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New Information about Cogs and Medieval Naval Logistics from an Eyewitness Crusade Chronicle, *De itinere navali*

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Imagine standing before the scaffolding of a church in the new mercantile village of Blexen, on the German Atlantic coast. It is the evening of 22 April 1189. In the harbour, three ships of a new design called “cogs” have recently arrived from Bremen, a gift from the Holy Roman Emperor to his loyalists to facilitate their participation in his Crusade. Now unfurling their sails and raising anchor to join these vessels are eight cogs from Lübeck, Oldenburg, and towns along the Weser, the Elbe, and even the Baltic Sea coasts. Some 470 Crusaders are putting the final touches on two years of preparation, now entrusting their lives to these cogs—made of oak and iron, with strong ropes spun of local moss—tonight setting sail for England, en route to fulfil their sacred vows in the Holy Land.

Picturesque moments aside, the logistics of the Crusades was a serious undertaking. The cog was not just a means of transit for the Crusaders—it could be converted into siege engines, but primarily it was home (Cushing 2010). This paper attempts some logistic reconstruction of the cog from the archaeological, historical, and artistic sources and via comparison to better-documented ship types like the English *esnecca*.

This work derives mainly from the manuscript *De Itinere Navali*, an eyewitness account by a northern German who sailed to the Third Crusade. (Figure 1) Though the original is now lost, I have dated its composition to 1191; it survives as a single, poorly-executed copy from the thirteenth century, where the *De Itinere Navali* follows the *Historia de expeditione Frederici* in the same hand. The copy’s fragments were discovered by Constanzio Gazzera at a farmer’s market in 1840; he purchased the surviving folios and bequeathed them to the Accademia delle Scienze in Turin, (Biblioteca MM.V.II). Today the manuscript is largely invisible from war damage; happily, it had been photographed in its undamaged stated by Charles Wendell David for his transcription (David 1939), and he donated the images to the Library of Congress. These were thought to be lost when I began my research, but librarian James Sweeney rediscovered them in an old closet that had been blocked off behind a bookshelf since the 1980s (now identified as MLA 633). Given the several near-demises of this very important source, in 2005 I had David’s images

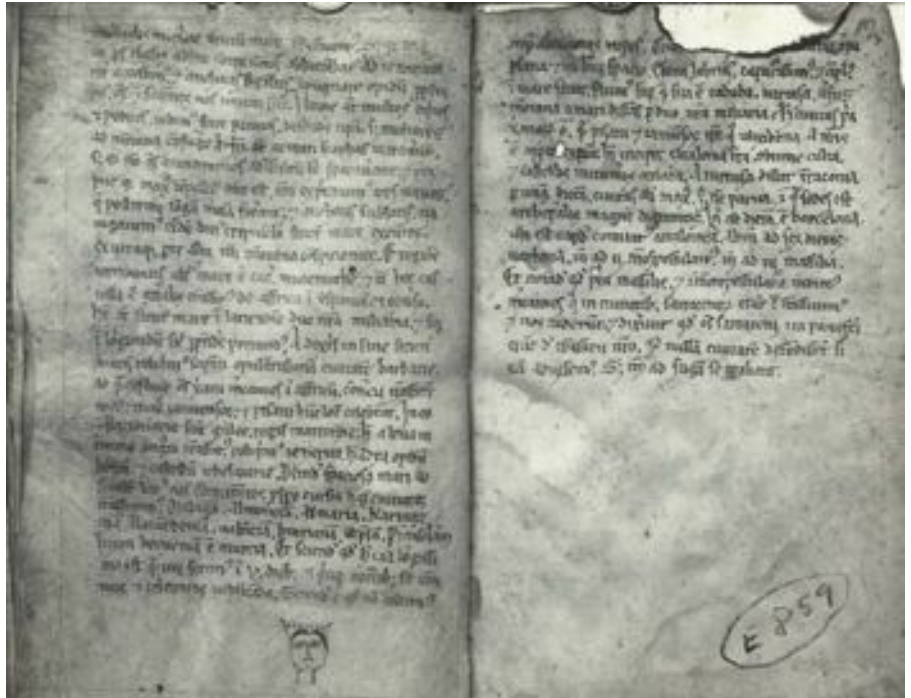


Figure 1. *De Itinere navali*, Washington, DC, Library of Congress, MS MLA 633, fol. 11^v–12^r.

digitized “ut posteritatis noticiam non evaderent” as its originator intended.¹

Our Crusader, as I call our manuscript’s author, was an extremely diligent informant—careful to distinguish observation from hearsay, consciously acknowledging the historical nature of “his” experiences in the manuscript itself, painstakingly gathering new knowledge, and striving for accuracy in writing his manuscript specifically for an audience unfamiliar with the actual process of Crusading:

Antiquorum provide consuetudine<ni> morem gerens qui gesta sua scripture laqueis innodare satagerunt ut posterita[tis] noticiam non evaderent . itineris navalis multiformes eventus qui peregrinis ierosolimam . tendentibus acciderunt simpliciter explicare decrevi.

Continuing in the tradition of the ancients, who endeavoured to bind their deeds with snares of script so that it should not escape posterity’s knowledge, I decided to relate straightforwardly the diverse events of the voyage that occurred to the pilgrims striving toward Jerusalem. (fol. 3^v, lines 1–4)²

In the surviving document, our Crusader described in great detail his voyage from Bremen to Marseilles, including

the route, weather and experiences of sailing, as well as local histories and landmarks. Most significantly, he chronicled the successful siege of Silves, the Almohad (Moroccan *muwa-hid*) empire's most important administrative and transportation center, which controlled access to the Mediterranean Sea. This was a crucial strategic victory for Portugal, an event mentioned in other chronicles but of which this chronicle is the sole primary source. Our Crusader's testimony is lost after Marseilles, but through contemporary sources we can follow him to the siege of Acre, where his group not only salvaged the siege but also participated in founding the Teutonic Order.

For the past seven years I have worked to create a modern edition of the text and to translate it, and to answer the many fascinating questions that it raises about Crusader ships and logistics in particular (Cushing 2011). Indeed, I believe that historians have focused too heavily on the better-known chronicles alone—we need to broaden our perspective, not overlooking other written media and seeking allied fields for evidence. For example, the *De Itinere Navali* was largely overlooked by modern scholars, yet it provides such an important and useful account—it is unusually accurate and specifically describes a cog-based voyage, corresponds well with archaeological and artistic finds, and is verifiable through contemporary sources and the experience of modern sailors. It is a valuable resource for the technology of the twelfth-century Crusaders.

The Cog by Other Names

"Cogs are defined by being built with a bottom with edge-to-edge planking that transforms into clinker planking towards the stem and stern. The ship sides are entirely clinker-built," to quote the simple definition by Jan Bill (Bill 2002, 96; for a technical definition see Unger 1980, 138). Today it seems obvious that the cog would be our Crusader's choice of vessel: It was a speciality of the region's shipbuilders, the ideal design for the job, and as a bonus it could hold a quantity of Crusader comforts and, they hoped, some plunder. In the written record, German cogs sailed regularly between Bremen and Latvia's newest Christian mission in Üxküll from about 1158 (Renner 1876, 16–17). Yet the familiar forms of the word *cog* first appear 1206 in England's Pipe Rolls, in a reference to merchant shipping (Heinsius 1986, 76–77)³—so how can we

be certain that our German Crusader's word *naves* ("ship")

really meant "cog"?

In our Crusader's account, we find two direct proofs: First, our Crusader described his group as eleven ships loyal to the German King. Researching this statement, we find that our Crusader's group included three ships provided personally by the Emperor Frederic Barbarossa to a group from Bremen (Renner 1995, unpaginated);⁴ in the *Deutschordenschronik* of Heinrich Caper, we find these ships described as hailing from Bremen and Lübeck. (Maschek 1936, 139); the *Detmar Chronik* indicated Lübeck's shipwrights and citizens were busy preparing to crusade by sea (Detmar 1884, 42–43, 266). Moreover, in the artistic record we find the Lübeck city seal of 1181 (Figure 2) shows a cog, and a contemporary Lübeck cog was found but destroyed (*Leipziger Illustrierte Zeitung*, 18 Jan 1873; see below and Figure 3); archaeologists have found the *Kollerup* cog of Jutland dates from about 1150 (Bill 2002, 96). So our Crusader's information is well-supported.

Second and most important, our Crusader specifies that a siege-machine was constructed from "new rudders of ships" (fol. 7^r, lines 24–25). Again we find our Crusader's information supported elsewhere: A cog used a purpose-built stern rudder and carried extra rudders in its ship's stores—modern cog replicas use enormous rudders which were certainly large enough to repurpose in siege machines like our Crusader's *ericius* (a digging-mantelet siege machine at Silves in 1189).⁵

Also in our Crusader's account we find three indirect proofs, which help us understand the different ship types found on the Third Crusade despite the confusion within other sources. Also it helps us to understand how the Crusaders perceived their ships, not only by revealing regional perspectives of the humans sailing with and in them, but also how the sea-work was assigned by ship-type, and how ships worked together. For example: First, our Crusader notes a type of ship peculiar to the southern seas which is totally new to him; a *galee* which is a "galley." In fact, the King of Portugal has many such galleys, but they served only as escort vessels for the Crusaders' cogs—much like a modern destroyer. Twice we encounter the galleys as Lisbon-based ships, sailing only at the King's direction, and only to protect the northerners from pirates (fol. 5^v, lines 18, 23; 6^r, line 15; 7^r, line 6).

Second, the King of Portugal implores our Crusaders to sail to Silves and lay siege, while he begins the arduous overland journey to meet them (fol. 5^v, line 21; Diceto 1876, 2.65). It seems that a drought prevented him from getting his own ships, the galleys, up the tidal river Arade to Silves, a

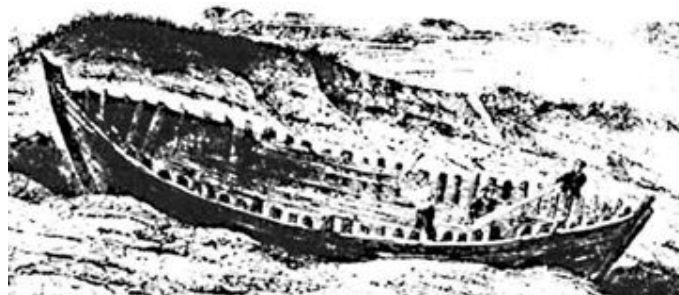


Figure 2 (far left). The Cog of Lübeck in the city seal of 1181.

Figure 3 (near left). The Danzig cog, dated by archaeologists to c.1180, from an old engraving



Figure 4 (above). The cog of the Dunwich city seal, 1199.

Figure 5 (above right). Jonah's ship depicted as a cog, Canterbury Cathedral, c.1200.

Figure 6 (right). St. Nicholas depicted sailing by cog, Lincoln Cathedral, c.1200.



key Almohad harbour; but the cogs were flat-bottomed riverboats and thus overcame this obstacle.⁶ Third, while the King recognized the naval element, his vanguard commander had responsibility to liaise with our Crusaders' little fleet—we find this commander ashore, save one quick commute to the Crusaders' anchorage using a sort of skiff called a *sagicia* (fol. 6^r, line 4). Our Crusader mentions skiffs again later, in the context of a small boat used for errands ashore (fol. 6^r, line 18; fol. 11^v, line 6).

To summarize the three ship-types and their functions: Galleys remained at sea to guard the approaches; cogs anchored in the open river, both to prevent piracy from and to gain intelligence about the town while formulating the siege; and *sagicia* functioned like a launch, here as a ferry to the joint-force meeting (fol. 6^r lines 12–15). Moreover, this helps us understand the integration of land and sea forces on the Third Crusade. We do not discover the command structure for the galleys, and the Crusaders keep control of their cogs; so why does the Portuguese land commander need to meet with our Crusaders? The manuscript reveals that the cog functioned as a battle-taxi: Once upriver, the Crusaders debarked to assist the land forces with engineering work facilitated by naval knowledge, such as siege-machines and sapping.

Thus we may be confident that our Crusaders used cogs, despite the fact that their nomenclature took a while to catch up with their technology (Heinsius 1986, 76–77) Even in its home waters, the cog was called simply *Das grosse Schiff*

by German Crusaders sailing from Köln in 1186; or *Naves mercatorum* in chronicles from the Baltic Sea in 1191; until the word *kogcho* finally appears in 1197, turning up both in a glossary and in a manuscript of *Parzival* (Heinsius 1986, 73–77). Moreover, the artistic record awaits examination: Cogs are first depicted in this era and merit more investigation, appearing in the Winchester Font carvings of 1180; in city seals, such as Lübeck's seal of 1181 and Dunwich's seal of 1199 (Figure 4); in stained glass like Canterbury Cathedral's "Jonah Swallowed by a Whale" (Corona I, the Redemption) and Lincoln Cathedral's "Saint Nicholas" window panel, both dated about 1200 (Figures 5 and 6); and in the many illuminations in religious texts which depict ships: for example the "Canticles, Hymns, and Passion of Christ" of the later 1200s (St Johns College, Cambridge, MS K21, fol. 60^v, 61^r).

Having thus established the use of cogs through documentary sources including the manuscript *De Itinere Navali*, as well as the development both of the word and image, now let us examine the cog as the housing and carrier of our Crusaders.

The Physical Reality of the Cog

The archaeological record provides three finds relevant to this Crusade. First, the Bremen find called the *Schlachte* from 1170 could provide clues, as we know our Crusader's group included Bremen cogs. Second, the now-destroyed Lübeck cog of 1180 discovered at Danzig would have been a key find, because we know ships in this contingent came from Lübeck—Danzig was the limit of Lübeck-based settlement during the Third Crusade period—but the cog was burnt for firewood in 1873 (*Leipziger Illustrierte Zeitung*, 18 Jan 1873; see Figure 2 above). Third, the Danish *Kolding*, a very exciting cog find that was located exactly in our Crusader's home region about Bremen and dated exactly to the Third Crusade year of 1190; this is especially important because I have identified some two hundred Danish Crusaders sailing to the Holy Land contemporary to our Crusader's voyage. Yet these three cogs—closest in time and geographical origin to our Crusader's cog—presently remain unexamined or destroyed.⁷ (Figure 7)

Alternatively, there is a comprehensive study of cogs by Paul Heinsius, who compiled very useful data from extensive work with contemporary finds and sources; also there are modern cog reconstructions, the most important to this study being the *Kiel* cog which has done extensive sea-trials, providing excellent data on historical capabilities. Generally a cog measured about 8m broad by 20m long at the water-line, which is the primary consideration;⁸ as this formula for the cog's construction did not vary much over the centuries, I have used the *Kiel* as replica for a contemporary cog's function. (The *Kiel* design dates to 1380 but she is comparable to the *Kammer* cog, dated 1336 but back-modified to 1234 based on the Stralsund town seal. The 1250 *Rutten* cog find was too incomplete to estimate capacity reliably; the 1190 *Kolding* remains in storage, awaiting funding for reconstruction and study. For measurements see the Bibliography, especially Bill 2002, Heinsius 1986, and the cog websites listed there.)

I have added the *De Itinere Navali* text as well as Heinsius' work to make a composite analogy, and checked my findings with experienced yachtsmen. Ultimately, without the benefit of a replica twelfth-century cog that has undergone sea-trials, I am using the best model and expertise available.

The Shipboard Population

First let us people our cogs with their captain, crew, Crusaders and, of course, servants. [Happily, our Crusader's group decided to hire a horse if they needed one where they arrived, so we need not concern ourselves with horses and their complexities!] Our Crusader sailed part of the journey with English ships, as they had done in 1147; thus it seems likely that our Crusader observed both German cogs and British *esnecca* (plural *esneccar*). While they were a different type of ship from the cog, *esneccar* are better described in Third Crusade chronicles, which helps us to calculate numbers missing from the cog descriptions.

First, the *esnecca*. Although earlier scholars have mistaken the *esnecca* for a single royal vessel, much like *HMS Britannia*



Figure 7. The Bremen cog of 1170, from the *Schlachte* wreck

was for HRM Queen Elizabeth II of England, in the twelfth century the contemporary chronicler Richard of Devizes clearly discussed them as a class of ship (Archer 1889, 371–372 and note B).⁹ Roger of Howden wrote that each of King Richard's *esneccar* carried 55 “well-armed men”: His account was based on the English Crusaders' aid to Santa Helena, Portugal in 1190, when 9 ships carried 500 men. (Our Crusader's cogs had helped reconquer this area from the Almohadin less than a year before—see Howden 1853, 2.146–153, especially 2.147) Roger of Howden apparently was not counting crew or stewards, however. Richard of Devizes described these people, placing aboard a captain and fifteen crew, for a total of 16 sailors. Our Crusader treated these sailors, called *navales*, as a separate, professional group whose knowledge gave them dual-purpose as siege-engineers, specifically repurposing parts of the ships into siege-machines; their similar role was observed during the First Crusade, one century before (Pryor 2008, 95). Finally, Richard of Devizes added 14 servants or stewards (Devizes 1963, 15) per vessel. So an *esnecca* carried about 85 people total.

The cog, by comparison, seems somewhat smaller. The *Renner Chronik*, although a later work, used medieval sources no longer extant; this chronicle specified that, arriving at Acre, the Lübeck cog of our group had 24 Crusaders aboard (Renner 1995). The *Detmar Chronik* indicated Lübeck's shipyard eagerly involved itself with the Emperor's pre-Crusade preparations, and that the town sent between 20 and 32 Crusaders by sea (Detmar 1884, 42–43, 266). For this essay I have assumed 24 Crusaders per ship.

The replica cog *Kiel* sails with a captain plus nine crew, or 10 sailors total—albeit that is with a modern companion vessel. But this is a modern luxury. Certainly the medieval crew would have had difficulty working around-the-clock for months on end, even if split into watches—a sailing ship requires constant vigilance and maintenance just in the harbour, let alone the continual, physically demanding work a-sea. To quote professional seaman B.E. Blackistone, who has over a quarter-century of experience on early medieval replica vessels:

You can run a diesel... without a complaint or pulled muscle, blistered palm... Even with a large crew, the loss, through injury or illness, of just one person can affect the efficiency and morale of that watch.¹⁰

Therefore I would add at least two more sailors in case of illness or injury, thereby placing up to a dozen sailors aboard as crew. [Moreover, the number 12 divides nicely into different arrangements for watch, should a colleague have further information on medieval sea-watches.]

Now the stewards—after all, our Crusader’s account proves he certainly was not humble in pocket, as we shall shortly discover!¹¹ Our manuscript fails to count them, so I have used the English chroniclers to derive a ratio: When the *esnecca*’s 69 Crusaders and crew had 14 stewards, then the cog’s 36 Crusaders and crew were roughly half that population, so they had half the stewards, perhaps 7 men.

In sum, I estimate the cog carried about 43 people. (Table 1) These extrapolations provide context for the cog, and help to show us what is missing from this chronicle that we should investigate and resolve: Can we find more proof for or against this calculation showing the cog as half an *esnecca*’s size by passenger capacity?

The importance of this question is highlighted by another item from our Crusader’s account. Later in the chronicle, at the siege of Silves en route to the Holy Land, our Crusader enumerated, “We had 3500 of all ages and ranks...” (fol. 9^v, lines 22–24); yet our Crusader described his departure, “Thus, with eleven ships—properly equipped with soldiers, weapons, and food from Bremen—we set out from Blexen on the journey...” (fol. 4^r, lines 3–5). But 11 ships carrying 43 people each makes only 473 people departing. Assuming that our Crusader had counted accurately the 3500 people reported—and there is no reason to doubt this count—therefore some 3027 people more should appear in the context of Silves. Working the math of 3027 people divided by 43 per cog, this would have required about 70 cogs more to carry everyone. But our Crusader described far fewer ships than 70 as having joined his own group of 11 cogs for Silves—in fact, the Silves fleet including our cogs, numbers roughly 40. Since we have 473 people in the 11 cogs, this leaves 29 other ships to carry the 3027 people “of all ages and ranks” needed to make up the 40-ship, 3500-strong contingent attacking Silves. But how?

Logistically, we must look for ships of larger-than-cog design, like the English *esneccar* or another contemporary ship-type found in English sources, the *buss*, in order to make up the “non-cog” ships. Richard of Devizes informs us (Devizes 1963, 13–15) that a *buss* received double an *esnecca*’s load of passengers and cargo, suggesting a *buss* nearly four times the size of a cog! But the *buss* was comparatively rare, perhaps only within the means of an extremely wealthy and upper-echelon nobleman like Roger of Howden’s “Fulk Rustac”; even King Richard’s fleet had only 14 *buss* ships reported in the sources (Devizes 1963, xiii–xiv; Ambroise 1976, Introduction, unpaginated). The galley was also a large and expensive ship, which our Crusader encountered only twice: First as the property of a very wealthy bishop, the “galley of Tuy” which joined our Crusader’s fleet (fol. 5^v, line 23); and then as a ship of the Portuguese King, as aforementioned. Such large ships as the *buss* and the *galley* must have been enormously expensive to

construct and maintain (Hottendorf *et al.* 1993, 41) perhaps helping to explain their rarity among the *cog* and *esnecca* vessels of this era.

Table 1: Comparison of Ships by Estimated Population

<u>Ship</u>	<u>Passengers</u>	<u>Crew</u>	<u>Stewards</u>	<u>Total</u>
Cog	24	<12	7	43
Esnecca	55	16	14	85
Buss	110	32	28	170

Additional Evidence: England’s Exchequer

Because the written sources do not provide clear evidence, can we find some other historical proofs to indicate the size of these ships? (Figure 8 and 9) Moving across the Channel to England, whither our Crusader’s fleet sailed to pick up some *sociis* at Dartmouth, again we find the various contemporary vessel-types working together. King Richard I of England composed his Third Crusade fleet from an assortment of ship-types, both of royal and private ownership. The English sealift of 1190 provides an excellent opportunity for modern medievalists to enhance our understanding of our Crusader’s voyage: Not only are there demonstrated links in the sources between the two regions’ seaborne trade at this time, but also the two regions display significant similarities in technology and the organization of the Third Crusade effort; moreover, the English Crusade has better source documentation that details preparations and expenses undertaken for the ships, unreported by our Crusader’s group in northern Germany.¹²

Less than a year after our Crusader’s voyage, King Richard was quickly gathering ships and goods for his own imminent departure, as evidenced in his Exchequer’s Rolls. While we must remember that the English favored the *esneccar*, nevertheless it is likely that cogs were among their fleet (e.g., the Dunwich seal of 1199; the 1206 Rolls, above). Although the odd ship was donated by a subject, the King dispensed about £51 4s 3d each for his own *esneccar*, and about £64 8s 11d each for some “ships” then under construction, and £56 13s 4d to hire Walter the Bosun’s “ship” for himself. Compared to an approximate cost of £51–65 per ship new, it was significantly cheaper to buy an old “ship” from the Hospitallers at £9 and to repair another used “ship” for £10. It remains to be determined which “ships” were *esneccar* and which were cogs.

These figures become especially relevant when we consider that our Crusader’s group crashed their ships in Sandwich harbor, thus forcing them to purchase an English-made vessel as well as to furnish it, all at the height of the market. In fact, these replacements must have proven enormously expensive, coming at exact same moment as King Richard’s Rolls detailed the peak of his naval efforts. We find our Crusader’s group purchased one ship and its equipment and *Lebensmittel* to replace two. Was this evidence of a funding problem? More importantly, was this one ship that replaced two cogs perhaps further evidence an English *esnecca* was double the

Cog or Esnecca?

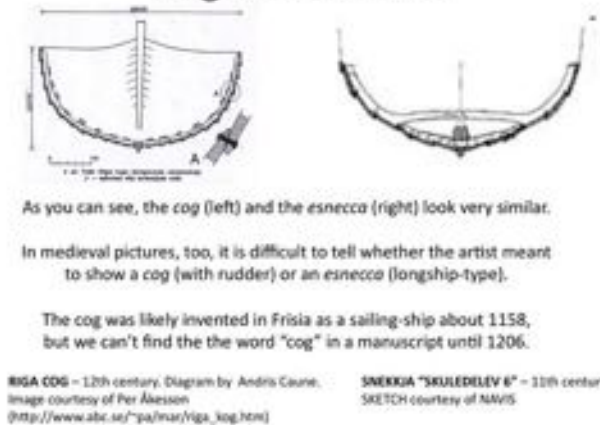


Figure 8. Cog or esnecca? Views of the Riga cog and the Skuldelev 6 esnecca show us how the two contemporary and co-located ship-types could become confused easily by medieval artists.

size of a German cog? Also, that our Crusader's group was able to raise funds and obtain material in such a tight market perhaps indicates their social status and political pull—our Crusader spent nearly a month in London to accomplish the task which leads me to wonder, were the nascent *Hanse* merchants perhaps facilitators for our German Crusader's credit and goods?

Also we may begin to understand the cost-burden imposed by the other eight ships of (as yet) undetermined origin. As our Crusader reports, "Thus we set out with eleven ships—properly equipped with soldiers, weapons, and food from Bremen..." We may imagine these vessels represented not only the Crusaders' home, but much of their earthly wealth. If indeed the approximate cost was £51-65 per ship, then becomes clear the real-money extent of the Emperor's gift of three cogs to the Crusaders from Bremen, described in the later *Chronica der Stadt Bremen*.¹³

Although I have not yet determined if this situation applied to our Crusader's group (whose sailors clearly participated in the sieges of Almohadin towns) nevertheless we may expect that the crew required payment—I have calculated that the Cinque Ports ships averaged 2d per sailor per day, or roughly £110 per ship annually (Rolls 2 Ric1; Archer 1889, 12–13). We must cautiously discard the Rolls item that most likely refers to King Richard's favourite ship, the *esnecca Trenchemer*, which cost £185 10s 10d in pay for 1190 (Rolls 2 Ric1)—clearly this vessel's use was atypical, being a favourite of the King for personal travel, which Richard of Devizes described as having had 61 crew, or double the typical complement aforementioned. Pay was generally only accepted in coin and, as we have just seen, annual crew payrolls were double or triple the cost of the ship itself. If our Crusader's *navales* (crew) expected payment—whether they were themselves Crusaders or not, is unclear—then 11 ships with 10 crew each cost over £1 daily in

Cog, not Esnecca



Figure 9. Cog, not esnecca. Medieval artists drew outdated technology and regionalist details on their cogs, nevertheless there was a conventional depiction of rigging which indicates a cog.

wages alone—a significant consideration when the cogs' voyage lasted at least the 180 days reported in the manuscript!

This information raises an interesting consideration: Were our Crusader's ships loaded to absolute capacity, considering the purpose of the voyage and their very nature as the sole reliable source of supply for their inhabitants? If so, coins and other waterproof items could effectively augment the typical ballast materials, thus usefully occupying space otherwise wasted by ballast: For example, 100 *solidi* (£5) went in a box called a *vasum lignum* or *archa*, and 20 *vasi* (£100) went inside a strapped and sealed bag called a *forulus* (Archer 1889, 370). In addition to the basic equipment and goods intended for Outremer, we must remember that each crewman and passenger brought baggage for an extended journey, which doubtless included a lot of "just in case" material. The Crusaders had armour and weapons as well as the items needed to maintain their gear; King Richard even transported his trebuchet, later dubbed *Malgriffon* (Archer 1889, 42) although our Crusader's fleet used its rudders and rigging to fashion their siege-pieces, as noted above.

To give an example from my own experience: Both times I deployed to Iraq, the military airlift weight limit was 300 lbs (136.4 kg) per person, which limit included the person's body-weight. With a cog of 43 people estimated at this limit, bodies and luggage weighed 5.86 tonnes per ship. Of course this is an anachronism but, in the absence of medieval sources, a helpful guideline.

"Lebensmittel": Quantifying the Little-Known

In addition to everyone's bodyweight and luggage, we must consider how the expedition fed and watered this crowd underway.

First, consider the various ways to obtain and keep food aboard. Doubtless the crews fished from the decks—in one

charming passage, our Crusader reveals his land-lubber nature, describing his first sighting of dolphins in terms of the Northerners' prized food-fish, the turbot. Long-lasting food we know was brought aboard in quantity: For example, King Richard spent £31 5s to purchase 140 "nets of cheeses to provision the ships of Jerusalem" (Rolls 2 Ric 1). Crusaders could purchase food ashore, but this was not a reliable method: In 1190, for example, some 700 English pilgrims were arrested in Lisbon due to food riots (Howden 1853, 2.149), thus demonstrating why Crusaders of this era were expected to self-provision in advance. Indeed, our Crusader's group brought at least one year's provisions for each person. Although the Emperor required his land forces to provide provision sufficient for the duration of the expedition (*Annales Marbacensis*, MGH US 9.60) and the seaborne Köln Crusaders reckoned three years' food supply was necessary (*Chronica Regia Coloniensis*, MGH US 18.141), I have not yet discovered whether this rule was an ideal or a practise. The more likely scenario was King Richard's requirement of his seaborne Crusaders to transport one year's provisions (*Itinerarium peregrinorum*; Stubbs 1864, 42–43; Nicholson 1997, 55) and the experience of the modern replica cog *Kiel* confirms this (see below). Also I expect that the status of our Crusader's fellow passengers, who were able to afford a replacement ship without any difficulty, would have entailed a generous spread of 2 lbs (0.9 kg) of food per person daily. Thus amounts to approximately 14.1 tonnes of food.

We must also consider beverages. At various times our Crusader's ship was becalmed or storm-tossed, yet he never mentions thirst despite up to ten days' lack of access to land-based water sources. Estimating that the ship carried a fortnight's emergency store of perhaps ½ gallon (2 L) per person daily—based on my military experience with temperate-zone Spring-season water intake needs for someone not working heavily and, anachronistically, on the Nelson-era British Navy habit of reckoning in lunar months (28 days) and stocking ½ month (14 days) of water—this amounts to roughly 1.2 tonnes of water per cog.

The *Lebensmittel* question highlights significant gaps in our knowledge, of which the reader should remain wary. For example, I have just discussed water, but what about its containers? Traditionally a *cask* comprises 4 firkins of 7.5 gallons each, making slightly over 34L per cask, thus requiring 35 casks to hold the estimated 1.2 tonnes of water aboard each cog; but the cask's tare itself introduces so many variables (wet or dry tare, density of woods used, and so on) that further estimation seems pointless. Instead, we can only imagine the local coopers trying to produce 385 casks for our Crusader's little fleet; the Crusaders themselves trying to collect 1.2 tonnes of rainwater; and their physical labour to move and load and stow these multiple, weighty, unwieldy barrels below-decks. Moreover, we must remember that my figure does not include those other medieval staples, wine and beer (Pryor 1988, 76) which were certainly expected and enjoyed by our Crusaders underway.

Likewise the subject of food and its preparation gives rise to many difficult logistical problems: Was cooking available aboard? If so, were livestock kept aboard too? And what sort of ovens were used, how much did they weigh, what equipment and dishes were taken? If the messing was organized into shifts, does that affect the quantity of dishes, or did each person pack their own mess? Interesting questions, but presently beyond our scope. So the reader should understand that I have made my best estimates lacking evidence for these daily items which individually seem small, yet collectively defy the modern analyst.

To return to the main theme, summarizing the argument to this point: Our Crusaders transported approximately 14.1 tonnes of food and 1.2 tonnes of water per vessel, or some 15.3 tonnes of *Lebensmittel* in each cog.

Ship's Stores

Next, we must examine the ship's furniture, the equipment required for the ship's functioning. Richard of Devizes tells us that each *esnecca* needed three spare rudders, thirteen anchors, two sails, three sets of rigging, and doubles of other necessary items (Devizes 1963, 15). Although he referred to an *esneccar*, in this case it seems prudent to use his numbers as-is for the cog, both because of the extended nature of the voyage and because the Crusaders expected to go without resupply. If we assume that our Crusader's cogs carried similar stores, then for eleven cogs we could expect some 33 rudders, 143 anchors, 22 sails, and 33 sets of rigging just to get underway! (I have not yet found good bases for calculating the weight of these items, because of course no medieval item was of standard manufacture.) However, the Devizes estimate may be excessive in that modern yachtsmen would carry only six to eight anchors per ship of this size, or 66 to 88 anchors; so I emphasize again, we should regard these numbers cautiously.

At this point I contacted Captain U. Ziermann of the *Kiel* cog, in order to discover if my guesstimates were pointing toward truth. Would roughly 43 people be able to live and work aboard a cog, with stores of luggage and *Lebensmittel* amounting to some 20 tonnes of stuff stowed on the cog among them, in a manageable manner? He emailed this reply:

The ship is then very full. But cogs rarely sailed day and night, rather, they often waited for the right wind. In that time certainly a portion of the ship's complement could have lived ashore... with 43 people you need a lot of deck space.¹⁴

Captain Ziermann's experience bears out the evidence of our Crusader's manuscript: Not only is it possible for a cog to carry this amount of material, but the cog would be quite full, just as we had anticipated above. So too is Captain Ziermann's suggestion, that the passengers lived ashore until sailing-time, supported by our Crusader's account. Moreover, my calculations and Captain Ziermann's experiences together are borne out by the 1150 *Kollerup* cog, which carried a maximum of

31.7 tonnes safely (Bill 2002, 96) but may have forsaken some capacity in favour of maintaining the essential deck-space, of which it had much less than the replica *Kiel*.

Speed: Wind, Waves, and Human Behavior

Captain Ziermann’s comment about waiting for “the right wind” leads us to the next consideration, the speed of the cogs. In 1189, our Crusader’s cog took about 79 days to travel 2268 nautical miles, making just under 29 nautical miles daily—our cogs just “mosey along” at only 1.5 mph (2 kph)! But note: If we include the calamities befalling our Crusader’s cog, then it needed fully 98 days to sail the same distance, reducing speed to just over 23 nautical miles daily or 0.8 mph (1.3 kph). [The Crusaders needed from 23 April to about 16 October for their voyage, or about 180 days. Subtracting 23 days for their Sandwich/London stop, 45 days for the siege of Silves, and about 14 days for pilgrimage stops, this leaves 98 days afloat. Not counting various calamities and becalmings, one deducts another 19 days, which leaves 79 days afloat.] Moreover, these figures include the favourable currents and winds then prevailing in the southeastern Mediterranean (Pryor 1988, 17 and figs. 3a, 3b), which significantly sped our Crusader’s cog-voyage in that region, as attested in his chronicle.

Even accounting for the cog’s ability to “sail across the wind” or tack, today’s historian will realize that this rate of sail compares poorly with medieval or modern estimates. For example, Roger of Howden estimated 120 nautical miles daily—clearly an outrageous speed despite his own account of the English Crusaders’ actual progress in 1190, especially given that our Crusader’s real-world experience in 1189 had already reached Roger’s ears (Howden 1853, 2.146). Yet we know the chroniclers have problems with accuracy: Many chronicles fail to give information on speed entirely; or over-estimate even when the author knew better, like Roger of Howden; and few texts relate specifically to cogs at all. Again the *De Itinere Navali* manuscript provides the most accurate and useful account, reminding us to look again at our lesser-known sources!

Modern historians have fared no better than those better-

known medieval writers: Compared to our Crusader’s actual progress of 1.5 mph (2 kph), the nearest modern estimate was Walter Vogel’s 1909 study stating that a fully-laden sea-cog sailed at 3.5 mph (5.6 kph), still nearly triple-speed our Crusader’s cog (Heinsius 1986, 168n3). In the 1930s Lionel Landon worked with Pipe Rolls information about King Richard’s sealift, calculating 60 nautical miles daily (Landon 1935, 187–188); based on information available through in the early 1970s, Detlev Ellmers reached the same estimate (Ellmers 1972, 250); in 1986, Paul Heinsius’ most conservative estimate was 54 nautical miles daily (Heinsius 1986, 166–169).¹⁵ Conversely, in the 1990s, Ian Friel (Friel 1995, 137) returned to the chronicles to substantiate speeds up to seven times our Crusader’s actual rate; he wrote that the Devon-to-Compostella sailing lasted 5 to 14 days, which works out between 5 days or 154 nmi/day and 14 days or 51.5 nmi/day.

However, reconstructing the cogs has provided useful data—from the *Kiel* cog especially because her skipper takes particular interest in replicating his vessel’s historical capabilities. In 1992, Captain Ziermann undertook sea-trials in order to record his cog’s performance in various wind and sea conditions, at various weights. Using formulae developed by marine engineers as well as observations underway, he found (Ziermann 1992, 7) that his fully-laden cog could achieve 2.7–4.7 mph (4.3–7.5 kph) reliably; his lowest figure, 2.7 mph (4.3 kph), was still nearly double-speed our Crusader’s observed speed of 1.5 mph (2 kph). However, an experienced yachtsman reviewed all of my material and advocated Captain Ziermann’s findings showed the most likely scenario, albeit within a narrower range of 3–4 mph (4.8–6.4 kph). (Table 2)

Two further examples: In 2009, Captain Ziermann expected the *Kiel* to sail 84.5 nautical miles daily, but he scheduled merely 16.5 nautical miles daily in case of adverse winds.¹⁶ Remembering that the *Kiel* sails completely empty, she has a more conservative rate of sail even than our Crusader, who averaged 23–29 nautical miles daily in a fully-loaded cog. But examining King Richard’s 1190 sealift—which voyage covers the same route in the same season and is better-documented than that of our Crusader in 1189—we find that Captain Ziermann’s worst estimate still betters the English Crusaders’

Table 2: Comparison of Cog Speeds (assumes 24 hours’ constant sailing)

Source	Min KPH	Min MPH	Min NMI per day	Max KPH	Max MPH	Max NMI per day
Richard’s fleet	0.3	0.2	13.3			
<i>De Itinere Navali</i>	1.3	0.8	23.0	2.0	1.3	29.0
Friel	2.9	1.8	51.5	8.6	5.3	154.0
Heinsius’ work from finds	4.3	2.7	54.0			
Capt. Ziermann’s trials	4.3	2.7	54.0	7.5	4.7	94.0
Yachtsman’s experience	4.8	3.0	60.0	6.4	4.0	80.0
Landon’s work from Pipe Rolls	4.8	3.0	60.0			
Ellmers	4.8	3.0	60.0			
Vogel	5.6	3.5	72.0			
Roger of Howden	9.6	6.0	120.0			

progress! In fact, that sealift of 1988 nautical miles took exactly 150 days, averaging a paltry 13.25 nmi/day, merely ½ mph (0.3 kph)!¹⁷

So what could account for the difference between a cog's proven capability for speed and its observed historical speed? Although winds or tides are usually blamed for the slow speed of a medieval ship, perhaps the human element is mostly to blame for the Crusaders' meagre forward motion: Our Crusader clearly states that his group sometimes delayed embarking the cogs until noon, or missed a favourable wind because they had wandered inland to look at something interesting and wound up spending the week there. It once happened that "two foolish Bremen men" were able to get ashore in skiffs from the cogs' anchorage and were killed while stealing from locals, subsequently delaying the fleet by their burial (fol. 5^v line 33). As evidenced in our Crusader's work and the modern experience, both cogs and humans occasionally break; and human attention could become diverted from its pious purpose by the desire for sleep, food, or wellness, and especially for touristic enjoyment of this once-in-a-lifetime Crusade experience.

Speaking of "tourism," to apply a modern term to our Crusader's trips ashore, some early medievalists had mistaken the contemporary sources' lists of towns where cogs stopped, interpreting these as evidence that cogs had to hug the coast for navigation and thereby slowed their progress versus a direct and presumably faster route. Actually, our Crusader's own account never mentions any landscape (his view from the sea) as a part of navigation; for him, it only occasionally functioned as a political landmark, never a navigational one; twice, a particular feature made him homesick; primarily, he recalled the places listed like a motion-tapestry of shrines, legends, and interesting plants to inspire the imagination of his audience. Hutchinson's work (Hutchinson 1994, 164–170, 178 and 180) neatly summarized the multiplicity of navigational methods used in medieval times, discrediting the notion that these same lists somehow proved the medieval sailor's dependence on coastal navigation. Hutchinson's work is supported by our Crusader's eyewitness record as in other contemporary accounts; ships were constantly stopping for water or for business ashore, and to await winds. Again Captain Ziermann's experience with the replica cog satisfies this modern question.

Since it would have been faster to walk, why snail-sail? Our Crusader's testimony has survived in a copy also containing the *Historia de expeditione Fredici*, which reported a sentiment among the German Crusaders: "navigationem transmarinam faciliorem utique pro terrestri expeditione ardua et prolixiori..." (MGH NS 5.13), that is to say that "navigation across the sea [was] easier, also the journey by land [was] challenging and lengthier". Our Crusader's account concurred:

Inter quos quibusdam placuit per longissimos tractus maris peregrinationis incolarum pro[]abolitione criminum erumpnosa[m] semita[m] prote lare .

Among whom, it pleased some upon the distressful path of pilgrimage to retard the crimes of the inhabitants in favour of amnesty, [going instead] by way of vast expanses of sea (fol. 4^r line 1–3)

As Paul Heinsius noted (Heinsius 1986, 168–169), a cog can sail day and night despite its pedestrian pace, but I argue that he has imposed the modern conception of machine-powered travel upon medieval times; certainly the crew would have had difficulty working 'round-the-clock for months on end, even when split into watches, as B.E. Blackstone's group of replica-sailors has found for some 25 years now (above). I think the Crusaders preferred to sleep ashore whenever possible as Captain Ziermann described; even today, most people would welcome not berthing below-decks on a very crowded, ever-moving ship pervaded by the stench of bilges and food-livestock, and often-seasick passengers! Indeed, several times our Crusader complained his cog was "bobbing" and "undulating" and "being tossed about" all evening, clearly indicating the passengers had an uncomfortable, sleepless night.

Conclusion

The problem of medieval naval logistics in the Crusades was summarized best by the French medievalist Michel Mollat, when he wrote:

Historians are just beginning to see somewhat more clearly the composition of the Crusader fleets and the characteristics of the ship-types serving as transports destined for the Latin East. Precision is therefore still difficult to achieve. (Mollat 1967, 352)¹⁸

Although the field of Crusades Studies has advanced considerably since then, the topic of naval logistics specifically remains controversial: Even though certain variables involved with the act and materials of sailing, and the vagaries of human behaviour, shall always prevent us from such "precision" as Mollat (and many today) demanded, nevertheless the modern historian may extract from the medieval sources some reasonable parameters that further the study of this important Crusader topic. Using the *De Itinere Navali* manuscript—which provides unique and accurate information facilitating the study of the cog and its role in the Third Crusade sealift—combined with additional supporting evidence from contemporary sources, and augmented using a multidisciplinary approach including art in several media and modern replica experiments, my calculations for the cog's population, load and speed provide those reasonable parameters. The correct interpretation of the word *naves* in the sources as *cog*, when made from careful consideration of the evidence presented here, reveals to us which sources contain the information necessary to furthering our understanding of the cog as a physical environment. Thus we may use these contemporary and modern evidence streams more accurately through a multidisciplinary approach, allowing us to reconstruct Crusader voyages in the last fifth of the twelfth century specifically and the medieval sealift generally.

Notes

1. The digital manuscript was presented to the Library of Congress (www.loc.gov/rr/mss/) and to the Biblioteca of the Accademia delle Scienze di Torino (www.accademiadelle scienze.it/biblioteca). The reader should contact these institutions for cost-free access.
2. The transcription uses the following conventions: Abbreviations in the MS are extended in *italics*, corrections in the MS are supplied <like this>, and corrections by the editor are supplied [like this].
3. Crusades historians may recall the phrase “vulgo ‘coggas’ dicunt” in the *Itinerarium Peregrinorum* of Richard, Canon of Holy Trinity (Stubbs 1864, 64; Nicholson 1997, 73). Although this source was possibly composed in 1191, I am reluctant to use it as the earliest example of “cog” because what modern scholars call its IP2 manuscript dates from 1217–1222 (Nicholson 1997, 9–11; also Heinsius 1986, 76–77). The *Deutschordenschronik* of Heinrich Caper of 1190 used “kogga”, but I believe this work was a fifteenth-century fiction. Therefore I use 1206 (Heinsius 1986, 76–77).
4. Please see the Works Cited.
5. I am indebted to Paul Chevedden for identifying this mantelet. I shall present this research in my planned article, *Sea-borne Siege Machines: Crusader Cogs Converted into Instrumentum, and Other Amphibious Transformations of the Crusades*.
6. Our Crusader noted that the town had large wells, but detailed several incidents indicating an extreme drought. I am reconstructing the siege on both sides, and shall present this information in future work.
7. The aforementioned *Kollerup* cog is contemporary most correctly to the Second Crusade, not the Third Crusade. A fifth ship find, the *Riga* cog, resembles our Crusader’s cog in size but it is not yet dated precisely.
8. Richard Unger considers cogs as about 9m broad up to 25m long at the waterline (Unger 1980, 136). Because of inconsistencies in his chapter on cogs, I have not used his work here so to avoid arguments confusing to the non-specialist, but overall his work is worth consulting. Therefore, for more detailed information about hull capacity and waterline-loading percentages please see Bill 2002, 93
9. The confusion appears to stem from King Richard’s personal preference for a certain *esnecca*, the *Trenchemer*. There are more recent studies, but Archer’s work is a free download from Google Books, helpful for non-specialists.
10. [Undated e-article] 25 Years Aft the Mast. *The Longship Company* (longshipco.org/lesson.html).
11. See below regarding the accident at Sandwich.
12. Cushing, D. 2000. [Presentation] *The Logistics of Richard I’s Voyage to the Holy Land: Sealift to Messina*. Kalamazoo MI: 35th International Medieval Congress, Western Michigan University
13. Renner, J. *Chronica der Stadt Bremen (1582)* 1995 (Liselotte Klink, ed.). Private publication. Please note, this book is not available publicly and I have only a portion translated by Blexen’s church curator, Michael Gädicke, for me in a personal email [April 6, 2006].
14. “Das Schiff ist dann sehr voll. Koggen sind aber selten Tag und Nacht gesegelt, sondern haben oft auf den richtigen Wind

gewartet. In der Zeit kann ja ein Teil der Besatzung an Land gewohnt haben... bei 43 Personen braucht man viel Platz auf dem Deck.”

15. Heinsius 1986, 166–169. Heinsius’ work seems highly accurate except in luggage weight. I hope to research information on the capacity and loading of cogs in furtherance of his work.
16. Lübeck to Visby, a distance of 350 nautical miles in 100 hours = 4.14 days, or 84.5 nmi per day. The Kiel crew’s project statement is online at (www.hansekogge.de/hkwcms/index.php?id=8,89,0,0,1,0)
17. Calculated from London to Marseilles, undertaken 25 March til 22 August 1190. See also the chronicles by Roger of Howden 1853 (2.142–143), Roger of Wendover 1849 (2.86 and 2.96–97), and especially Ambroise 1976, 48 11. 509–510.
18. “Les historiens commencent seulement à voir un peu plus clair dans la composition des flottes de croisade et la nature des types de navires affectés aux transports à destination de l’Orient latin. La précision est cependant encore difficile à atteindre.”

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