

KALMAR NYCKEL SAILS AGAIN

A 375th Anniversary Celebration of the Voyage that Founded New Sweden

Samuel Heed & Andrew Hanna



Narrative by Samuel W. Heed
Photography by Andrew Hanna

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¹Delivered as a lecture for the Kalmar Nyckel Foundation's 2012 "Monumental Maritime Anniversaries" Lecture Series, the essay was originally titled "The Things They Carried' Aboard *Kalmar Nyckel*, in 1637-38." As the quotation in the title acknowledges, the approach for this essay was inspired by Tim O'Brien's classic memoir of the Vietnam War.

Foreward – Captain Lauren Morgens,
Kalmar Nyckel

As one of the Kalmar Nyckel Foundation's primary practitioners of the art and the science of 17th-century seamanship – if in a somewhat modernized form – I have had the privilege of seeing this project grow from its very beginnings, both in text and in photography. It has been an adventure full of challenge and curiosity in which we seemed to tackle everything: from the unexpected difficulty of naming every line on the ship, to the obscured etymology of the phrase “dead reckoning,” to the retrospectively obvious discovery that if the wind is from one direction and the sun another, it is physically impossible to take just that photograph. And yet for me, editing and fact-checking this narrative raised dozens of intriguing questions that I had never thought to ask. Some addressed the history of New Sweden, and thus touch only the periphery of my daily routine, but many questions challenged my assumptions about my own area of specialization: the ship, her crew, her tools, and what exactly we modern sailors do and do not share with our counterparts of 375 years ago.

By skipping nimbly between this rigorous research and the personable realm of historical fiction, Sam Heed's narrative is a captivating and readable look at the experiences of the founders of the colony of New Sweden. We see their motivations as well as the often bleak facts of their lives, their trials as well as their tools. We catch a timeless flavor of life on a long passage across the ocean – perhaps the part of the earth that has changed the least of all since 1638 – but we are often reminded of the uncertainties of 17th-century navigation that made the experience of being at sea so fundamentally different from ours today. We see trials of endurance that I hope never to be faced with – pervasive lice and eternal sauerkraut spring to mind – but the risks of seafaring, though reduced, are not eliminated, and the culture of stoicism is as endemic to the maritime professions today as it has ever been.

I hope that the story woven here, arresting as it is in word and in photograph, will capture the imaginations of students, public and professionals alike, inspiring us all to identify with its people and to continue to ask the creative questions that have fascinated and challenged me.





Introduction & Acknowledgements

This booklet is a new educational resource – part history, part story – that attempts to provide a fresh perspective on the colony of New Sweden and Delaware’s early history. The Atlantic Ocean was an enormous “first frontier” all its own in the 17th century, and any accounting of America’s colonial experience should include this maritime world. The Atlantic could be a highway and a barrier, but it was always a dangerous and wondrous place. It shaped our formative history, often directly, in ways that are too often overlooked. No one living in this period could take transiting the Atlantic for granted. Looking back, neither should we.

This essay and collection of photographs tells the story of the founding of New Sweden in 1638 from a *Kalmar Nyckel* point of view – a “deck’s-eye” view from the perspective of Peter Minuit and his original crew, including those first 24 soldier-settlers who stayed behind to hold the fort, quite literally. In words and images, it attempts to answer the questions we are asked all the time, namely – what was it like to sail on the original *Kalmar Nyckel*? Who were they that did it, and how did they ever make it? Why Delaware? What were they thinking, and what did they bring with them? How did they live, what did they eat, and where did they sleep? What did they do once they got here?

Written for 2013 and the 375th Anniversary of the founding of New Sweden, the publication is expressly designed as an educational resource to augment Delaware’s Recommended Curriculum and to spark the historical imaginations of secondary school teachers and students. If it proves useful or interesting to others, if it helps to interpret and broadcast more generally the *Kalmar Nyckel* story, that too would be welcome. Intended as a meditation on transatlantic voyaging and Delaware’s surprisingly pluralistic formative history, this essay was also written with the women and men of our modern-day ship in mind.

A special thanks goes to Captain Lauren Morgens for her many contributions to this project. Certainly her technical advice made the intricacies and nuances of the sailing sequences work. Even more, the creative process and the final product benefited from her spirit of critical inquiry and unflagging curiosity.

Most of all I want to thank my friend Andrew Hanna – the photographic half of the photo-essay collaboration – for his extraordinary work providing the images that mark so well the narrative content. As a volunteer crewmember with special skills and an uncanny eye for detail, Andrew represents – and his work conveys – something of the fun and inspiration that it is to work at the Kalmar Nyckel Foundation. We like what we’re doing at the Kalmar Nyckel Foundation, living in the 21st century and sometimes working in the 17th, and we hope it shows.

Samuel Heed
Senior Historian & Director of Education
Kalmar Nyckel Foundation

May 1, 2013



They were *Kalmar Nyckel* shipmates, part of Peter Minuit's crew, and they carried the first permanent European settlers to the Delaware Valley.



Image: Alisair Gillanders, Kalmar Nyckel Foundation (KNF)

They landed at "the Rocks" in March of 1638, on a tributary meandering just west of the Delaware, where they built little Fort Christina on land that would one day become the City of Wilmington.¹ They flew the Swedish flag and carried it across the Atlantic but hailed from territories all over the Baltic and North Sea – Dutchmen and Danes, Germans and Poles, Finns as well as Swedes, a lone Scot.

On behalf of their twelve-year-old sovereign sponsor, Queen Christina, they founded the colony of New Sweden in what would become Delaware, the future first state of the United States of America. Eventually, they would carry the distinction of having sailed the ship that completed four round-trip crossings of the Atlantic, more than any other documented ship of the colonial era.

¹The Kalmar Nyckel Foundation shipyard and offices are located on Wilmington's historic 7th-Street Peninsula, adjacent to Fort Christina Park. In 1997, the new *Kalmar Nyckel* was launched on the Christina River about 200 yards downstream from the site of the original landing at "the Rocks."

Image: Stanley Arthurs, *Landing of the Swedes and Finns*, Courtesy University Museums, University of Delaware. Gift of Mrs. Joseph S. Wilson, Class of 1967



Image courtesy of artist Lars Gillis

As their expedition leader and colonial governor, Peter Minuit carried the Royal Standard for the House of Vasa together with the official "Instructions" from the Swedish Royal Council. The "Instructions" were made of paper and not very heavy on their own. The responsibilities themselves carried considerable heft, however, since the original idea for a North American colony on the Delaware that would compete with those of the Dutch and the English had been Minuit's. His making good on the promise of starting a commercially successful colony, one that could pay for itself and survive long enough to turn a tidy profit, weighed him down as he prepared to launch the expedition. Minuit didn't have to look at the enameled miniature of his wife Gertrude Raets, the one he always carried in his left breast pocket, nearest his heart, to know the risks might outweigh the rewards. Standing on the wharf in Gothenburg harbor in November of 1637, he faced the freshening breeze that would carry their little expedition across the Atlantic.



They carried four traditional anchors on *Kalmar Nyckel*, two to port and two to starboard. Weighing anchor – weighing *the* anchors, at 1,000 pounds each – could be the heaviest of burdens.

Added to that was the literal weight of the enormous hawsers, giant ropes with the girth of a man's thigh, used to raise the cast-iron behemoths. The figurative burden could be even heavier – leaving home, casting off family and friends as well as the mooring lines to the dock of their homeport, heading on a journey with hazards known and unknown.



The three masts and nearly 8,000 square feet of sail they carried in classic square-rigged configuration defined their ship *Kalmar Nyckel* and gave them purpose in this Age of Sail. They had purchased her from the Dutch to serve the Swedish navy in 1629, and she was carried on the rolls of the *Skeppskompaniet* ("Ship Company") for the cities of Kalmar and Jönköping. Built in Amsterdam in about 1625, *Kalmar Nyckel* was a product of the "Golden Age" of Dutch naval power and seaborne world trade, carrying on the proud tradition of the most advanced naval architects and finest shipbuilders available anywhere in the early 17th-century world.

With a sparred length of 141 feet, she measured 93 feet on deck and had a beam of 25 feet. Her mainmast stood 104 feet off the waterline – about six stories tall. A new class of vessel called a Dutch *Pinnace*, she could operate equally well as an armed merchantman or small warship. She was stoutly built and seaworthy, characteristics that served them well throughout her long and remarkable career.



They carried ten different sails for propulsion and maneuvers – two on the bowsprit, three each on the fore and main masts, and another two on the mizzen mast. Nine of the ten sails were square-rigged – spritsail, sprit topsail, foresail, fore topsail, fore topgallant, mainsail, main topsail, main topgallant, and mizzen topsail – leaving only one, called the mizzen, lateen-rigged.¹ The square-rigged sails were set and adjusted to drive the ship forward.

The triangular-shaped mizzen sail was carried near the stern and useful in helping to steer the vessel. Using the sails in combination meant that they could sail close to the wind, with increased speed and maneuverability. With three masts they could balance her nicely on her course, and, by unbalancing the sails, they could turn her quickly onto another course.



The sails were made from hemp or linen, hand-loomed in special sailcloth factories. The Swedish navy stipulated using the best hemp, which came from Riga. The linen came from France by way of Holland and was cheaper, but it didn't hold up as well. Sewing kits were carried because frequent repairs were necessary. No matter how rugged, sail cloth took an awful beating from sunlight and saltwater, not to mention the strain caused by high winds and the wear of rolling in a calm. On long voyages like the 1638 Expedition across the Atlantic, they carried an extra set of sails, just in case, it better to be safe than sorry when heading into a New World and parts unknown.



¹The present-day *Kalmar Nyckel* typically sails without the topgallants on the fore and main masts, but she has been and can be rigged this way.



Image: Herb Comer, KNF



Image: Lloyd Collins, KNF



The complicated rig they carried – one of the great inventions of the early-modern age – allowed them to convert the often fickle and dangerous winds into a safe and efficient motive power. The rig required miles of rope and hundreds of blocks, but it gave them versatility, enabling them to sail – and to make progress – in the wide variety of weather conditions they would encounter in an ocean crossing. Still a work of art as much as a science in this period, really, the rig required a symphonic conductor with the skills of a master mariner. And constant adjustment.

It fell to them to carry the burden of making these adjustments. About thirty of them there were on *Kalmar Nyckel's* first voyage to America, professional seamen from Holland and Zeeland mostly, men of the sea. They were sailors, and they spent their time hauling one or another of the hundreds of different lines that made up the complex rig. But to do that, first, they had to “learn the ropes,” figuratively and literally, an idiomatic expression they carried to distinguish the landlubber from the experienced seaman.

They carried the certain knowledge that each line had its own specific function and own specific gravity, from the sprit topsail halyard off the bow to the mizzen sheet up on the quarter-deck near the stern, and that they all would have to be learned ... and hauled. The ropes seemed endless to the novice, and each line needed to be handled over and over again, depending upon wind, waves, and weather; on the need for speed, the desired direction, the ultimate destination; on the demands of the sailing master or the whims of the ship's captain.

They hauled endlessly, in gale force winds and airless doldrums.¹ They hauled and overhauled lines, sometimes raising, hoisting, and setting sail, sheeting it home, before dousing it again, hauling it back in and shortening as needed. They hauled by day, against a blindingly bright sun, and by night, under a blanket of stars, the moon waxing and waning, phasing from inky-darkness to a glimmer-glow. They hauled hand over hand, sometimes alone, more often in pairs or teams. Under exigent circumstances or for complicated maneuvers, they hauled with nearly everybody on board, the captain having called “All hands on deck!” – meaning that every able-bodied person with “hands” of any kind would be needed to “tally on” and lend a hand.

¹For an extended version of this section that names every active line in the complex rig, the way it was originally written, see Appendix A.



Sometimes they hauled on deck, stepping over and around the guns, using cleats and belaying pins for points of attachment, other times tying off around knightheads or horn kevels.



It made their heads spin sometimes, thinking of the rig and all its functions, the variations and permutations, each sail change, each adjustment a response to something – a course change, a weather change, a sail on the horizon, a tiny piece of the enormous challenge that was a voyage to the New World – but at least they didn't have to think about it, but could go on hauling hand over hand with no volition, just hauling, concerned only with their sail – set, brace, trim, douse – the rest of the world and its decisions left blissfully to others, to the boatswain, to the officer of the watch, to the ship's master, or even to the captain maybe, hell, all the way up the chain of command to the governor of the colonial expedition or the admiral of the fleet, maybe even to the Queen herself, who was all of twelve years old in 1638. But the hauling never stopped, never ended, not while there was a cro'jack brace to hand or the main sheet still to work.

¹For a more complete look at *Kalmar Nyckel's* complex rig, see Appendix B.

Other times they hauled from up in the rigging, climbing up the shrouds – which were “standing rigging” because they didn't need to move through blocks, and thus could be blackened with thick tar to keep the wet out, dampness being especially destructive to the composition of natural fibers, hemp, usually, or flax. They used the little ratlines of the futtock shrouds to ascend into the fighting top, getting dizzier the higher they went, 104 feet to the highest point, if they needed to unfoul topgallant gear atop the main mast, swaying softly or violently depending on the weather.



But hauling lines they did, morning, noon, and night. They hauled lines in their sleep, if they got any. They hauled them instead of eating sometimes. They would haul lines no matter what, in battle if necessary, with cannon balls roaring from the big guns, which could decapitate them or worse, maybe disembowel them smack in the middle of their haul. But the lines needed to be hauled regardless, and so they did. Theirs was a hands-on philosophy – when to haul or not to haul, but never *whether* to haul. Still hauling, up on the quarterdeck now, they hauled the mizzen topsail halyard.¹



They carried things – and didn’t carry other things – based on superstition. No umbrellas were allowed, not after they were invented, anyway. Dogs might or might not be bad luck depending on the circumstances. Cats were always welcomed,¹ for company but also to ferret out the rats, which were ever-present and often a supplemental source of protein. Women passengers were often frowned upon, intruding into a man’s world in ways unwanted, reminding the crew of the things they couldn’t carry.² They carried gold or silver coins under the masts, good luck charms placed there by the shipwright before the masts were “stepped,” meaning secured into their proper places and fixed to the hull. A ship or a voyage or a crewmember could be doomed for the simplest of reasons.

¹See image of “Toolbox”, *Kalmar Nyckel*’s longest-serving crew member.

²Today, women are not only welcomed as passengers aboard the new *Kalmar Nyckel*, but they comprise about 50% of the all-volunteer crew. That her captain and relief captain are both women - Lauren Morgens and Sharon Dounce, respectively - completes the irony, serving as powerful reminders that some things have changed in 375 years! (see image above of Captains Lauren and Sharon)



Starting a voyage on the 13th day of any month was never a good idea. In the Swedish navy, no one ever polished the ship’s bell. The brass was allowed to weather and turn green with oxidation. Somewhere, somewhen, on some Swedish naval vessel, or so the story goes, a sailor happened to polish his ship’s bell, which led directly and immediately to catastrophe. The ship was sunk in a battle off Gotland, in the middle of the Baltic, heeling over and capsizing, before exploding thunderously when a tipped-over candle flame touched-off the entire gunpowder magazine. All hands were lost except for the bell-polisher, who lived to tell the tale. Bells were never again polished on ships of the Swedish navy. That is why, to this day, the crew of the reconstructed *Kalmar Nyckel* is forbidden from cleaning their bell - the fates being what they are in ships at sea, polished bells mean certain and imminent doom.

In storms and high seas, sailors mostly concentrated on doing their jobs, knowing and hoping that competency at sea mattered most, that the rest of their shipmates were counting on them – to shorten sail, belay the line, handle the whipstaff with stoical professionalism. But at sea it was always a matter of fate, and they never forgot that human proficiency might not matter in the end. The ship, no matter how large and seaworthy, was the merest speck bobbing on a gigantic, raging, endless ocean. They did their jobs to the best of their abilities, but it was never a case of “zero defects” protecting them from the ultimate fates, the weather gods and the sea monsters that were out there, lurking, looking for them and calling their names – or worse, whispering the name of their ship. Sometimes, they could hear it in the rigging if they listened for it. They and their shipmates were very much alone with their fates, and no amount of reason or logic or proficiency would ever make a difference.



When it got really rough – like the vicious storm in November 1637 that broke their main mast and almost sank them three days outbound from Gothenburg – they resorted to whatever came to mind, muttered prayers mostly, whether in the form of Protestant or Catholic incantations. On Scandinavian ships like the original *Kalmar Nyckel*, Norse pagan gods could be called upon frequently. When the worst happened, and the seas started cascading through the main deck hatches, and the pumps were being overwhelmed, nothing much worked. Down-flooding either sank them or it didn’t. And so, they did what they could, did what they were told, and they kept a weather eye on the fates, because one could never be too sure which superstition might matter in what circumstance, and they took no unnecessary chances. It was madness to think otherwise, and one could go mad just thinking about it. Between the realms of madness and superstition, superstition prevailed at sea.





What they carried varied depending on the mission. When *Kalmar Nyckel* served as an auxiliary warship for the Swedish navy, which she did off and on again throughout her twenty-five-year career, they carried extra guns, ammunition, and crew. Swedish Admiralty records from 1634 list her as carrying a crew of 55 men and 12 six-pounder cannon – probably typical of her wartime strength. Guns were classified in terms of the weight of the shot fired – thus, six-pounder cannon fired six pound projectiles, usually round cannon balls. Sometimes chain, bar, or scissor shot would be used against the rigging of enemy ships, and grape and canister were often employed against enemy personnel. The six-pounder guns themselves weighed about 1,700 pounds, making them the heaviest things they carried on the ship.

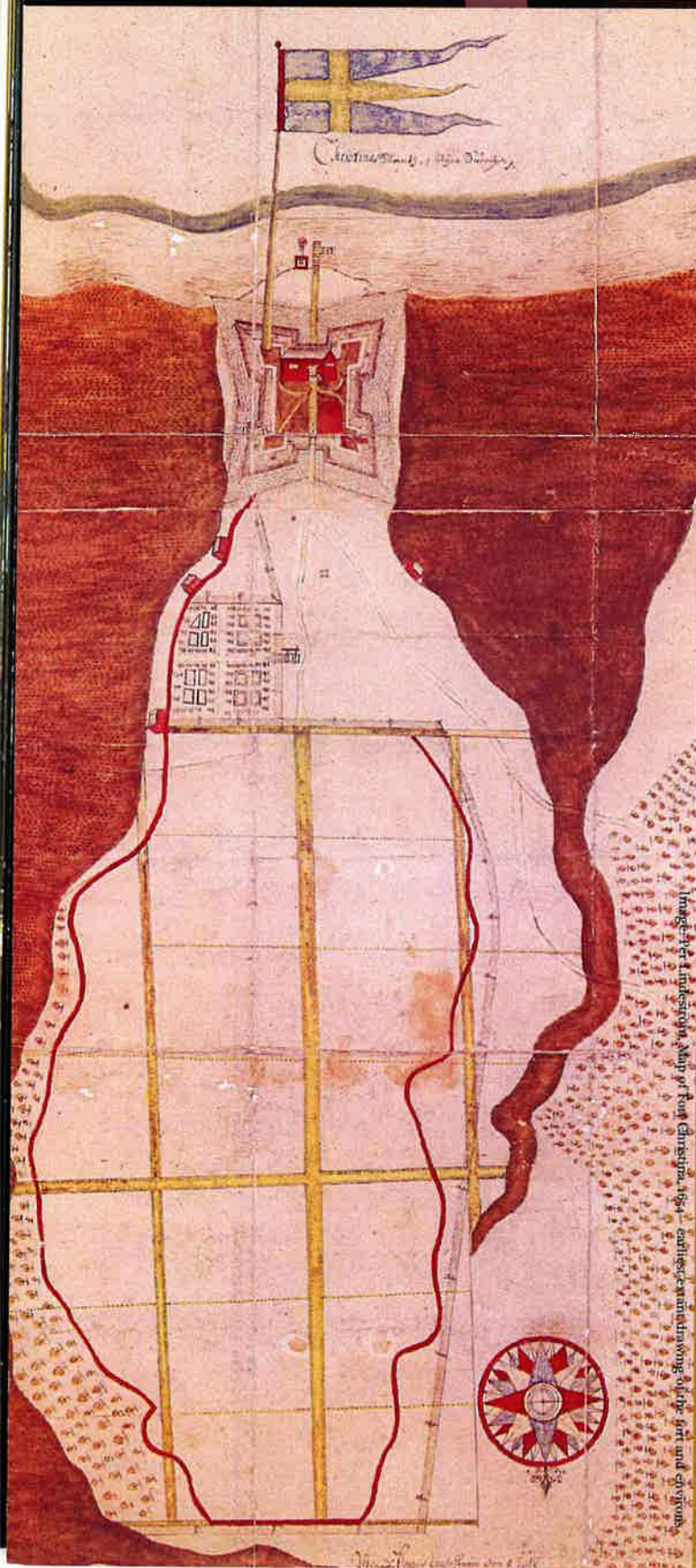
A surprising amount of shot and powder could be discharged in any one ship-to-ship action, so a special gunpowder magazine was created below decks to carry it all. The magazine was located as far below the waterline as possible, and it was copper lined, which prevented sparks. Extra crew with special training serviced the big guns, each of which required a team of six men to operate effectively for any length of time. Swedish naval captains expected their gun crews to fire about ten rounds an hour, which was what the Dutch navy could do, the highest rate of fire achieved during the early 17th century. Other crew could become supplemental maritime soldiers – not yet but soon to be called “marines” – who carried special short-barreled muskets, short swords called naval cutlasses, explosive grenades and petards, and an assortment of pikes, clubs, and boarding axes for close-in mêlées.



When operating *Kalmar Nyckel* as a merchant vessel, sailing her in and about the Baltic, which they did for the Swedish *Skeppskompaniet* when not campaigning her with the navy, they still carried cannon for protection. But they carried fewer of them, and often sailed with a skeleton crew of twelve to fifteen men. Sailors were a major expense for merchant-capitalists, who, then as now, worked diligently to reduce their labor costs. One way was to use crews with less experience or professionalism; the other method was to reduce the size of the crew to its smallest unit of functionality.¹ As merchantmen, they usually carried bulk cargo, mostly timber or grain or naval stores, sailing from one end of the Baltic to the other, sometimes venturing beyond the Sound Toll at Kronborg Castle in Helsingør, out around Jutland into the North Sea and down to the Dutch ports.

¹Today's non-profit Kalmar Nyckel Foundation operates the ship with an all-volunteer crew, who provided over 41,000 volunteer hours of services in 2012.

On colonial expeditions to North America and back, which *Kalmar Nyckel* did four different times, they carried everything possible with which to start a colony. Finished European goods for trading with the native Lenape were perhaps the most important things they carried, since the colony's primary purpose was commercial gain. The fur trade, at which the Indians excelled, was the major enterprise. Beaver pelts, which in Europe had been trapped into extinction, were highly prized for their dense and lustrous hairs – up to 23,000 hairs per square centimeter – and in high demand for hats and collars and cuffs, furs making a fashion statement then as now. They also carried three miles of finished cloth – called duffel, from the Dutch town outside Amsterdam where it was made. Minuit knew from prior experience dealing with the Lenape, which he had done as the former director of the Dutch colony of New Netherland – where he also happened to purchase Manhattan Island – that bright red cloth was highly valued by the Lenape and would bring the best return in a trade. Iron implements were prized as well, the Indians of the Eastern Seaboard not having developed iron-mongering and metallurgical techniques. Iron replaced stone, wood, and leather for tools, cooking pots, hinges, and arrowheads. Burnished copper pots were used by the natives more for adornment than for cooking and eating, the pots being cut into irregular pieces for jewelry. Mirrors, gold rings, glass beads, and clay pipes were sought after as well.



They carried 24 soldiers on the first colonial expedition in 1638, pioneers who built a wooden fort before staying behind to hold it. Many were “Forest Finns,” who had been conscripted into service and forced to make a fresh start in New Sweden. Within the fort, named for Queen Christina, the Finns used their “backcountry” skills to good effect, building two log-cabin structures – one a storehouse for trade goods, the other a barracks – the first of their kind ever constructed on American soil. 500 bricks from Gothenburg were carried as well, serving first as ballast for the ship before being off-loaded and used for fireplaces and chimneys. Bags of crop seeds – for the planting of barley, wheat, and rye – were carried as well as barrels of preserved food, enough to last a full year.

They also carried a small boat, called a shallop, stowed in pieces and packed away in the hold. Re-assembled once across the Atlantic, it had a flat bottom and could be sailed or rowed. Minuit used it to scout the shallow waters of the Christina and Brandywine Rivers, looking for any Dutch or English settlements that might have emerged since 1631, when he was last in America.



Kalmar Nyckel made three follow-on voyages between 1640 and 1644, in which men, women, and children were carried as well as dogs and other livestock – horses mostly, but cows, pigs, chickens, goats, and sheep, too. They were on the thin edge of a massive migratory wedge, what later historians like Alfred Crosby would call the “Columbian Exchange.”¹ It was a two-way, multi-lane highway connecting the Americas with Eurasia and Africa, post-1492, an Atlantic World that made “One New World” out of what had been “Two Old Worlds,” a ship-borne conveyer system that brought together and cross-fertilized the plants and animals, the peoples, ideas, and ailments of the Western and Eastern hemispheres. For better and worse, they carried the seeds that grew into the modern world.

Peter Minuit carried “secret orders” on the 1638 Expedition, which authorized him to operate *Kalmar Nyckel* as a privateer.



¹See, e.g., Alfred Crosby, *The Columbian Exchange: Biological and Cultural Consequences of 1492* (1972)

Privateering was a form of licensed, irregular warfare at sea, providing monarchs and governments a 17th-century version of “plausible deniability” and “constructive ambiguity.” “Asymmetrical warfare” is a new term but an old idea, as is the use of “special forces” for shadowy operations that could be lucrative if they worked and disowned if they didn’t. Leaders and governments like to have it both ways, as always, waging war without having to declare it or own up to its consequences. Thus it was that Minuit found himself with “secret orders” from the private offices of the New Sweden Company, his employer, with the implied “license” from the Royal Council that oversaw its operations and charter, to seize any treasure ships that he might find on his voyages to and from the New World.

Kalmar Nyckel operated in a dangerous Atlantic world and carried her guns for protection. In 1638, the Swedish government was at war with the Spanish and Portuguese empires, while the Dutch, Danish, English, and French navies could not always be relied upon to act in a friendly manner. Pirates were a common concern.



At night, on watch, they were carried away by the lure of New Worlds, transported by the wanderlust of exploration and imagination. There were fabulous riches to behold, somewhere out there off the far horizon, beckoning them on the breeze of desire. There were real places out there, with real gold and silver, places that did actually exist and had been found, some of them, the Lost Cities of Cibola, El Dorado, treasure islands sprinkled across the Atlantic like fairy dust. And there was still so much to see, places to discover, lands to find.

And there were women, too, always aching-ly beautiful, primitive and free, frolicking and swimming and paddling in their dugout canoes, calling their names, keening softly.¹ It was intoxicating, thinking about the possibilities, the chance encounters that put them on this ship at this time on this voyage. And that evergreen breast of the New World, unsullied by European hands, the forests that stretched forever, lands to begin again, a chance to start over. Just the smell of the pines, which carried miles out to sea, so fresh and so clean, stayed with them all their lives. It made them wonder. It changed them. Nothing would ever be the same.



¹The sexism and cultural insensitivities here were defining characteristics of the period.

They carried simple machines onboard to help them with their work, a windlass, a capstan, two bilge pumps, and the whipstaff – not including block and tackles that made up much of the rig.¹ The windlass and capstan were muscle-powered winches that provided the crew with a significant mechanical advantage when lifting spars, weighing anchor, loading cargo, hauling lines, trimming sails, hoisting topmasts, warping the ship tight against the dock, and any other heavy work. The windlass lay horizontally just aft of the fo'c'sle and offered a mechanical advantage of 10:1 – meaning it gave each person ten times his normal power. Up to eight “hands” could use the long bars as levers to turn the windlass. The capstan stood vertically, aft of the main mast and before the captain's cabin. The capstan was pushed around by as many as sixteen crewmembers using the bars, hands to chest. It gave a 5:1 mechanical advantage, which was less than the windlass, but could be operated continuously to haul a line wrapped around its drum.

The two hand-cranked piston pumps they carried were ingeniously designed for sucking water out of the bilges and discharging it through wooden pipes over the side of the ship. The pumps were located just aft of the main mast, one on either side. One or the other could be used to keep the bilges dry, depending on whether they were heeling to port or starboard. Both pumps could be operated simultaneously if the ship were flooded. The pumps were made from hollowed out logs, with the bark still on them for insulation, and with copper sieves attached to the piston bottoms, which kept out the muck and bits of debris.

¹Block and tackles, which consisted of two or more pulleys with a rope threaded between them, were the most prevalent – and important – “simple machines” carried aboard sailing ships. Given their ubiquity in the “Age of Sail” and for sake of brevity, block and tackles are not highlighted here in the narrative discussion.



Surprisingly effective, these bilge pumps could discharge hundreds of gallons a minute.

They carried a whipstaff to move the massive rudder, which weighed 3,200 pounds. The whipstaff was the latest in helm technology until about 1710, when it was finally replaced by a steering wheel that operated the rudder through a complex system of ropes and pulleys. The whipstaff was a vertical lever attached to a horizontal lever, called the tiller, a long, shaped block of wood that ran through the wardroom cabins and out the stern where it attached to the rudder. A nifty gadget called a rowel – essentially a 17th-century version of a universal ball joint – allowed the whipstaff to pivot while connecting it to the tiller. The whipstaff and tiller combined to give a *multiplicative* 40:1 mechanical advantage, enabling a single sailor to handle the massive rudder, no matter how high the seas or bad the weather. Helm commands were given by officers standing on the quarterdeck, who conned the ship from a position where they could see the workings of the ship and where and how it was moving. In stormy conditions or in battle, a relay was used to pass the commands from the officers to the helmsman. It took teamwork and constant attention, but it worked remarkably well – and still works today.





Among the manifold dreams Peter Minuit carried with him to the New World, the one that excited him the most was the chance to create a haven for his Germanic countrymen, all those uprooted by the ravages of what would soon be called the Thirty Years' War.

That he might build a vibrant and tolerant society on the banks of the Delaware, one that would be peopled by his fellow Rhinelanders, friends and families who had suffered the cross-fires of religious and political persecution, stirred his Dutch-Reformist soul and capitalist sensibilities. America *could* be a new world, and he could make it happen.



They carried a “watch-keeping system” to divide their work schedules aboard the ship, ocean voyaging being a 24-hour-a-day business. They employed a variation of the typical watch bill aboard *Kalmar Nyckel*, which divided the crew into two groups, one assigned the “port watch” directed by the first mate, the other the “starboard watch” led by the second mate.

Except for the “idlers” – which included the ship’s cook, carpenter, and cooper – who worked by day and slept at night, each “watch” served four hours on duty and fours off throughout a 24-hour day. A “dog watch” was usually included, whereby one watch was divided into two shorter watches so that there were an odd number of watches throughout the day.

¹There exists a Swedish source for this system, which dates to 1656.

²For a look at a typical 24-hour watch-keeping system, see Appendix C.

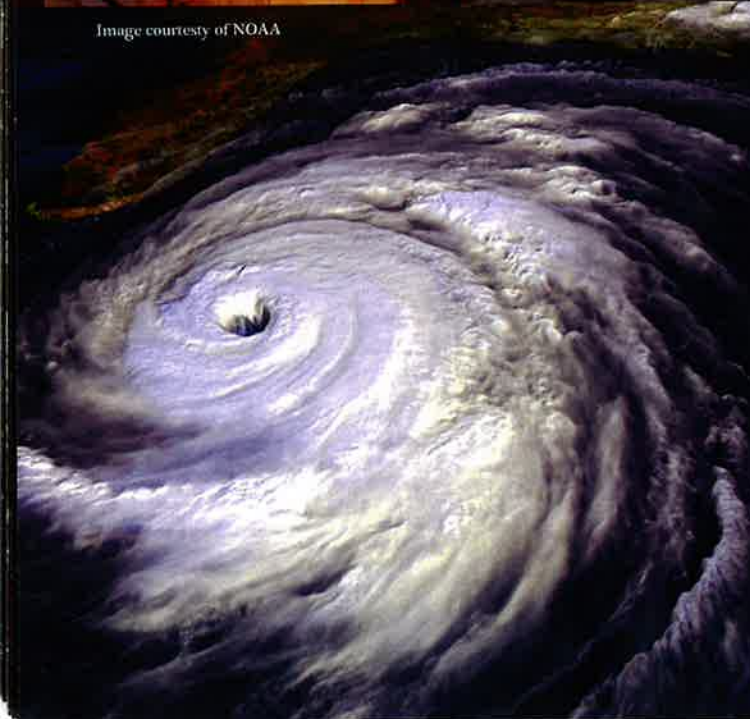
³Even with the advent of accurate marine chronometers, which kept “Greenwich Mean Time” for the calculation of longitude, the ship’s time was still kept with the glass.

This “dogged” the schedule, allowing it to rotate, giving crewmembers a slightly different watch schedule each day. Dog watches were often set for supper time,¹ allowing the entire crew to be fed in a short period.²

They carried hour glasses to keep time and mark their watches, the sand trickling from a top bulb to the bottom one in predictable, thirty-minute increments. Hour glasses were the most accurate time keepers at sea, the regulated action of the sand being reasonably unaffected by the motion of the waves and changes in temperature, humidity, and barometric pressure. An English carpenter named John Harrison would eventually build a more accurate watch for use at sea, his famous marine chronometers, but these wouldn’t be invented until the middle third of the eighteenth century.³



Image courtesy of NOAA



Each half hour they rang the ship's bell and turned over the glass, the sand trickling out a fresh thirty minutes. "One bell" would call out the first half hour of the watch, "two bells" the first hour, and so on. "Eight bells" would signify four hours and the end of the watch, from which derives the expression "eight bells and all's well." The condition of the ship – its course, heading, speed, location, weather, etc., and anything else worth noting – would be marked into the ship's log book at the end of each watch.

This routine could be interrupted if need arose – whatever the emergency – in which case "all hands" would be called to duty, signifying both watches and every able-bodied person. But most of the time it was four hours on, four hours off, eight bells on and eight off, day and night, day after day. When they weren't standing watch or called for an emergency, they tried to get as much sleep as possible.



Peter Minuit died in a hurricane on the way home. He was lost at sea near the Caribbean island of St. Kitts in August of 1638, while visiting a friend who was the captain of a Dutch ship, *The Flying Deer*. The *Kalmar Nyckel's* captain, Jan Hindricksen van der Water, was with Minuit and lost, too. *Kalmar Nyckel* survived, but neither Minuit nor van der Water was ever seen again. Hurricanes happened at sea, and one carried the knowledge that sailing the Atlantic was a dangerous business.



Necessity dictated the things they carried. Ships were small and space was limited, precious even.



Sailors lived Spartan lives and carried very little personal gear. Besides the clothes they wore, home-spun shirts and breeches made of wool or sometimes linen, they carried a utility knife and a wooden marlin spike, called a fid, for rope work.



They each carried a small sea chest, crude wooden boxes about 2 feet by 3 feet by 3, in which they stored their worldly possessions – a wooden bowl, cup, and spoon; a pair of leather shoes; a woolen hat and mittens; some fishing gear; a personal keepsake or two; maybe some extra food, usually bags of dried peas and salted fish. The experienced seaman learned to travel light, the finite space of the fo'c'sle confining one's expectations. If they were lucky they carried an extra blanket and a woolen jacket, which could be worn or used for bedding as they slept on wooden pallets in the fo'c'sle. Cramped, wet, and smelly, life in the fo'c'sle was no bowl of cherries. Frigid in the northern high latitudes and suffocatingly hot near the tropics, it was a "misery loves company" kind of place. Water, beer, and distilled spirits were carried as well as food, which made for some compensation.

Officers usually carried their own libations, wine and coffee the typical fare, which were considered necessities. Officers also carried the navigational equipment, often their own personal possessions, which were among the most important necessities anyone ever carried at sea.



Knowing one's location at sea, fixing the latitude and longitude, where spaces were vast and landmarks non-existent, separated the successful mariner from the lucky ones and the dead. In an age before GPS and LORAN, before radar and sonar let alone John Harrison's marine chronometer, determining one's location at sea was tricky business. All kinds of navigational aids had been developed over the centuries, and so they carried as many of these as they could – the astrolabe and the compass were old essentials, the backstaff an ever-improving instrument for sighting the sun, the chip log

¹"Dead reckoning" is the proper term for this kind of nautical navigation in the Age of Sail, where its use dates at least to 1613 according to the *Oxford English Dictionary*. The idea that the term "dead reckoning" actually derives from "deduced reckoning" (shortened to "ded. reckoning") is folk etymology, a misnomer originating in the mid-20th century. Captain Lauren Morgens of the present-day *Kalmar Nyckel* reminds me that DR remains an important part of the mariner's toolbox, a valuable fallback regardless of equipment failure, and necessary for calculating the set and drift of current or for doing modern celestial navigation.

with its line of nautical knots to be tossed overboard for discerning the ship's speed, and the lead line for sounding the depth.

A traverse board was used for dead reckoning, recording the ship's last known position, course, and speed. Dead reckoning required careful plotting, because getting from point "A" to point "B" was never straightforward, and allowances had to be made for wind drift and ocean currents. The term "dead reckoning" – "dead" here meaning "completely" or "absolutely," as in "dead wrong" or "dead last" – comes from open ocean sailing, where mariners had to rely entirely on calculation once they were beyond the sight of land.¹



Image: Ludolf Bakhuizen, *Dutch Merchant Ships in a Storm*, 1660; courtesy Rijksmuseum, Amsterdam

But the "dead" could become a double entendre pretty quickly, taking on a whole new meaning where missing a landmark by as little as ten miles in hundreds of thousands of miles of open water might spell doom. For nautical navigators in an age before the advent of modern technology, all reckonings were a kind of whistling past the sailor's graveyard.

Navigational charts, the more up-to-date and exacting the better, were often the most prized possessions carried aboard ships in the Age of Sail, unknown shorelines being deadly to wind-driven wooden boats. They were state secrets, really. As such, the charts usually belonged to the highest ranking person aboard, the ship's captain or the supervising admiral.

On *Kalmar Nyckel's* 1638 expedition to America, it was Governor Peter Minuit who carried the charts, being in command of the entire New Sweden operation. One advantage Minuit had on his competitors in the 1630s was his access to the charts drawn up by the Dutch West India Company, which he'd acquired from his time as director of the colony of New Netherland. The Dutch were the best cartographers and hydrographers of the 17th century, and they kept the most accurate charts.

Whether Minuit made copies from the Dutch originals or simply took the ones he wanted is still a subject of conjecture, but possession carried 9/10ths of the law even then – maybe especially then – in the world of the 17th century.





Fleas and lice infested their clothes and belongings, and they carried germs and parasites with them at all times. Compared to crews on other ships, however, which were notorious disease factories, they were remarkably healthy.¹ Their diets were bland and basic but regular and laden with sauerkraut, so they never suffered the vitamin and mineral deficiencies that plagued most crews on long voyages. Scurvy, for one, brought on by a debilitating deficiency of vitamin C – which led to spongy gums, loss of teeth, bleeding mucous membranes, suppurating wounds, and killed something like two million sailors between 1500 and 1800 – was never a problem. Sauerkraut, a kind of fermented cabbage, with a long shelf-life and rich in ascorbic acid, proved a natural scurvy preventer – which is why explorer James Cook would later bring it on his long voyages to the Pacific.



¹Captain Sharon Dounce in period clothing for the filming of a NATGEO TV special, looking “remarkably healthy.” Passengers on *Kalmar Nyckel*’s three later transatlantic voyages were not so lucky and often sick.



They carried the emotional baggage of men who risked their lives in a hazardous occupation. Sailing square-riggers across the Atlantic was about as risky a job as one could have. Statistics from the period are sketchy, but we know that one in five ships that left major Atlantic harbors in the 18th century never made it to their destinations and were lost at sea. Most of these losses were for ships traveling to and from European ports.

Losses were even higher in the 17th century and presumably much higher for transatlantic voyages, although by how much is hard to say. Despite the statistics and the tangible dangers, by and large they kept their fears to themselves – the fear of falling overboard or from a yard, fear of sinking or capsizing or just drowning, being washed away and lost forever, never to be found or seen again. Above all, they carried the fear of getting lost, “dead reckoning” their way to starvation and the insanity of being in the middle of a vast ocean with nothing left to drink. It was a credulous age, and the dangers were many, the distances vast. Monsters of the deep and devilish omens plagued the unwary, good shipmate and Christian or not.



And so they mostly carried their blue-water demons inside, maintaining a mask of fortitude. More than anything else, they were afraid of their own cowardice, an intangible that made them weary with the weight of the infinite.

They were quick to sneer or laugh at the weaknesses of others, imposing a finite peer pressure of shipmate stoicism known to everyone who ever ventured to sea in a boat. And it worked, too, for the mocking of others helped keep the coward at bay, that inner voice of terror that led to shameful behavior.



When the wind slackened, or they were stuck in port – waiting, waiting ... interminably ... for the wind to rise and blow from the right quarter – they carried boredom. It could be a tedious life when the ship didn't sail, space confined, not enough to do, and absolutely nowhere to go. The English wit Samuel Johnson likened it to jail, or worse, because you might sink and drown. The food was bad, the smells vile, the company notorious. The wooden bulwarks were as good as horizontal iron bars, letting you look out onto the broadest of worlds without ever actually letting you out to experience it.

As such, they carried unsavory reputations. Most of them came from seafaring families or from harbor towns. Most of them were the poor and unwashed, men willing to risk danger and to cut themselves off from society, from family and friends, the landed world, for weeks or months, maybe even years, at a time. They were – and are – a breed apart.



A

fter two months of fruitless searching for Governor Minuit and Captain van der Water in the waters off St. Kitts, First Mate and now Acting Captain Michel Symonsson gave a shrug as he called to make sail. "Carry on," he said, giving a curt nod. The topmen let go of the topsails and the men on deck sheeted them home, as...



Kalmar Nyckel

began to catch the winds out of the west, bearing East-Northeast, heading back across the Atlantic and the long voyage home.



Appendix A: Extended Version of Line-Handling Narrative

They hauled endlessly, the sprit topsail braces, leechlines, clewlines, sheets, lifts, and halyard, in gale force winds and airless doldrums. They hauled by day, the spritsail braces and yard lifts, against a blindingly bright sun, and they hauled at night, the spritsail clewlines and buntlines, under a blanket of stars, the moon waxing and waning, phasing from inky-darkness to a glimmer-glow. They hauled lines, all of them and each of them, the foresail bowlines, fore topsail bowlines, foresail clew garnets, and foreyard lifts, no matter what the weather. They hauled hand over hand, sometimes when their own hands were all they could see in the morning thick with mist, foresail martlets, fore topsail clewlines, buntlines, leechlines, and lifts. They hauled with calloused hands, skin petrified by constant friction, frayed fibers, and saltwater, the fore t'gallant lifts, fore t'gallant clewlines, leechlines, sheets, and halyard.

They hauled hand over hand over hand, sometimes alone, more often in pairs or teams, the mainsail bowlines, main tack, spritsail sheet, and foresheet. Under exigent circumstances or for complicated maneuvers, they hauled with nearly everybody on board, the captain having called "all hands on deck" – meaning that every able-bodied person with "hands" of any kind would be needed to "tally on" and lend a hand – the mainsail clew garnets, mainyard lifts, mainsail martlets, main topsail clewlines, buntlines, leechlines, and lifts. They hauled upwind and downwind, the main t'gallant lifts, main t'gallant clewlines, leechlines, sheets, and halyard, whether the wind was on the starboard quarter or the port bow, whether with following swells that lifted the stern from behind or sharp-lipped seas that rolled the ship beam-on, sending the yards through arcs of 70 degrees or more, their arms dipping now and again into frothy waves, spray billowing.

They hauled and overhauled lines, sometimes raising, hoisting, and setting sail, sheeting it home, before dousing it again, hauling it back in and shortening as needed. Sometimes they hauled on deck, stepping over and around the guns, using cleats and belaying pins for points of attachment, other times tying off around knightheads or horn kevels, using the cavel blocks as needed.

It made their heads spin sometimes, thinking of the rig and all its functions, the variations and permutations, each sail change, each adjustment a response to something – a course change, a weather change, a sail on the horizon, a tiny piece of the enormous challenge that was a voyage to the New World – but at least they didn't have to think about it, but could go on hauling hand over hand with no volition, just hauling, concerned only with their sail – set, brace, trim, douse – the rest of the world and its decisions left blissfully to others, to the boatswain, to the officer of the watch, to the ship's master, or even to the captain maybe, hell, all the way up the chain of command to the admiral of the fleet or the governor of the colonial expedition, maybe even to the Queen herself, who was all of twelve years old in 1638. But the hauling never stopped, never ended, not while there was a cro'jack brace to hand, or a mizzen topsail bowline or mizzen topsail brace, not yet with the mizzen yard bowline and the main sheet still to work.

Other times they hauled from up in the rigging, climbing up the shrouds – which were "standing rigging" because they didn't need to move through blocks, and thus could be blackened with thick tar to keep the wet out, dampness being especially destructive to the composition of natural fibers, hemp, usually, or flax – using the little ratlines of the futtock shrouds to ascend into the fighting top, getting dizzy the higher they went, 104 feet to the highest point, if they needed to unfoul topgallant gear atop the main mast, swaying softly or violently depending on the weather. But hauling lines they did, morning, noon, and night, now the main topsail braces, the main topgallant braces, the mizzen topsail clewlines, the mizzen topsail buntlines, the mizzen topsail leechlines, or maybe the mizzen foot brayles, mizzen clew brayles, the mizzen peak brayles, main braces, or mizzen sheet. They hauled lines in their sleep, if they got any, the forsail buntlines and fore topsail sheets. They hauled them instead of eating sometimes, the foreyard truss tackles, the fore topsail halyard. They hauled lines no matter what, sometimes in battle if necessary, the fore braces, fore topsail braces, fore topgallant braces, main topsail bowlines, and fore tacks, with musket shot whizzing past their ears, jagged splinters showering their faces, and cannon balls roaring from the big guns, which could decapitate them or worse, maybe disembowel them smack in the middle of their haul. But the lines needed to be hauled regardless, and so they did, the mainyard truss tackles, the main topsail sheets, the mainsail buntlines. Theirs was a hands-on philosophy – when to haul or not to haul, but never *whether* to haul. Still hauling, they hauled the mizzen topsail sheets, the mizzen yard truss.

Appendix B: *Kalmar Nyckel's* Complex Rig, Including "Standing Rigging," "Semi-standing Rigging," and Cargo-handling Lines and Gear

Lines not specified in the narrative include most of the "standing rigging," which would be adjusted from time to time for the purpose of tensioning or "tuning" the rig: sprit topmast backstay, fore topgallant stay, fore topmast stay, fore stay, fore shrouds, fore topmast shrouds, for topgallant shrouds, fore futtock shrouds, fore catharpins, fore topmast breast backstays, fore topmast after backstays, main topgallant stay, main topmast stay, main stay, main shrouds, main topmast shrouds, main topgallant shrouds, main futtock shrouds, main catharpins, main topmast breast backstays, main topmast after backstays, mizzen topmast stay, mizzen stay, mizzen shrouds, mizzen topmast shrouds, mizzen futtock shrouds, mizzen topmast backstays.

For a more complete appreciation of *Kalmar Nyckel's* complex rig, one should also include the "semi-standing" rigging, which would be used to hoist the large spars – the yards and top masts – during up-rig: sprityard halyard, foreyard halyard, foreyard jeer, foreyard parrel nave, fore topmast toprope, mainyard halyard, mainyard jeer, mainyard parrel nave, main topmast toprope, mizzen yard halyard, mizzen yard jeer, mizzen yard topping lift. These lines would be handled in port before setting sail or during extreme weather emergencies, when one wanted to lower the entire ship's center of gravity.

Cargo-handling lines and gear, which were essential to the loading and off-loading of all "the things they carried," completes the complex picture: fore yardarm tackles, foremast burton tackles, fore gantline, main garnet tackle, main yardarm tackles, mainmast burton tackles, main gantline, mizzen burton tackles, mizzen gantline.

Appendix C: Typical Watch-keeping System

Using a typical four-hour watch system, "dogging" it for rotation, a sailor's day would be scheduled as follows:

First watch from 20:00 to 00:00 hours – Starboard Watch on duty; Port Watch off duty;
Middle watch from 00:00 to 04:00 hours – Port Watch on duty; Starboard Watch off;
Morning watch from 04:00 to 08:00 hours – Starboard Watch on duty; Port Watch off;
Forenoon watch 08:00 to 12:00 noon – Port Watch on duty; Starboard Watch off;
Afternoon watch 12:00 noon to 16:00 hours – Starboard Watch on duty; Port Watch off;
First dog watch from 16:00 to 18:00 hours – Port Watch on duty; Starboard watch off;
Last dog watch from 18:00 to 20:00 hours – Starboard Watch on duty; Port Watch off;

The Port Watch would then start the ship's day all over again, taking up the First Watch from 20:00 to 00:00 hours. The Starboard Watch would be off until 00:00 hours, when it would be their turn to keep station.



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Photographer, Andrew Hanna

