On – and off – the *Edda*

by Martin Carver

During the 1987 season of the Sutton Hoo excavations, Ole Crumlin-Pedersen came to visit, and was able to inspect the scrambled remains of the ship-burial in Mound 2 – a burial which had been entered at least four times since its construction, not always in a spirit of religious devotion or scientific enquiry. Steeped in his research on Slusegård, he raised, with characteristic lateral thinking, aspects of naval architecture and burial practice that opened for me many new connections between one branch of science and another and many new ideas about early medieval people and their use of the sea. That was my first real awakening to the great importance of maritime studies for our subject; I rapidly developed an interest which was to culminate the following year in a baptism of fire, or to be more exact, a baptism in extremely cold water. The godfather on this occasion was another celebrated doyen of the sea, Ray Sutcliffe, who had been making television films about archaeological research since 1965; by preference they would include boats and waterways, and the saltier the better. While putting together our series about the new campaign at Sutton Hoo, he came up with the suggestion for a programme that emphasised the links between the Anglo-Saxons who were buried there and the sea on which they travelled. The great ship discovered in Mound 1 was an obvious starting point. How did such a ship perform? Was she a royal barge or a sea-going warship? What was her debt to Scandinavia? Did she depend on oars alone, or did she sail? I was more interested in the social implications of these technical matters. How maritime were the Anglo-Saxons? Was the North sea, for them, a barrier or a thoroughfare? Was it Scandinavia, or the English Midlands, which represented the most foreign and distant land to those who dwelt in the coastal districts of Anglo-Saxon East Anglia? We addressed some of these questions in the television programme *Sea Peoples* and some of the ideas were eventually published[1].

Our BBC team, collecting material and filming in Norway, had a marvellous opportunity to view two nautical experiments: the first being the performance of a replica of the Kvalsund boat under oars, and the second the maiden voyage of an immaculate replica of that most beautiful of all early medieval vessels, the Oseberg ship. It was while filming the latter experiment, that I experienced the drastic adventure which quite altered my perception of the Vikings, and changed my position from a positive to a passionate advocate of experimental maritime archaeology. Since this experience has never before been related to an adult audience, it will I hope be appropriate to present it now to the person most qualified to assess it, with the expectation of providing him with amusement rather than enlightement. What follows was compiled from notes made at the time, and the reader should be aware that they represent the inexpert reflections of a landlubber: reasonably authentic in observation, but without authority in judgement.

A full scale replica of the ship excavated by Gabriel Gustafson in 1904 at Oseberg[2] was built in 1987 in Norway for Ragnar Thorseth under the supervision of Sigurd Bjørkedal. Eventually named *Edda* (although at first she was *Dronningen*) and equipped with square sail, oars and steerboard, she went on trial in Sunnmøre during early 1988. One of her earliest journeys under sail took place on 6th May, and it was then that her performance under sail and oar was filmed by a BBC crew under the direction of Ray Sutcliffe in connection with the series on Sutton Hoo. The crew on this occasion was Jon Godal (skipper), Liv Godal Heide, Bent Andersen (Viking Ship Museum in Roskilde),

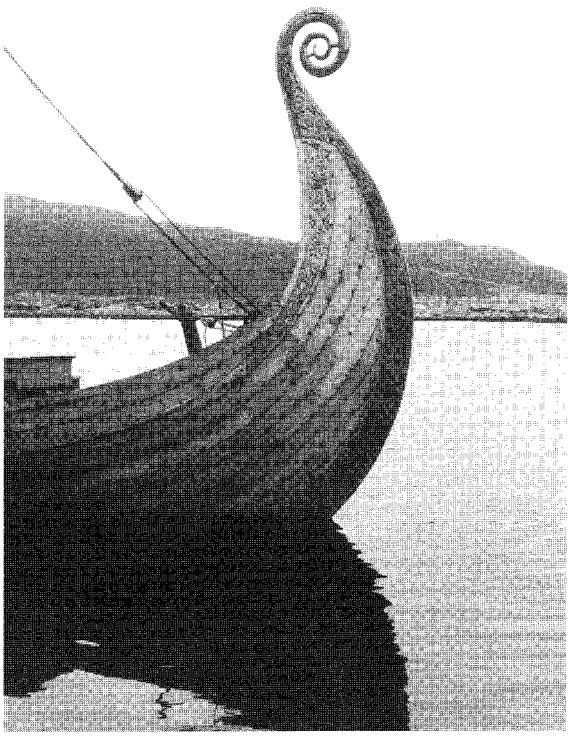

Fig. 1. The *Edda*, prow. Photo: M.O.H. Carver.

Gunnar Austrheim, Arne Terje Sæther and Hans Borgfjord. Ray Sutcliffe, BBC2 Producer, and Martin Carver, director of the Sutton Hoo project and presenter of the television programme, made up the ship's complement of 8. The film crew followed in the escort vessel *Strandholm* with her skipper Sigbjørn Notøy.

The trials took place off Flavær in Herøy fjord within 2km of open sea. The water was calm and the wind initially slack (5-10 knots) rising to 10-15 knots by mid-afternoon. The ship was rowed into the sea breeze and the sail hoisted at about midday. She ran on the starboard tack initially and then crossed the fjord twice at somewhere between 5-15 knots, before returning on the port tack towards her moorings. She then capsized at speed and sank to the bottom. No-one was hurt and the crew remained in the water until picked up by *Strandholm*. Within 36 hours Edda had been located by remote submarine and on the morning of 9th May was lifted by salvage crane and put on dry land, to await refit.

The ship

The ship, which was an impeccably executed copy of that found in the Oseberg mound, lay very tidily in the water with about a metre of freeboard (Fig. 1, 2). The lines of the snake-headed prow and snake-tailed stern appeared very balanced and offered a lively impression to the observer, enhanced by the proximity of water. The colour of the freshly varnished oak (yellow buff) lent an entirely new character to the familiar and much illustrated ornamental carvings on the *brander, tingle* and *span* carried at stem and stern. In contrast to those of the (black) original, the figures appeared humorous and skittish, rather than grotesque. The familiar virtuosity was given an almost mesmeric effect by the wriggling reflection of the ornament in the water at stem and stern. About 40cm of the ornamental frieze lay below the water line, fore and aft, and would have been visible only when the ship was on the stocks. All materials used for hull, frame and rigging were authentic. The frame was lashed to the clinker-built hull with softened whale-baleen, the sheets were of heavy horse-hair and the shrouds of hemp. *Edda* was ballasted with sand in blue plastic bags beneath a deck of small boards each c. 50 x 70 cm. These were not (as in the original) nailed down – happily as it turned out. The oars were not cradled but lay on board alongside the gunwales, as did the yard and the "tacking spar", a forked pole like the one originally found, but not identified in the burial[3]. It was here employed to hold out the forward "throat" (leach) of the sail. The unforked end fitted into a block (on the port or the starboard side depending on the tack) each of which had two sockets (as found on the Gokstad ship), presumably corresponding to two positions and two settings of the sail. The mast was stepped in the "crone" and secured in a massive "fish", with fore and aft stays and 3 hemp shrouds to port and starboard. The mast had been put in upside down with respect to the tree it came from, and appeared to be the same diameter all the way up. It also appeared taller and thicker than that of the original (for the dimensions of the hull and mast in the original ship, see Brøgger et al.[4])

The steerboard resembled that found in the original ship (although the tiller was there missing). It was secured by a tie of three twisted birch withies (it was a pine-root in the original), made into a knot outboard against the blade and wound inboard around the stern bulkhead. It was put into

tension with three wedges. Although functioning well, it was apparent that this arrangement required a certain vigilance. Jon Godal spent some time re-arranging and securing withies and wedges before the trial commenced, and they required resetting on at least one occasion during the voyage.

Two outboard motors had been let in side by side through the planking immediately forward of the helm. They were concealed beneath the decking while under sail. To port of the helm was a waterproof perspex map table and a radio telephone (Fig. 3). Immediately forward of the helm, presumably just forward of the outboard motors, was the securing point for the block of the halyard, which made fast to the cleat at the foot of the mast. Under sail, the halyard ran from the mast aft, about 30cms above the deck to a point 2m forward of the helm, where it turned in a block and tackle forward to masthead and yard. The sheets were secured in cleats adjacent to the helm.

There were a few inches of water in the bilge which was pumped out by electric pump before we cast off.

Performance under oars

The oars were led blade-first through slits in the oar ports. Each was thickened towards the grip, preventing it from dropping through the oar port into the sea. Each oarsman sat on a small box c. 90 x 30 x 20 cms., and occupied a "room" (i.e. space between the ribs), which seemed very small. It was difficult to avoid hitting the back of the rower in front with one's knuckles, particularly if he was large. The oar blades (as in the original) were small, and the motion was a short jabbing stroke in the sea, half-way between a paddle and an "Oxbridge" pull. The rhythm given by our stroke (Arne Saether) was: forward-pause-in-pause. The ship was quite sluggish under oars (although we were only 6 oars as opposed to 30) and very stable, unaffected by water or the breeze before the sail went up. The contrast between rowing and sailing was electrifying.

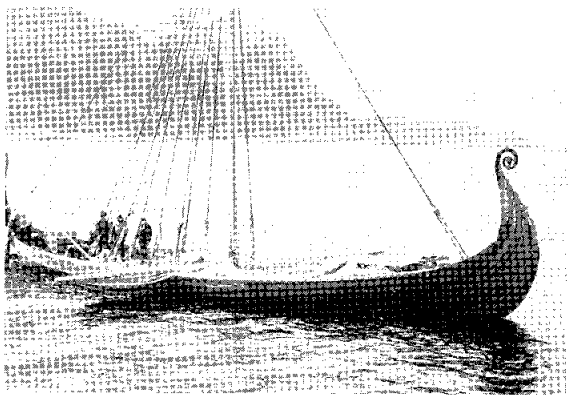

Fig. 2. *Edda*, hove to. Photo: B. Marden-Jones.

Performance under sail

The yard was hoisted by a single halyard and there was just room for four, possibly five pairs of hands to grasp it between its block and tackle and the cleat in which it was secured, and which acted as a brake during hoisting. The wind caught and started to fill the sail and to turn the ship when the yard was about half-way up, so the hoisting had to be done quickly. Additional hands could not have been engaged, since there would have been no additional places on the rope.

Once the yard was hoisted and the halyard secured in its cleat, the ship took off like a train, initially on the starboard tack (Fig. 4). The tacking spar, with its base in one of the two starboard sockets, held the port throat of the sail in its forked end. The starboard throat was sheeted aft on the starboard side. The centre of the sail was also secured by a third "sheet" to the mast, about half way up.

The direct force on the main sheet even in a light breeze was considerable, quite enough to drag the person holding it along the deck, as happened to Jon Godal on one or two occasions. There was no block and tackle for tightening the sheet and it was usual to lock it into a cleat. The sail was, therefore, secured in three places, fore, centre and aft, by three points none of which could be released instantly. Due to the centre of the sail being secured to the mast, the sail billowed in two sectors, almost resembling a jib and mainsail sewed together.

Steering the leading edge of the sail into the wind allowed the ship to tack at about 60 degrees to the wind, going at what seemed an incredible speed. In general she sailed on her side, the topstrakes of the lee side and perhaps the bottom two or three on the windward side being in the water. Any increase of wind or bearing away would tip her over more. The oar-ports were blocked with disks of wood; but for those on the lee side, water generally squirted at high pressure in a circle of jets around the disks. At a certain

Fig. 3. The stern, showing map table, tiller and outboard motors. Photo: M.O.H. Carver.

point, water would be shipped in over the gunwale strake but, unlike in a decked yacht with its scuppers, could not drain out again, so disappeared into the bilge with its sandbags. Another factor contributing to the shipping of water was choppy water which turned the prow (and thus the sail) away from the wind causing the ship to dip in the lee side gunwale.

"Going about" was naturally not easy without a jib, and we would sometimes lose way before the yard could be caught and returned to the wind. On one occasion the ship stalled with its sail set abeam and we started going rapidly astern. The other problems were in the resetting of the tacking spar which seemed to require considerable strength, and the more usual one of the fouling of the slack sheet which lay along the inside of the gunwale, where the oars, oarsmen's chests, etc. were situated. I suspect that the consummate skills of our particular crew made the manoeuvre seem easier than it was. Each time we went about, the lee side shrouds appeared to slacken and had to be retightened.

The performance of the steering gear was difficult to observe. The tiller seemed to behave quite differently on the port tack and the starboard, presumably because of the positioning relative to the water. I obviously cannot report on this directly since I never took the helm, but the steersman seemed to be under some pressure while on the port tack when the blade was deeply immersed in the water. On the first transit we made with the wind to port one of the wedges securing the withies sprang out with a loud clunk. It was in fact almost at the same point, on the same tack an hour later, exposed to the sea breeze, that we capsized; but on that occasion I heard no clunk.

Under sail *Edda* was an unforgettable experience. The speed in relation to the land appeared to be 30-40mph (judging by the speed of a motor car in a built-up area), but I suppose it must have been 15 knots at most, and probably nearer to 10 (11 knots was the top speed registered by the Gokstad replica[5]). As has been observed in other rep-

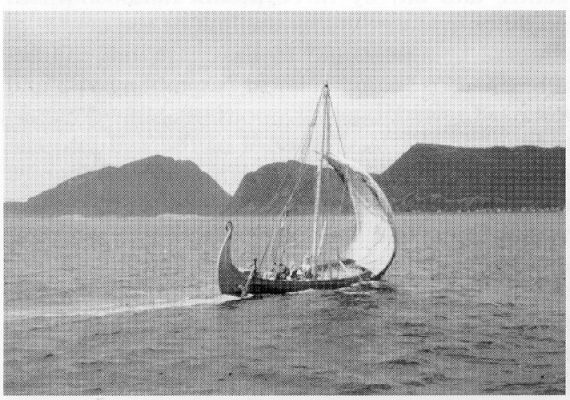

Fig. 4. Hoisting the sail: *Edda* takes off. Photo: B. Marden-Jones.

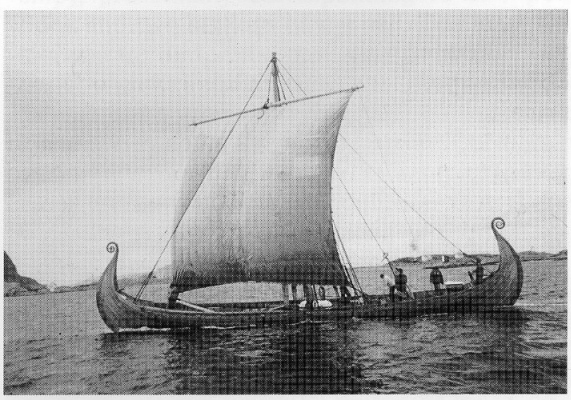

Fig. 5. Under sail. Photo: Don Lee.

Fig. 7. Looking aft, shortly before the capsize. The deck-boards and boxes can be seen. Photo: Hans Borgfjord.

licas which are clinker-built and have lashed frames, the hull appears to ripple and wriggle as if it were alive, adjusting itself to the contours of the water. This adds to the serpentine image provided by the snake-head ornament of the prow and the tail astern. Even in choppy water she does not bash and yaw but appears to glide or slide along the surface.

Sinking

Before the final run back to the boathouse we had shipped water on several occasions at speed, mainly on the port tack, but the ship appeared stable and the ride exhilarating. In experiments of this kind, going over is always a possibility: whatever the skill and experience of a crew, not every detail of an ancient ship's design can be drawn from the surviving original, nor of the way she was likely to have been rigged and handled. As a prudent precaution, it was important to explore her capacity as much as possible before any long voyage was undertaken. Nevertheless, the abrupt end of our experiment came as something of a surprise.

Our final run led through a patch of water with access to a fresher breeze which appeared to have the effect of turning the sail, and the ship, across the wind pushing her over to starboard. We shipped some water, and this was photographed from the prow by Hans Borgfjord (Fig. 7). We came up and then 20 seconds later yawed again and went on going down. The ship braked like a lorry going into a sand trap and was almost stationary when she settled on her side with her sail in the water. This was accompanied by the rumble of oars and boxes sliding across the deck. I had been sitting out to windward on the port gunwale and at this point transferred on top of the oar-ports, now facing the sky. I balanced there, expecting *Edda* to float, on the principle that it was made largely of wood (Fig. 8). However, neither hull nor sail appeared to have any buoyancy, and both began to go down at about the same rate; the ship sank on its side in a horizontal position without either up-ending or turning turtle. It vanished rapidly, followed by a tangle of swirling ropes. I watched the snake-head prow slide under the water and then was deposited in it myself. From first shipping water to the ship sinking out of sight had taken about 20-30 seconds. *Strandholm* was perhaps a mile away at the time, waiting to film an appropriately artistic scene - a Viking ship turning for home with snowy mountains in the background. The camera crew were astonished to note that the ship had suddenly disappeared, to be replaced by a distant carpet of flotsam (Fig. 9). Together with two other ships in the fjord, they came rapidly to the rescue. There was a choice of timber pieces to hang onto and we were picked up by *Strandholm* within 10 minutes or so (Fig. 10). The principal hazard (for me at any rate) was the cold water which, together with my clothes (golfing jacket and wellington boots) made it rather difficult to swim anywhere. In any case, it was perhaps a mile to the nearest land. I would judge that, even for those used to swimming in waters north of Shetland, the paralysing effect of the cold would have made survival difficult at most times of the year.

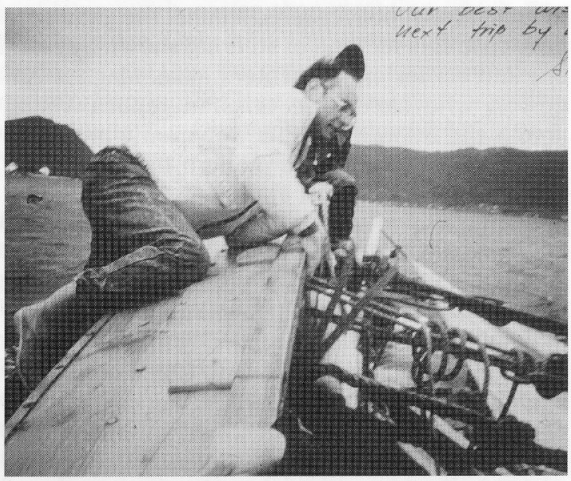

Fig. 8. Clinging to the hull. Photo from the water by Hans Borgfjord.

Fig. 9. Where *Edda* went down. Photo: Don Lee.

Reflections

The investigation of *Edda*'s performance will no doubt be concerned with many aspects of design and technique. Among those which strike a layman are the sensitivity of the steering gear and the great power generated by the sail. On the port tack particularly, the steerboard is so engaged in the sea that it seems to want to climb up under the ship. This seems to be accentuated if the withies are loose. Similarly, if the rope which secures the vertical section of the steering board aft is loosened by the sternwards pressure of the water, moving the tiller forward to bring the ship back into the wind might easily meet with no response, at least initially. However, these untutored apprehensions must be measured against the great confidence in this method of steering shown by modern and earlier experimenters alike. Magnus Anderson who sailed the Gokstad replica *Viking* across the Atlantic in 1893, apparently in weathers which would scare a modern liner crew, decided that this kind of rudder is *the work of a genius ...one man can handle it with ease in all kinds of weather*[6].

The sail's pull on the sheet was also remarkable, and it is understandable to wish to secure it to a cleat. If there were a number of sheets held by many hands (as implied by Gotland picture stones) the human force would act as a safety valve, since a gust of wind would tug the sheets free and spill the wind from the sail, rather than pushing the ship over. A wash-strake could well have provided a further safety valve, preventing the ship from dipping its gunwale too easily and taking in water. It is possible that water was being cumulatively taken into the hull below decks, so that we were gradually losing freeboard without realising it; although the vessel did of course have a pump. Bailing would presumably be a regular duty in a Viking ship, as in a dingy[7]. In our final run the film crew on the other vessel observed considerable yaw and lack of consistent direction, suggesting a heavy response to the steerboard, or a distortion of the hull.

One point of debate is presumably whether the sail was not too large, or at least too broad or too tall. The mast discovered in the burial had survived to a length of 5.70 m and was estimated to have been originally some 13 m long[8]. The height of the experimental mast (which determined the size of the sail) was apparently suggested by the angle of the stem and stern ribs, the masthead being the point at which lines extrapolated from these ribs (i.e. along the fore and aft stays) meet. An alternative might have been to use the Viking rule of thumb that the girth (distance around the ship amidships) equals the height of the mast; or (another rule of thumb) the length of the mast would be 2 1/2 times the width of the hull amidships[9]. Yet another traditional method uses a combination of the number of "rooms" and the length of the boat, such that *the length of the mast in relation to that of the boat will increase as the boat-length increases*[10]. Whatever hypothesis proves practical, the *Edda*'s mast certainly appeared, to the untrained eye, to be rather tall for the length of the vessel. However, it is equally possible that

all the rigging was correct, but that the hull had failed to bear the water pressure while tacking. The wriggling motion of the hull through the water is striking and seductive but may of course mask any loosening of the lashing of the frame, and disguise any buckling of the hull at a penultimate moment.

One way in which our trial may have been unrepresentative, under both oars and sail, was in the number of people on board. The ship has oar positions for 30, and a putative crew of 35[11], while we were 8. Although the full complement of oarsmen may have been a ceremonial rather than a necessary crew, there certainly would have been advantages in having far more people on board. When sailing, it was necessary to have 2 crew members on the tacking spar, one at the helm, one perhaps on the halyard (in case of emergency) and the skipper aft. In our case, this left only two to sit out on the windward gunwale. With 10 or 20 sitting out, it might have been easier to hold her level in the absence of a deep keel. One can easily imagine the speed at which a fully trained sporting crew could cause such a vessel to travel across the surface of the fjord.

Most memorable of all the aspects of this brief voyage was the contrast in *Edda*'s behaviour running before and sailing into the wind. It is of course a truism for most of us that the ships we go in now are quite capable of ignoring most winds. Even the modern yatchsman does not like to commit himself wholly to dependance upon it. And in spite of a boyhood addiction to sea sagas, and a little amateur crewing for my father (an ocean racer for 50 years), I was still not prepared for the sensitivity shown by this extraordinary boat to relatively light airs. With the wind to the aft, the ship acclerated like a leaf on a pond; probably we were aquaplaning, at all events the sensation was certainly similar to wind-surfing. As soon as the wind was no longer directly behind, the stress was immediately apparent: stress on the stays, shrouds, sheets, mast, sail, hull and steering; an impression that one was *dragging along quite a lot of sea*[12]. But that is not to say that tacking was impossible or even inappropriate for such a vessel. Given that it would not be the preferred strategy for a long voyage, and that the practice would have to have been served by a hard apprenticeship, it is difficult to exaggerate the implication of being able to sail against the wind. The voyage of the *Edda* persuaded me that the gift of the Vikings to the early medieval world was not the sail (which as like as not they already had) but the ability to tack.

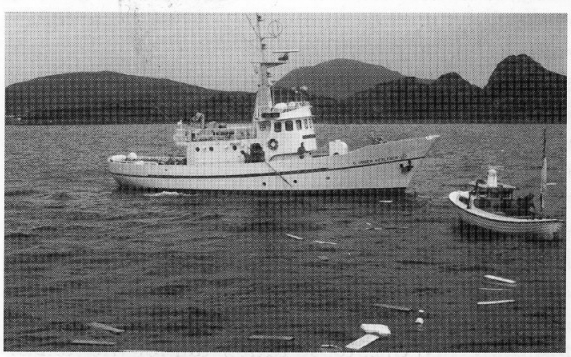

Fig. 10. The scene at the pick-up. Photo: M.O.H Carver.

Those who mistrust experimental archaeology as an academic recreation are inclined to dismiss such adventures, saying that they prove nothing. Whether the experiment is one which is predominately reconstruction, or replication or re-enactment, it can only, in the opinion of its detractors, tell us what might have and not what did happen in the past. While I do not discount the difference between these things, one being factual the other not, it would be wrong I believe to relegate the "might-have-been" to the wilder shores of the discipline. Even academics who began their calling late in life, like me and the scholar we are honouring here, know the value (perhaps we more than most) of the agenda, the work programme. Archaeology, as all twentieth century theory agrees, is about problems rather than antiquarian collecting. But problems themselves have to be discovered; many people find the solving of problems much easier than deciding which the problems are. Only from the identification of the problems and thus the creation of an agenda does new work spring. For those that find such problem-definition taxing, I strongly recommend a ride on a Viking ship, preferably followed by a brisk bathe.

In the weeks and years which followed my immersion in this new subject, a great many questions came to mind, some of which it might be appropriate to share here, in the company of those best equipped to solve them. These questions were themselves born of wild images stimulated by the experiment: a dozen well-organised agile crews racing each other before a light breeze; 20 men sitting out to windward, waiting to leap across as the ship went about; crews faced with five days rowing to get home; crews that made one mistake and never returned, their fate marked

only by an oar washed up on a strand; the interdependance and emotion which bound crews to their ships and to each other. These may be deemed the sentimental musings of the machine age, but they are also thoughts relevant to a consideration of early medieval society and its use of the northern seas. Was sea travel essentially different in the Viking from the pre-Viking Age? Did the earlier mariners, the Frisians, the Angles, the Saxons and the Jutes make "blue-water" crossings? Does the natural ecology of the North Sea and its winds and tides, offer westwards advantage to summer travellers; in other words favour the Scandinavian destined for Britain over the Briton destined for Scandinavia? How dependant was either generation on oars and sail? How could the social competition based on leadership at sea be adapted to territorial control? Must the one always be lost when the other is achieved?

I remain convinced that there was regular traffic in small boats in the pre-Viking Age between England and Scandinavia, and that natural conditions favoured a net emigration westwards[13]. This implies that Scandinavian commercial and ideological visitation and emigration to England in the 5th and 6th centuries, far from being exiguous, as is now being insisted[14], was continous and persistent. I would see the English *wic* developing in the 7th century as the first attempt to control that traffic, prevent it from beaching wherever it liked, and canalise it into tax-collection points[15]. Such boats would surely have used sail when running before the wind, and oars otherwise. Their power-weight ratio was therefore low, many men being needed to move a relatively small cargo. In the Viking Age, Scandinavian seafarers were no doubt irritated by the newly stand-offish posture of their traditional destinations, and sought new pastures north and west. But their greatly increased range was not due solely to expedience or technology. The ability to tack, assuming it was a Viking invention, would make a fundamental difference to the social context of their ships. Fewer men could undertake longer voyages and return with larger cargos. The initial development of such a skill was no doubt punctuated by spectacular accidents, as in the early days of hang-gliding. It is among the greatest frustrations of archaeology that we can no longer rediscover such skills or dig them up. Nearer than most, the brave scholars of replica vessels such as the *Edda* re-open our eyes to the idea that physical skills of hand and eye, nutured in long summer evenings of obsessive sporting competition, rather than technology, politics, social evolution or the environment, may once have played a decisive role in the early history of Europe.

Acknowledgements

I am most grateful to Jon Godal for the chance to take part in the trial, to him and Ray Sutcliffe and Arne-Emil Christensen for their comments on an earlier draft of this paper. It is sad to report that the *Edda* was recovered and rebuilt only to be finally lost in another trial in the treacherous waters of the south Mediterranean.

Notes

1. Carver 1990.
2. Brøgger et al. 1917.
3. Ibid.:408.
4. Ibid.:279-364, and 406, (English).
5. Christensen 1986:73.
6. Ibid.:76.
7. Ibid.:73.
8. Brøgger et al. 1917:407.
9. Godal 1988:199.
10. Ibid.:198.
11. Brøgger et al. 1917:406.
12. Godal 1988:205.
13. Carver 1990.
14. e.g. Higham 1992.
15. Carver 1990:124.

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