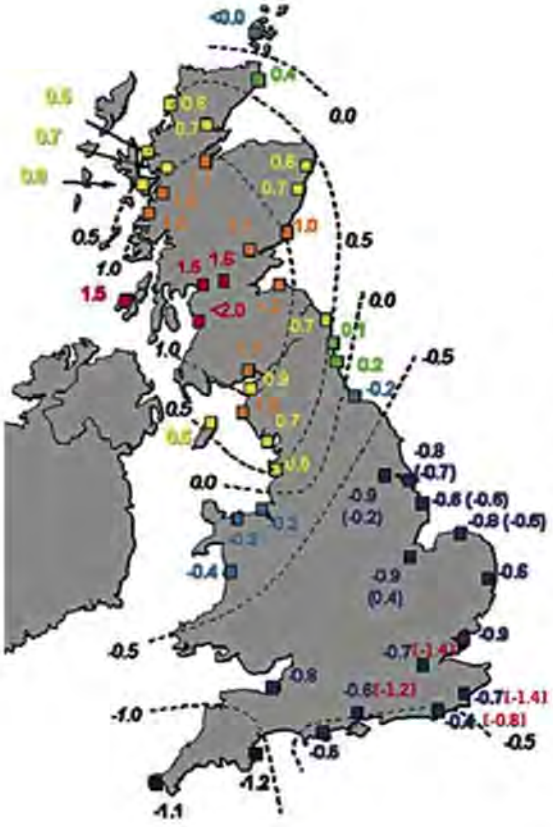

Fig. 2 Late Holocene (last 4,000 years) mean, relative, sea-level changes (mm/yr). Positive values indicate the land has risen relative to the sea-level, negative the opposite. Values in parentheses indicate modelling of local tidal ranges. Red values in square brackets are relative sea-level changes in metres for South-East England since AD 43. Note that no allowance has been made for the compaction of local sediments. Primary source: *Updates to regional net sea-level change estimates for Great Britain*, UK Climate Impacts Programme, 2007. Secondary source: Shennan and Horton, 2002.

negative, mean, relative sea-level change, i.e. the land has lowered relative to an approximately constant sea-level during the Late Holocene and, by implication due to compatible date ranges, since the Roman invasion in AD 43. This study calculated that the land has fallen relative to sea-level by 1.41m in the London and north Kent regions; 0.8m on the South-East coast (around Eastbourne and Hastings); and 1.2m in the Solent region.

With relatively higher land in AD 43 tidal effects may not have travelled as far inland as they do today, but precisely calculating by how much less is difficult due to many unknown ancient factors that influenced the ebb and flow.

Furthermore, human agency operating over the centuries has varyingly altered the estuaries and tidal reaches of all rivers in South-East England, typically in an effort to reclaim land and/or enhance the carrying capacity of the river for either flood-relief or transport. In their natural state in AD 43 most rivers in South-East England approached their estuaries in a single channel, much as they do today. But the estuaries then were generally very different, with a main channel often accompanied by tidal sub-channels separated by mud-flats and salt-marshes. Today, after centuries of engineering works and draining of marshes, etc., most of the ancient estuarine land has been claimed as farmland, with a single tidal channel flowing within. Furthermore, due to engineering works to improve transportation, the tidal effects within these modern channels often extends far inland, much further than the natural flow in AD 43.

The known archaeology and a myriad of geological processes have been combined to produce a coastal map for the South-East in the Roman era (**Fig. 3**). It shows a coastline significantly different to today's: more intricate and indented, with longer sand and gravel spits embaying large lagoons and, of course, the coastline extended further out to sea, all of which would have altered the tidal regimes operating within the rivers. This information can be combined with the earlier findings on fluvial flows and wading limits to compare the only rivers remaining for consideration as possible sites for the two-day river battle: the Arun and Medway.

Comparing the Arun and Medway

In summary, the fluvial characteristics of the Arun (**Fig. 4** and **Table 2**) and Medway (**Fig. 5** and **Table 3**) were benign to wading Romans in AD 43: they were not absolute barriers; both were easily porous; and neither had an instability index, hv (m^2/s), that exceeded the limit to wading.

In AD 43 the Arun entered the English Channel *c*.4km further south of where it does today (Fig. 3), while the Medway has little changed, for example, the modern Rochester Bridge (Fig. 4) may be underlain by the foundations of the Roman equivalent. Therefore in AD 43 the tide in the Arun flowed 6.75km before reaching its probable limit at Ford; the limit for the Medway was probably at Snodland, an inland distance of 10.8km (Kaye 2014).

A summary of fluvial and tidal findings for the Arun in AD 43 would conclude: that it may have been tidal to Ford; had been a porous barrier to wading Romans from Ford to just north of Houghton Bridge; and, from that point north, readily waded by Roman legionaries. Only the tidal reach south of Ford might have required the *Keltoi* to swim.

Consequently, the postulated site of the two-day river battle at Pulborough (Hind

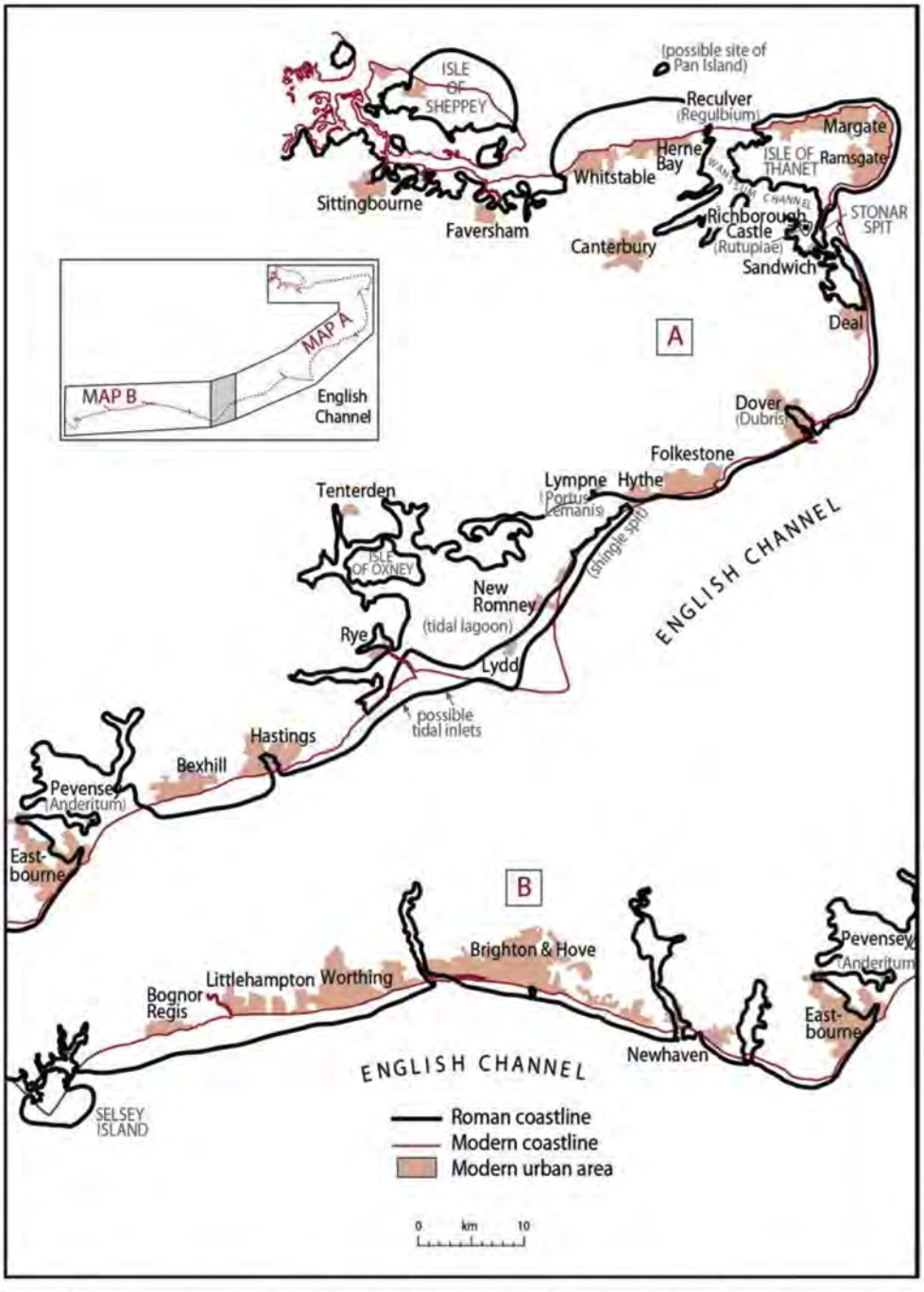

Fig. 3 The Roman coastline of East Sussex and Kent. Map courtesy of Dr C. Moses, Beaches at Risk (BAR) Project, Interim report No. 4, January 2005. The original BAR text is: 'BAR researchers have prepared this map using archaeological and geological data as well as cliff-retreat rates calculated from historic maps. Despite many uncertainties, it is clear that the coastline in Roman times was more intricate than at present, with larger tidal estuaries and bays. Coastal cliffs extended further out to sea, making France and England even closer neighbours. Beach shingle is likely to have been more plentiful'.

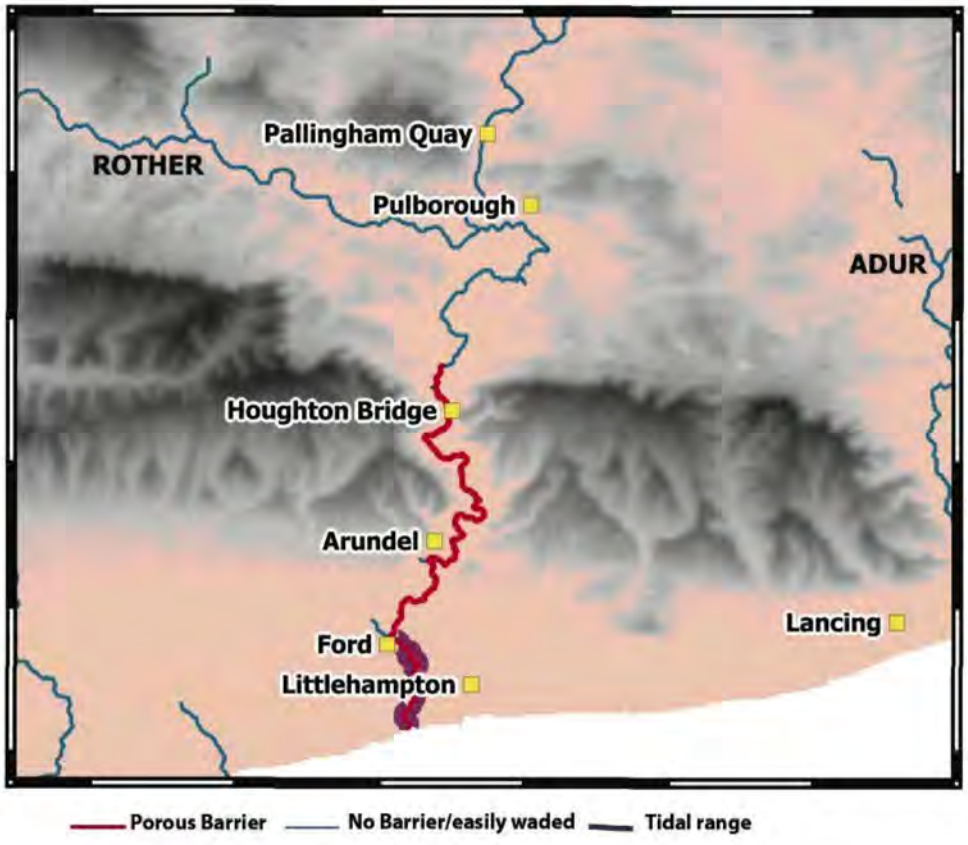

Fig. 4 The Arun, West Sussex, tidal range and wadeability in AD 43. The river was probably tidal to Ford; was a porous barrier to wading to just beyond Houghton Bridge; and, further north, easily waded by Roman units, such that the river offers no barrier at Pulborough. Note that the tidal range does not extend into the upland region of the South Downs and that the coastline extended c.4km further south than shown. Grid spacing at 5km.

2007) can be dismissed as a possibility, there being no reason why the *Keltoi* would have had to swim the Arun anywhere north of Ford, *c*.15km away. Indeed, the legionaries could have easily waded the river near Pulborough at any point and at any time.

A critical difference between the two rivers was the limit to tidal ingress, i.e. the Arun's did not extend as far as the South Downs, but the Medway's progressed southwards through the steep-sided and narrow Medway Gap in the North Downs. Hence, any British force located on high ground, and wishing to oppose the Romans either wading, rafting or building a bridge, would have had the benefit of the tidal-depth and energy at the Medway Gap. This was not so for the Arun. Here, a British force on the Downs could have been directly attacked from the centre and flanked, both north and south, by wading Roman legionaries; thus swimming *Keltoi,* somewhere south of Ford, would have been tactically superfluous.

Therefore, the Arun was not the location for the two-day river battle. This

TABLE 2. STATISTICS FOR POINTS ON THE RIVER ARUN

Location	Dates for the location of the tidal limit	Distance to sea, AD 43 (km)	River depth, July AD 43	Thalweg depth, July AD 43	Instability index for thalweg, July AD 43
Pallingham Quay	Present day	26	0.78	0.99	0.77
Pulborough	Post-1785	22.5	0.97	1.23	1.10
Houghton Bridge	1785	15	0.98	1.25	1.14
North Stoke	1547	140.98	0.98	1.25	1.14
Arundel	Post-1086	10.5	0.99	1.26	1.15
Ford	1086 and AD 43 (?)	6.75	1.01	1.29	1.19
Littlehampton (mouth – present day)	Unknown	4	1.01	1.29	1.19

Note: The distance figures are straight-line values to the river mouth and can be thought of as military 'fronts'. Note that the average river depth (m) nowhere exceeded the 1.25m wading limit and the thalweg depth (m) only just exceeded this limit at, and south of, Arundel. Nowhere on the river was the critical instability index value of 1.32m²/s exceeded (tide values excluded).

TABLE 3. STATISTICS FOR POINTS ON THE RIVER MEDWAY

Location	Dates for the location of the tidal limit	Distance to sea, AD 43	River depth, July AD 43	Thalweg depth, July AD 43	Instability index for thalweg, July AD 43
Teston	NA	18.1	0.96	1.22	1.09
East Farleigh	c. 1798	16.5	0.96	1.22	1.09
Maidstone	Unknown	14.6	0.98	1.25	1.14
Allington Lock	Present day (imposed)	12.7	0.99	1.26	1.15
Aylesford	AD 43 (?)	12.1	0.99	1.26	1.15
Snodland	AD 43 (?)	10.8	1.0	1.28	1.18
Halling	Unknown	8.8	1.01	1.28	1.19
Cuxton	Unknown	6.4	1.01	1.29	1.19
Rochester Bridge	Unknown	3	1.02	1.3	1.2
Mouth	Unknown	0	1.03	1.31	1.23

Note: The distance figures (km) are straight-line values to the river mouth and can be thought of as military 'fronts'. Note that the average river depth nowhere exceeded the 1.25m wading limit but the thalweg depth exceeded this limit at all points north of Maidstone. Nowhere on the river was the critical instability index value of 1.32m²/s exceeded (tide values excluded).

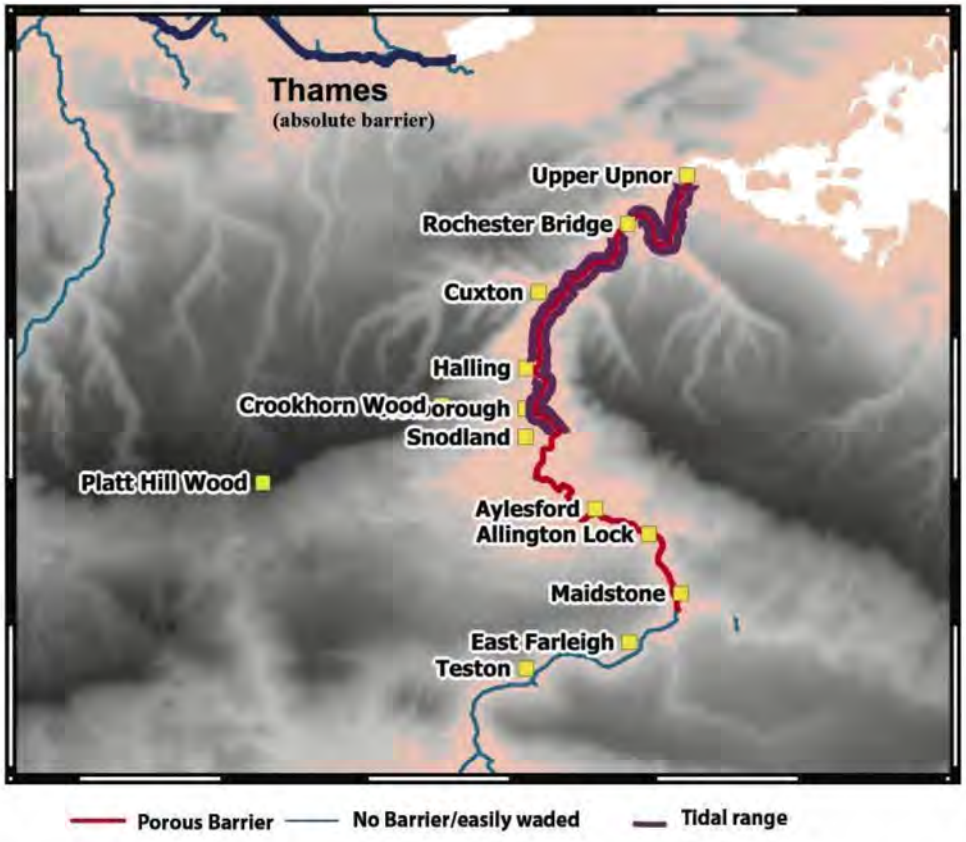

Fig. 5 The Medway tidal range and wadeability in AD 43. The river was probably tidal to Snodland; was a porous barrier to wading as far as Maidstone; and, further south, easily waded by Roman units. Note that the tidal range extends into the North Downs. Grid spacing at 5km.

observation, of course, leaves only the Medway as a contender for the site of the two-day river battle.

The Medway as the battle site

The Medway is (IECS 1993) and probably was, ebb-dominated, with the tidal component of the river depth being intermittent twice-daily leaving just the average July water depth or some level of thalweg depth (Table 3). Therefore, for one or two hours twice a day the tidal river may have been porous to wading legionaries. Of course, some means such as a corduroy of logs placed over the muddy embankments, may have been required, but this would not have troubled the engineers in a Roman army. Consequently the tidal range shown in Fig. 5 may not have formed an absolute wading-barrier, but instead, a tidally-determined porous barrier, possibly as far north as Cuxton where the average July water depth was only 1.01m.

If the British intent was to hold the ground to the west of the Medway and gain an advantage in battle by attacking as the Romans crossed the river, then the tidally- and fluvially-porous reaches south of Rochester were favourable locations. Presumably the British calculated that while the Romans could wade upstream of Rochester, they could not cross much further seaward. In which case the *Keltoi* would have taken the British by surprise by swimming the river at such a point, possibly in the area of Upper Upnor before the river widened considerably. Furthermore, a viewshed analysis (Kaye 2014) from Upper Upnor, suggests that this area would not have been within the British line of sight from nearly all locations west of the Medway, unless the observer was on the heights immediately west of Upper Upnor. Thus, a hidden move to the river, followed by a swift swim by the *Keltoi* would, if they were only observed locally, have left little time for the British commanders to amass an opposing force. A late detection of the *Keltoi* by the British might have initiated a rapid reinforcement of the area and, if so, the swift chariots might have been the first to arrive and they bore the brunt of the fighting as – possibly – reflected in Dio's writing. Note that this situation was in complete contrast to the situation on the Arun, where all Roman movements would have been seen from the elevations on the South Downs. Of course, the assumption was that these were daylight movements and not hidden in woods.

For all points upstream of Upper Upnor there must have existed some level of doubt, at least in prudent British minds, about whether the Romans could wade or not; only in the area of Upper Upnor (or further seaward) would they have thought themselves safe from wading Roman units.

This would have given the British a front, from Upper Upnor to Snodland, of approximately 11km to guard and contest any wading Roman units. South of Snodland the British would have expected the Romans to easily wade the river, in which case their most likely battle strategy may have been to withdraw from the Medway to the elevated ground between Platt Hill Wood and Crookhorn Wood (Fig. 5) which was protected to the south by the steep gradient of the North Downs escarpment.

In summary, it is found that the river Medway was the only river in South-East England that would have required the *Keltoi* to swim under the circumstances described by Dio. Therefore, the Medway probably was the site of the two-day river battle and, consequentially, the Kent coast the location of the beachhead.

Approach routes and beachheads

Aulus Plautius probably had a force of 40,000 soldiers, legionaries and auxiliaries, a further 10,000 supporting men, at least 10,000 mules and an unknown number of horses; in combination they required at least 880,000 litres of water per day and for the rivers supplying the marching camps and beachhead to flow at least 0.02968m^3 per second. The needs of the invasion fleet might have increased the demand on the water source(s). Neither the beachhead nor marching camps could be sustained without adequate water. This necessarily imposed limits on where the force could have been landed and the placement of marching camps on the approach routes to the Medway.

As a result there were only two approach routes to the Medway: either north of

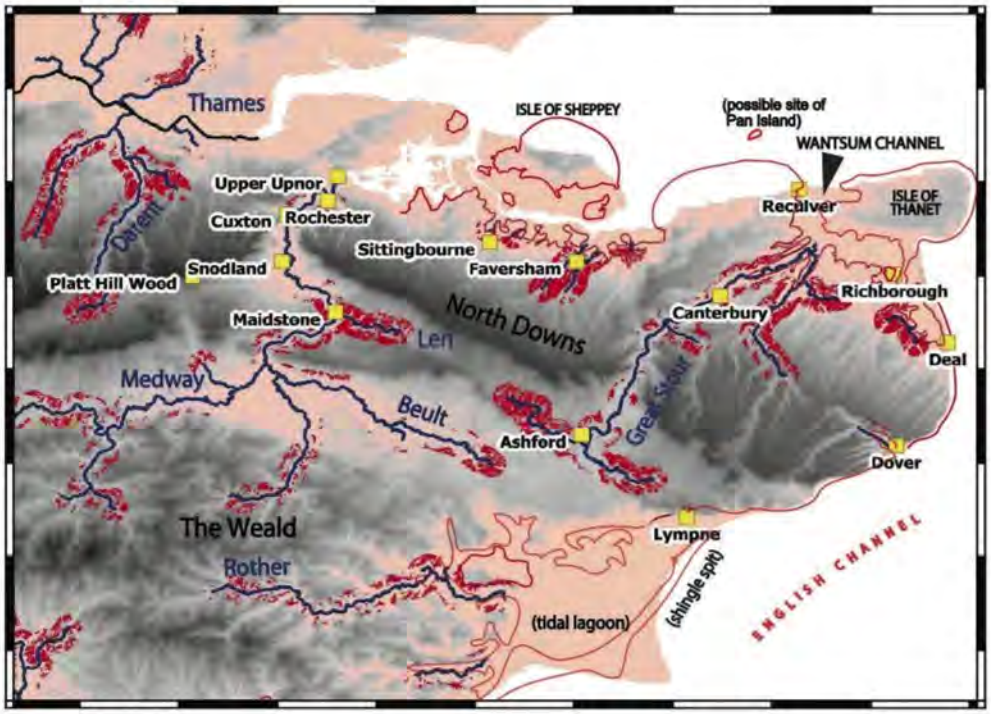

Fig. 6 Approach routes and beachheads in Kent. The red patches were the areas most suitable for Roman marching and beachhead camps. The rivers were those that could supply sufficient water for the Roman army, 0.02968m^3/s. The elevation data displays the current coastline; the red coastline is for AD 43 (source: Beaches at Risk (BAR) Project, Interim report, January 2005). Grid spacing at 10km.

the North Downs taking the axis Canterbury – Faversham – Rochester or south of the Downs along the axis Canterbury – Ashford – Maidstone (**Fig. 6**). The red areas in Fig. 6 show the most favourable camp grounds based on a study of temporary marching camps in Britain (Kaye 2013). The southern axis was probably the easiest route and would have brought the Roman army to Maidstone at a point on the Medway easily waded, thus greatly diminishing the tactical need for swimming *Keltoi*. In contrast, the northern approach axis would have brought the army to Rochester where the Medway was unlikely to be wadeable. Hence the bulk of the army might have turned south, marching alongside the river until reaching wading points; meanwhile the *Keltoi* remained behind in the Rochester – Upper Upnor environs before performing their *pièce de résistance*. This northern approach route and deployment best matches Dio's account and the work previously discussed in this essay.

With regard to possible beachheads, Richborough, Reculver and Lympne have all been previously championed but were at least 4.5km from a river capable of supplying adequate water and, hence, can be discounted (Fig. 6).

A suitable beachhead might have been in the area to the north-west of Deal. Today the land extends from Deal northwards to the Isle of Thanet, but in AD

43 there was a tidal inlet, sheltered by a spit, with adequate water and a gently shelving coast bordering higher ground. It should be pointed out that the exact form of the coast, river or spit in AD 43 is not known.

The same limiting observation can be made for the western shore of the Wantsum Channel, which in AD 43 lay between the Isle of Thanet and the mainland and where the mouth of the Great Stour was located. Nevertheless, this area is the most commonly-cited location for the beachhead. If the coast depicted in Fig. 6 is correct then the most likely entrance to the channel was from the north, the southern being narrow and probably difficult to navigate.

Moving westwards along the north coast of Kent brings into consideration the area around Faversham (Fig. 6). It had adequate water together with a broad inlet sheltered from the North Sea. Additionally, the coastline in AD 43 was closer to the southern high and firm ground than it is today. Based on the evidence of topography and hydrology, Faversham cannot be discounted as a beachhead, plus, it does have the strategic benefit of being closer to the Thames crossings.

Conclusion

New location information derived from an amalgam of river, wading, tidal and relative sea-level data leads to the following conclusions: the Medway was the only river capable of matching Dio's account of the two-day river battle, and the Roman beachhead in AD 43 was on the Kent coast, probably either at Faversham, the mouth of the Great Stour in the Wantsum Channel, or a lagoon north-west of Deal.

STEVE KAYE

Beaches at Risk (BAR) Project, January 2005, *Beach Sustainability and Biodiversity on Eastern Channel Coasts*, Interim report No. 4 (2004). http://www.sussex.ac.uk/geography/researchprojects/BAR/home.html

Bird, D., 2000, *The Claudian Invasion Campaign Reconsidered*, Oxford Journal of Archaeology, vol. 19, Issue 1.

Gustard, A., Bullock, A. and Dixon, J., 1992, *Low flow estimation in the United Kingdom*, Report No. 108, Institute of Hydrology (NERC).

Halcrow Ltd., 2010, *Medway estuary and Swale shoreline management plan SMP*, Appendix C – baseline estuary processes.

Hind, J.G.F., 2007, 'A. Plautius' Campaign in Britain: an Alternative Reading of the Narrative in Cassius Dio (60.19.5-21.2)', *Britannia*, Vol. 38.

Hoffmann, B., 2013, *The Roman Invasion of Britain: Archaeology versus History*, Pen and Sword.

IECS, 1993, *The Medway estuary. Coastal processes and conservation*, Institute of Estuarine and Coastal Studies, University of Hull.

Jonkman, S.N. and Penning-Rowsell, E., 2008, 'Human Instability in Flood Flows', *Journal of the American Water Resources Association* (JAWRA) 44(4):1-11.

Kaye, S.J., 2013, 'Roman marching camps in Britain: GIS, statistical analysis and hydrological examination of known camp sites, resulting in the prediction of possible camp sites', http://independent.academia.edu/SteveKaye, unpubl. essay.

Kaye, S.J., 2014, 'The Roman invasion of Britain, AD 43: riverine, wading and tidal studies as a means of limiting the possible locations of the invasion-ground and the two-day river battle', http://independent.academia.edu/SteveKaye, unpubl. essay.

SAGA, *System for Automated Geoscientific Analyses*, an Open Source GIS. http://www.saga-gis.org/en/index.html .

Shennan, I. and Horton, B., 2002, 'Holocene land- and sea-level changes in Great Britain', *Journal of Quaternary Science*, 17, 511-526.

A ROMAN SILVER CROSSBOW BROOCH FROM THE VICINITY OF ST RADIGUND'S ABBEY, NEAR DOVER

A silver crossbow brooch was recovered from the plough soil in the late 1980s near to St Radigund's Abbey. The exact find spot near a footpath has been lost to the passage of time; it was in an area of level ground on the North Downs at an elevation of 135m AOD, between the Alkham Valley and Coombe Valley (NGR TR 26883 42235), 0.76km north-west of St Radigund's Abbey farm.

Unfortunately, the finder had not recognised the importance of the find which was completely covered in green and black patina, and thought to be bronze. The item was viewed by the author during 2013 – during the conservation process, small slivers of patina cleanly lifted from the surface revealing a decorated silver brooch.

The early types of these heavy crossbow cloak fasteners/ brooches had terminals that screwed into the arms of the brooch and first appeared around AD 200. They occur in significant numbers in the Limes forts along the Rhine and Danube, and also in Oudenburg, although silver and gold examples are rare. Around AD 250, an even heavier type with fixed onion shaped terminals evolved, some of the earliest examples being found in graves at Koln in association with objects assigned to 270-330 (Bushe-Fox 1949).

Crossbow brooches, an important variation of fibulae, were worn as status symbols by senior ranking officers in the Roman army as well as eminent officials of the Roman state (Johns, C. 2006). These brooches were an effective and robust design of safety pin, the most prestigious examples being made in silver or gold.

A number of other bronze and gilt examples have been found at military sites around Britain including several examples from Kent. A published study records 15 silver and 8 gold examples of the period found in the UK and Continental Europe (Swift 2000). Parallels have been found in Belgium and the Netherlands in burials 27, 57, 115 and 172 from the cemetery of Oudenburg, dated to the second half of the fourth century (Mertens, J. and van Impe, L. 1971). Other examples are:

Sc110, with the catchplate missing, from Tongeren, Gallo-Roman Museum, Belgium;

RMOL05 from Maasdiel;

RMOL25 from Wijk bij Duurstede, a Roman rural settlement in the Lower Rhine (where many military objects have been found).

A recent study of the crossbow brooches from the Netherlands and Belgium indicates that the average length of Type 3/4b is 75mm, width 50mm and height 27mm. The St Radigund's example is slightly bigger and uncommon and probably related to the military reorganisation and changing fashions in the 4th century (Van Thienen 2014, *pers. comm.*).

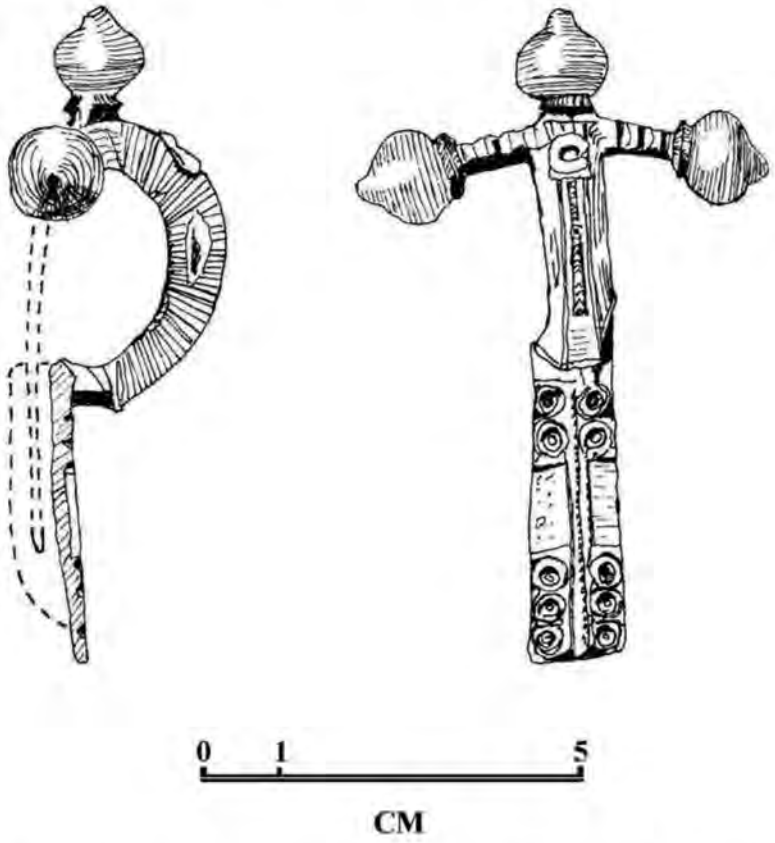

Fig. 1 The St Radigund's Roman crossbow brooch. (Illustration by William Laing.)

Fig. 1 shows the fully developed Type 3/4b (in Swift 2000), or Type 4a (Keller 1971), dated to the second half of the 4th century (although this late form does not appear in the Limes forts). During the excavation at the Roman fort at Richborough, similar (albeit bronze) examples were recovered of which the eight relevant ones are:

no. 9 (Bushe-Fox 1926, plate XII),

nos 16, 17 and 18 (Bushe-Fox 1928, plates XVII-XVIII),

no. 64 (Bushe-Fox 1949) and no. 65 (being the fully developed 4th-century crossbow with exact parallels having been found in Mainz (*Lindenschmit, A.V.H.V. iii,2, iv, fig.2),* and in Totis, Hungary (Roder, Fahrbuch des Provinzial Museum zu Hannover, N.F.V., fig. I, p. 14).

nos 80 and 81 (Cunliffe 1968, plate XXXIII).

(For a more recent review of the brooches from Richborough and composition analysis, see Bayley, J. and Butcher, S. 2004.)

In detail the St Radigund's example was cast with three fixed 'onion' terminals with beading below the knobs; the arms are decorated with three raised ribs on either side. Inset into an aperture just below the head terminal on the bow, the brooch is embellished with in situ dark blue niello setting, rarely still present on most examples. The ornamentation down the stem is formed by linear double vertical groves on opposing sides, closed just above the bow and foot juncture.

The foot decoration is almost the same as the Richborough brooch no. 65, consisting of an undecorated central faceted border separating two rows of incised twin annulet patterns on the upper foot and two rows of three incised annulets on the lower part. However, the Richborough top row of annulets is notably uneven in comparison to the St Radigund's example. Both types also differ in that the St Radigund's brooch has three incised linear grooves separating the two sides of the lower foot's geometric pattern. The grooves on the St Radigund's example also terminate between the top juncture of the faceted border and the upper annulet decorations on the bow-stem. The Richborough brooch also terminates between the top juncture and faceted border although the bow-stem is decorated with chevrons enclosed by twin vertical borders. From the brooch examples found at Richborough, the foot design of the bronze brooch no. 65 is geometrically parallel.

The overall length of the St Radigund's example is 8.2cm, marginally greater than the 8.1cm of example no. 65. The individual finish and decoration of these brooches were very personal although similar motifs and styles are found on most crossbow brooches in the UK and Continental Europe. The foot decoration, Type b2, is very common, although less so in Britain. The distribution of examples with this foot pattern shows many in the Danube provinces (Swift, E. 2000).

Imperfections in the casting process of the St Radigund example can been seen in the twisted left angle of the head terminal together with two small holes present on the bow-stem and a further indentation on the left lateral side of the bow. A peculiarity in the functioning of the brooch is the complete absence of the solid catchplate and pin socket which had been vertically sawn off from the top to the bottom of the foot. During the cleaning process, on removal of the thick layer of patina, a series of grooved hacking marks were exposed running down the length of the foot suggesting removal of the catch-plate in antiquity.

The sawn off catch-plate provides good evidence of intentional removal, possibly related to a phenomenon from brooches found in Nijmegen, Netherlands. Here many sole arms with attached knobs were found intentionally severed from the rest of the brooch. They all have approximately the same size and weight. Two possible options for this occurrence are postulated: one related to weights used for balances, the other to paying solders when no money was available or where precious metal objects were cut up to pay off the barbarian hordes. Further research is being undertaken (van Thienen, 2014, *pers. comm.*).

The St Radigund brooch silver content has been non-invasively examined and authenticated as solid silver by F. Hind, jeweller, Dover. The silver weight is 54.14g; the missing catch-plate and pin is estimated at about 6.0g, suggesting an overall weight of around 60g. In the mid 4th century, the brooch represented a sizeable investment for a single dress accessory with the average pay of a common solider a little over one denarius per day. Based on the average weight of four

specimens of late 4th-century Roman silver denarius at 3.5grams, the intrinsic ancient value in silver of this brooch equates to about 17 days of a soldiers pay. This figure does not take into account the artisan's time in creating the mould and producing the brooch for sale. Theoretically, it can be estimated that the final net value of the brooch could represent in time and material around 20-25 days pay of a soldier.

The findspot of the brooch is perplexing in that no significant Roman archaeology has been found in the area despite a field inspection and previous archaeology undertaken in and around St Radigund's Abbey by Dover Archaeological Group (Parfitt, K. 1993) suggesting that there is no evidence for a late Romano-British settlement or other buildings at this location (Parfitt, K. 2014, *pers. comm.*). Google Earth satellite coverage of the location shows no tangible evidence for contemporary structures, pits, large enclosures, tracks or roads.

Situated 5km NNW of the Roman Fort at Dover (*Dubris*), the location has no obvious military strategic significance and is some 3.5 km west of the main Roman road leading from Dover to Canterbury (Margary 1973). Previous discoveries twenty years apart by Mr Phipps, detectorist, at or near the same location, comprise two rarely found Roman gold coins: Magnus Maximus AD 383-388 Solidus, Trier Ric 76; and Honorius AD 395-402 Solidus, Milan Ric x 1206 (Holman, D. 2009 *pers. comm.*; information extracted from Bland, R. and Loriot, X., 2010.) The landowner has recovered samian bowls, two damaged and one partially reconstructed from sherds, whilst ploughing the fields in the general area (Moynan, W.J. 2014, *pers. comm.*).

The casting defects and the hacked catch-plate may indicate that the brooch, although finished, was rejected and retained for bullion and may indicate a potential small founder-hoard or offering site dating around the mid 4th century; thus, despite the physical absence of Roman structural material some kind of settlement could lie undetected in the vicinity of the findspot.

It can be speculated that this item, if not rejected by the maker, may have been in the possession of a Roman military official of some standing, perhaps associated with the fort at Dover. Geophysical fieldwork in the St Radigund's area is planned by the author that may help in answering this mystery.

Acknowledgements

The writer thanks Mrs Susan Lees for bringing the brooch to his attention (and donating the find for display in Dover District); Mr Moynan for his helpful local background knowledge; Mrs Rebecca and Miss Elissia Burrows for their time cleaning the brooch and William Laing who kindly produced the illustration. He is also grateful to Vince van Thienen (PH.D. student, Ghent University Belgium), Drs Steve Willis and Ellen Swift (of Kent and Canterbury University), and Keith Parfitt (Canterbury Archaeological Trust) for their kind assistance during the research for this report.

VINCE BURROWS

Bayley, J. and Butcher, S., 2004, *Roman Brooches in Britain: a technological and typological study based on the Richborough collection.*

Bushe-Fox, J.P., 1926, *First Report on the Excavations of the Roman Fort at Richborough, Kent*, p. 44, plate XII.

Bushe-Fox, J.P., 1928, *Second Report on the Excavations of the Roman Fort at Richborough, Kent*, p. 44, plate XVIII.

Bushe-Fox, J.P., 1949, *Fourth Report on the Excavations of the Roman Fort at Richborough, Kent*, pp. 121-122, plate XXXII.

Bland, R. and Loriot, X., 2010, *Roman and Early Byzantine Gold Coins found in Britain and Ireland*.

Cunliffe, B.W., 1968, *Fifth Report on the Excavations of the Roman Fort at Richborough, Kent*, p. 91, plate XXXIII.

Johns, C., 2006, *The Jewellery of Roman Britain: Celtic and Classical Traditions*, Routledge.

Keller, E., 1971, *Die spatromische Grabfunde in Sudbayern*.

Margery, I.D., 1973, *Roman Roads in Britain* (3rd edition 1997).

Mertens, J. and van Impe, L., 1971, 'Het Laat-Romeinse grafveld te Oudenburg', Archaeologia Belgica, p. 135.

Parfitt. K., 1993, unpubl. site report.

Swift, E., 2000, *Regionality in Dress Accessories in the Late Roman West*, Monographies Instrumentum II, Monique Mergoil, Montagnac, pp. 14-15, 24-27, fig. 44.