

THE HISTORY OF, AND SEARCH FOR, THE SEVENTEENTH
CENTURY BRISTOL MERCHANTMAN ANGEL GABRIEL

A Thesis

by

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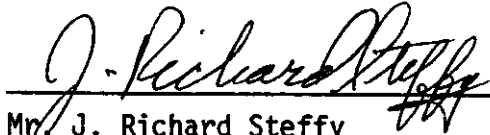
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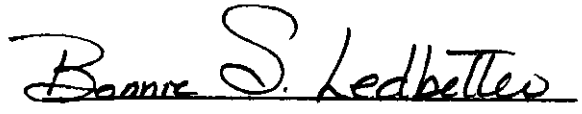
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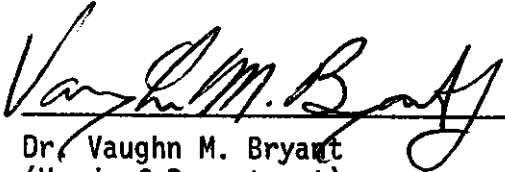
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ABSTRACT

The History of, and Search for, the Seventeenth
Century Bristol Merchantman Angel Gabriel (December , 1980)

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On August 15, 1635 the Bristol merchantman Angel Gabriel, conveying settlers and supplies to the New World, wrecked near the Pemaquid (Maine, U.S.A.) settlement. Before this study little was known of her, except her tonnage, approximate ordnance, and the names of a few of the passengers on her last voyage. Sport divers had looked for her remains, but had found nothing.

Research was conducted in both New England and English archives to discover the history of the ship, or possible references to the location of her wreckage. The ship's history is presented from her early days on an adventure to South America in 1618 to her last voyage and wreckage in 1635. Evidence suggests her wreckage to be in, or near, Pemaquid Harbor. Short biographies of people associated with the ship are presented as these people appear in her history.

A field search for the remains of the Angel Gabriel was conducted in two short sessions in 1977 and 1978. The ship was not located, but information valuable to the search effort was collected and analyzed. Methods and data from the field search are discussed.

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1977

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CHAPTER I
HISTORY OF THE SHIP AND HER PEOPLE

Introduction

After many years of warfare between England and Spain, peace was achieved by James I (1603-1625) in 1604. In an attempt to mend animosity between the two nations, James considered a marriage between his son, Prince Charles, and the Spanish Infanta, which was not achieved. He also disallowed any privateering by the remnants of Elizabeth's "sea dogs", who had preyed so daringly on Spanish treasure fleets. Peace continued throughout the remainder of James' reign, enabling England to increase its empire building efforts. Although James encouraged settlement of the English American territories, he was reluctant to allow interference with Spanish claims in the southern latitudes of the New World.¹

Near the end of his reign, James, possibly influenced by a determination to remain independent from Spain and by a new anti-Spanish court (most of the pro-Spanish court were implicated in the Sir Thomas Overbury murder scandal), became cooler toward Spain.² This cooling progressed into Charles's reign and culminated in open warfare between 1625 and 1630.

Contrary to the efforts of Henry VIII and Elizabeth I to build and protect the growing empire by constructing and maintaining a small but strong navy, James preferred to leave merchants and settlers to arm themselves properly.³ In times of war the Crown could hire the

The style and format of this thesis are those followed by the Mariner's Mirror.

armed merchantmen or grant letters of marque to the owners, allowing them to be privateers.⁴ These ships had served effectively against the Spanish Armada in 1588 and therefore were considered sufficient defense against the lesser dangers of the early seventeenth century.⁵ Except for depredations to the merchant fleets from "Turkish" (Mediterranean) pirates in their quick, heavily manned ships, the system worked well.⁶

As the empire grew in the seventeenth century, permanent English settlements in North America developed into trade centers and havens for financially, religiously, and legally oppressed men and women. Twenty-five thousand English emigrants had settled in America by 1640, approximately two-thirds of these from the Southwest and Midland countries of England.⁷

Adventurous businessmen of the new mercantile class invested in the settlements, either emigrating themselves or sending agents to administer their interests.⁸ These settlements were founded, supplied, and protected with early seventeenth century armed merchant ships. One of these ships, the Angel Gabriel of Bristol, wrecked at the Pemaquid settlement (in present day Maine) during the devastating hurricane of 1635. The ship's history and search for her remains are the subject of this report. Before this study, little was known of the ship except her approximate capacity and number of guns.

The Angel Gabriel's history was researched for three specific reasons. First, information about this particular ship and the people involved with her adds to our knowledge of the period, giving insight into the varied uses of ships, details of merchant shipping in

England's expanding empire, and specifics of methods of supplying the colonies. Second, research of the people involved in the voyage enhances the local history of Pemaquid, Maine and Bristol, England and is helpful to genealogical studies in England and the United States. Third, the ship's history suggests details and clues to archaeologists searching for her remains, such as the location, construction details, and the last cargo of the ship.

Discovery and excavation of remains of the Angel Gabriel will answer some important questions in nautical archaeology and maritime history. In particular, construction details of early seventeenth century English ships are not well known. Although we know the Angel Gabriel was well armed, the type of armament carried by such ships is in question. Some historians feel they would be made of brass, but a study of the contemporary English gun industry indicates iron guns.⁹

Cookstove bricks from the Angel Gabriel could provide the answer to yet another question. Until recently, archaeologists have assumed that all bricks made in England during the seventeenth century were of equal size because masonry standards, set in 1571 and confirmed in 1725, required brick dimensions to be 9" x 4-1/4" x 2-1/4" (actually by 1725 the last measurement had changed to 2-1/2" or 2-3/4").¹⁰ But Colin Martin, while excavating the 1690 wreck of HMS Dartmouth, discovered bricks associated with the galley that measured 8.6" x 3.9" x 2.4".¹¹ Do the Dartmouth bricks indicate a different size for bricks used on ships, or were these bricks of foreign manufacture? They are, in fact, similar in size to the common American eighteenth century brick, which Noël Hume describes as measuring 8-3/4" x 4" x 2-5/8".¹²

A contemporary writer stated that passengers bound for New England prepared at least some of their food on the voyage.¹³ Were they using braziers on the deck, or were they using the ship's cookstove? The presence of braziers, a second cookstove, or the size and shape of the ship's stove will provide a further understanding of the immigrant's life aboard ship.

All forms of tools would have been shipped from England for the settlers. Wooden tool handles do not survive well on land sites, yet the size and shape of an artifact tool's handle often can define its use. Remains of the cargo may therefore add a new dimension to our knowledge of colonial tools.

Many problems are caused by a lack of accurate dating methods for some types of artifacts; therefore, any finds from this wreck site will add chronological information to present knowledge of colonial artifacts. A specific problem is that of dating early English clay pipes by the diameter of the stem hole. Jean Harrington has indicated a systematic decrease in the average diameter of the hole from 9/64 inch to 4/64 inch between 1620 and 1800.¹⁴ The accuracy of Lewis Binford's subsequent formula for determining either the average diameter of the hole, or the year of the artifact, has been challenged by Noël Hume. In comparison to other archaeological evidence, Noël Hume has found the formula to give incorrect dates for seventeenth century pipe stems.¹⁵

In particular, Harrington's theory for a 1635 site suggests a sixty percent chance of the pipe stem holes averaging 8/64 inch in diameter, and about twenty percent chance of either 7/64-ths or 9/64-ths; Binford's formula yields 7.76/64 inch diameter (Appendix E).

While Noël Hume's archaeological results from this period fall within Harrington's probability curve, they do not agree with Binford's strict formula.

As most colonial clay pipes were inexpensive, disposable imports from England, the Angel Gabriel would most likely have been carrying a supply of them to New England. With an exact date of 1635 for the site, and a large number of pipe stems, the hole diameter question will be resolved for at least one period in the seventeenth century.

In addition, the remains of the cargo will answer some specific questions about the economy of northern New England in the early seventeenth century. Among these questions is the availability and quality of blacksmiths in the colonies. The relationship between the amount of finished iron products and iron ingots being brought from England will indicate the level of the industry.

Other questions concern the fishermen who traded at Pemaquid. A large quantity of fish was consumed and exported by the fishermen, who used hand lines and nets to catch fish.¹⁶ Which species were most important? Was the hand line or net used more often? By 1642, whaling was an important industry in Massachusetts; and Richard Mather, in 1635, related the catching of a porpoise during his voyage from England.¹⁷ Was the catching of mammals an important industry in northern New England? If so, which species were more important? Answering these questions requires more evidence than is presently available in the written record.

The Angel Gabriel would have been bringing supplies to the fishermen at Pemaquid and the nearby fishing village of Damariscove.

Different sized hooks were used for different species of fish and various sizes of spears and harpoons were used for various sea mammals. Although net fibers would probably not survive 350 years of immersion, each net required a different set of lead weights, which would survive. The archaeological excavation of this cache of fishing equipment will indicate both the predominate species being sought and preferred equipment of the early fishing industry.

Thus the information to be gained from historical and archaeological research of the Angel Gabriel is important to the refinement of today's perspective of New England's early seventeenth century settlements. In the first chapter the ship's history - including her voyages, uses, and related people - are followed from her first voyage through the aftermath of wrecking at Pemaquid.

Details of the search for the ship's remains are presented in the second chapter. Finally, archaeological information helpful for the identification and interpretation of the site are presented in appendices C and D.

Identification of the Ship

The first definite reference to the Angel Gabriel which wrecked at Pemaquid is found in the Bristol Port Records of 1619. But evidence indicates that she was originally named Starre, renamed Jason by Sir Walter Raleigh, and finally purchased by two merchants from Bristol, England, who subsequently changed her name to Angel Gabriel.

The relationship of the Angel Gabriel to the Starre and Jason was first indicated by John Aubrey, an early seventeenth century West English antiquary. After Sir Walter Raleigh's death in 1618, while

discussing Raleigh's ability to influence people to support his adventures, Aubrey wrote, "Sir Charles Snell, of Kingston Saint Michael in North Wilts, my good neighbor, an honest young gentleman but kept a perpetuall Sott. He [Raleigh] engaged him to build a ship, the Angel Gabriel, for the Designe for Guiana ... which ship, upon Sir Walter Raleigh's attainder, was forfeited."¹⁸

Aubury was referring to Raleigh's second expedition to Guiana, in 1617. An Angel Gabriel does not appear in any account of the expedition, but a letter from Raleigh to his wife associates Snell with the Jason, which was captained by John Pennington: "You have also a writing from C. [Captain] Pennington for the fourth part of his shipp w^{ch} I may deliver to S^r. Cha. Snell to whom it belongs."¹⁹

Raleigh's letter is only a hint at a Jason - Angel Gabriel connection, but an inspection of contemporary accounts of the expedition reveal information about the ships that indicates a common identity. A complete list of Raleigh's fleet has not been located, but from several partial lists of the fleet and occasional mention of different ships and captains, a compilation of Raleigh's fifteen ships can be deduced:²⁰

1. Destiny (440 tons) Captain Wat Raleigh (Sir Walter's son), flagship of the fleet.
2. "The Starre alias the Jason of London, of the burthen 240 tons, John Pennington Captain, George Cleuingham master; 80 men, one Gentleman and no more; 25 pieces of Ordinance."²¹
3. Encounter (160 tons) Captian Edward Hastings, later Captain Whitney.

4. Thunder or John and Francis (150 tons), Captain Sir William Sentleiger (or "Sir Warrenn Selinger").
5. Flying Joane or Flying Chudleigh (120 tons) Captain John Chidley.
6. Southampton or Husband (80 tons) Captain John Bailey.
7. Page (25 ton pinnace)²² Captain James Barker.
8. Flying Hart (pinnace) Captain Sir John Ferne.
9. Confidence (pinnace) Captain Richard Wollaston.
10. Convertine (pinnace) Captain Lawrence Keymis.
11. Supply (flyboat)²³ Captain Samuel King.
12. Pink (flyboat) Captain Snedul, later Captain Robert Smith.
13. Fifty Crowns (pinnace) Captain ?; bought and lost during the voyage.
14. ? (caravel)²⁴ Captain Hall.
15. ? (pinnace) Captain ?; lost off Ireland.

Mather, and other sources presented below, refer to the Angel Gabriel which wrecked at Pemaquid as a 240 ton ship,²⁵ but in the fleet, only Pennington's ship is listed as 240 tons, and no other ship in the fleet is close to that size. In fact, a 240 ton ship was particularly large in the early seventeenth century - for instance, a list of all ships registered in Bristol a few years after the Guiana expedition reveals only four of forty-two ships being 200 tons or over.²⁶ Therefore, if the Angel Gabriel was in the fleet she could only have been the Jason.

A coexistence in port records of the names Starre, Jason, or Angel Gabriel would prove this theory wrong, but records of England's largest

two ports, London (1614-1620) and Bristol (1616-1619), do not include mention of the Starre, Jason, or a different Angel Gabriel.²⁷ In addition, there is no mention of the Jason or Starre in English colonial state papers from the same period.²⁸ It is therefore possible that the Starre's name was changed to Jason in 1617,²⁹ that the name Jason was used for the ship until at least mid-1618,³⁰ and that the name Angel Gabriel was used from at least mid-1619 to 1635.³¹

In 1629 the age of the Angel Gabriel was given as fourteen years,³² which leads to a construction date of approximately 1615. But of the three names, only references to the Starre and Jason have been found for the period before 1619.

An accumulation of circumstantial evidence therefore implies that these three ships were one and the same. No located information contradicts this theory. There is also the possibility that there is no real connection, or that the Angel Gabriel to which Aubrey referred was the unnamed pinnace or caravel. But no indication of either of these possibilities was found.

The name "Angel Gabriel" was not found for any other ship during the first half of the seventeenth century. Chronologically the nearest ships of the same name were a Dutch ship captured and sold by one of Raleigh's ships in the late sixteenth century,³³ and another ship which carried emigrants from Bristol to the New World between 1663 and 1679.³⁴

History of the Jason

When James I ascended the throne in 1603 he imprisoned Sir Walter Raleigh in the tower of London for suspicion of treason. After 13 years in the tower, Raleigh was released in 1616 to prepare a fleet to seek a

gold mine that one of his lieutenants claimed to know near the Orinoco River, Guiana, South America. The Crown would not invest in the expedition, although King James would receive a share of any gold found. Sir Walter and Lady Raleigh, however, invested their total fortune, and that of many others, to build and fit out the necessary ships.

Raleigh was planning to take his fleet into Spanish South America, near an existing Spanish gold mining settlement. The Spanish crown knew of Raleigh's plans, and his hatred for the Spanish. Raleigh knew the Spanish were watching his preparations in the Thames and he expected to be attacked by a strong Spanish fleet at some time during the expedition, but he felt his fleet was strong enough.³⁵ As George Lord Carew wrote to Sir Thomas Roe in December before the fleet sailed, "The allarme of his iorney is flowne into Spayne, and as he tells me, sea forces are prepared to lye for him, but he is nothinge appalled with the report, for he will be a good fleet."³⁶

The two largest ships in the fleet were the flagship Destiny (440 tons), which Raleigh had specially built by Phineas Pett, and the Jason (240 tons), whose origin is not known. The Jason carried twenty-five pieces of ordnance. Her captain was thirty-three-year-old John Pennington, a well respected officer who became Lord High Admiral in King Charles's navy.³⁷ The master was George Cleuingham. On a fighting ship the sailing of the ship was most often conducted by a sailing master, while the captain made overall decisions such as destiny, strategy, and tactics. Besides the sailors there were eighty fighting men and one gentleman (much like marines with one officer).³⁸

The seven ships of the Thames squadron sailed late in March 1617

(Fig. 1) and anchored at Plymouth; but Pennington stopped for provisions at the Isle of Wight. Because Pennington could not pay for bread for his crew, he rode back to London where Lady Raleigh gave him letters of credit to cash in Portsmouth. When the Jason joined the fleet at Plymouth, Pennington received a set of orders from Raleigh that included rules on sailing, fleet maneuvers and signals, and personal behavior on board and in America.

After four other ships joined them, the fleet left Plymouth on June 12th, but was forced by a gale into Falmouth. The ships sailed again in late June, but were forced by heavy weather into Cork, Ireland, losing a pinnace on the way. Finally, in August, favorable winds allowed Raleigh to sail south with his eleven remaining ships. Sailing past Portugal the fleet landed in the Canary Islands to resupply and reach the Cape Verde Islands on October 3rd after weeks of fighting gales and contrary winds. An illness spread through the fleet, killing many and almost killing Raleigh. Finally the fleet reached South America on November 11th. Three of the ships had already turned back for various reasons and two pinnaces had been lost during storms. Raleigh sent the five smallest ships up the Orinoco River in search of the gold mine while the five remaining large ships waited at Trinidad to intercept the Spanish fleet which was assumed to be pursuing them. Neither the Spanish fleet nor the gold mine materialized and the people sent up the Orinoco battled Spanish settlers, something strictly forbidden by King James.

Raleigh was ruined. His fleet dispersed and two of the ships' crews turned pirate. The Destiny, Jason, and two other ships sailed

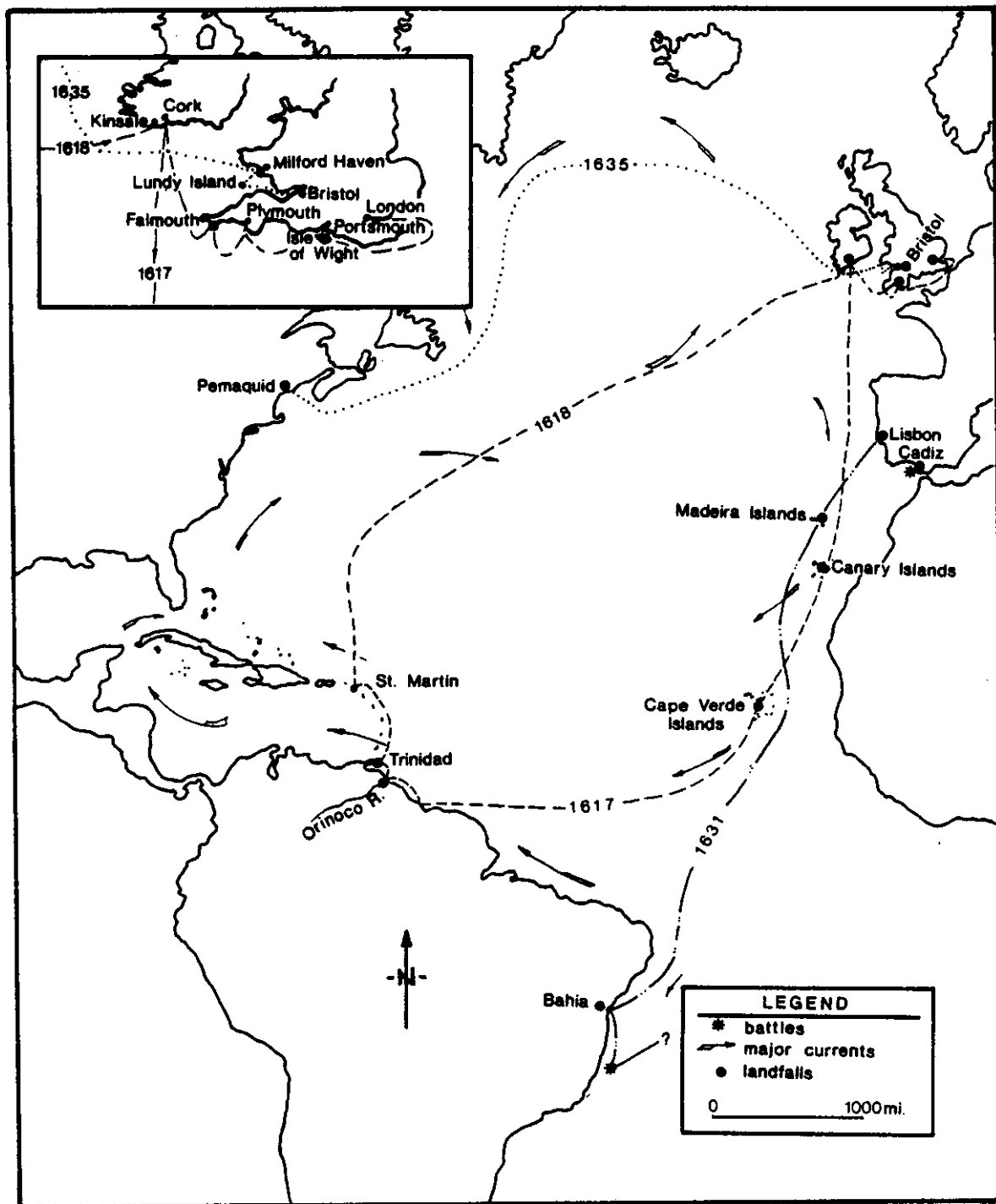


Figure 1. Map of Atlantic Ocean with inset of British Isles, showing various voyages of the Jason and Angel Gabriel.

separately to Kinsale, Ireland. On his flagship Destiny, Raleigh returned to Plymouth, where he was arrested on the king's orders by his own cousin.³⁹

Captain Pennington suffered equal misfortune as we can see from a July 1618 petition to the Privy Council in which Pennington stated that he had lost £2,500, his "whole property" except his ship, on the voyage with Raleigh. His ship, the Jason, had been seized by the Lord Deputy of Ireland in Kinsale, where bad weather had forced it. She lay in the harbor without her rigging, mast, and furniture. Pennington was petitioning for the restoration and release of the Jason.⁴⁰

Instead of the release of his ship, Pennington was imprisoned in London where he gave witness of the expedition in Raleigh's trial. He was released shortly and became a Royal Navy captain in 1620. In 1625 he was in command of a fleet in a particularly sensitive international confrontation off the coast of France, but he handled the situation well, once threatening to imprison his vice admiral Sir Ferdinando Gorges (who appears below).

Pennington was a very successful admiral in the late 1620's, in the war with France and Spain, and was knighted on his flagship by King Charles I. Mistrusted by Parliament, however, he was relieved of his duties as Lord High Admiral when it took control of England.⁴¹

Raleigh's reference to Pennington's ship, quoted above in the letter to his wife, is the last located mention of the Jason. A year later the first definite reference to the Angel Gabriel appeared.

History of the Angel Gabriel

As previously mentioned the Angel Gabriel first appears in the Bristol Port Records of 1619. From the port records we are able to obtain an outline of the history of the ship through the next decade (see below).

Bristol Port Records after 1629 have not been found and are presumed destroyed. The merchants, who were the power in Bristol, were generally in disfavor with Charles I. His agents confiscated many of the merchants' records and the port's records; they included the Society of Merchant Venturers' records for the period in question (1616 to 1635) and the port records between Christmas 1629 (Surveyor of Customs) and Easter 1636 (Collection of New Importation).⁴²

The Angel Gabriel was owned by Robert Aldworth and Giles Elbridge, two members of the Society of Merchant Venturers (SMV), a business organization composed of wealthy Bristol merchants. In order to minimize losses it was common for ships and cargoes to have more than one owner - Aldworth and Elbridge owned shares in more than one ship, and most often a portion of the Angel Gabriel's cargo was owned by a number of SMV members.⁴³

Excerpts from the Bristol Port Records - Overseas, 1619-1629

1619

August 25 - Ten tons of lead were loaded into the "Angel Gabriel of Bristoll".⁴⁴

October 25 through December 9 - Robert Aldworth, among other members of the Society of Merchant Venturers, shipped melted

butter, cotton, and calf skins in the "Angel Gabriel of Bristol".⁴⁵

1623

Late June through July 30 - A number of entries indicate that Aldworth, Giles Elbridge, and others were shipping lead and calf skins on the "Angel-gabriell of Bristol iijCtn [300 tons]".⁴⁶

1625

October 11 - 302 casks of oil, listed also as approximately 151 tons, owned by seventeen merchants (mostly members of the Bristol Society of Merchant Venturers) including Aldworth "In the Angel Gabriell of Bristol [250] tonnes". A tax of £ 142 14s was levied (Appendix A).⁴⁷

1627

Date unknown - "In Le Angell Gabrielle", a shipment of raisons(?).⁴⁸

1629

July 21 - A shipment of lead exported in the Angel Gabriel.⁴⁹

August 31 - A shipment of lead and French tallow exported in the Angel Gabriel.⁵⁰

Aldworth had been sheriff, mayor, and alderman of the city and master of the SMV. He was a prominent sugar refiner and merchantile trader. Like his father before him, Aldworth was interested in New World exploration, supporting Martin Pring's 1603 expedition from Bristol to New England. Elbridge had also been sheriff of the city and an officer of the SMV. He started as Aldworth's apprentice and became his business partner, nephew (by marrying Aldworth's niece), and heir.⁵¹

When England commenced warfare with Spain and France in 1626, Spain detained a ship belonging to Aldworth and Elbridge. Hoping to seize a Spanish ship and exchange it and its crew for their own, the two merchants petitioned Lord Buckingham (of the Privy Council) for a letter of marque.⁵² The plan must have been successful, for not only did the captured captain, Michael Hunt, gain his freedom, but the Calendar of State Papers - Domestic records a letter of marque being granted every year of the war for Aldworth and Elbridge's larger ships.⁵³

The last three entries on page 17 indicate that during the war the Angel Gabriel, at least occasionally, carried cargoes. But she must also have served as a privateer, for a letter of marque was issued for her in each year of the war.

Excerpts from the State Papers - Domestic, 1626-1631

1626

July 7 - a letter of marque issued to Giles Elbridge, et al., for the Angel Gabriel of Bristol (300 tons), William Chappel in command.⁵⁴

November 11 - in a list, for the King, of armed merchantmen of Bristol: "The Angell gabriel, 220 tn, 20 pecs [pieces of ordnance], [and] may carry 4 peces more, Robert Aldworth Alderman - owner".⁵⁵

1627

Date unknown - a letter of marque issued to Giles Elbridge, et al, for the "Angel Gabriel of Bristol (300 tons)", Thomas Netheway in command.⁵⁶

1628

November 4 - a letter of marque issued to Michael Hunt, et al., for the Ange1 Gabriel (250 tons), and her pinnace (40 tons), commanders not stated.⁵⁷

1629

March 1 - a letter of marque issued to Giles Elbridge for the Ange1 Gabriel (220 tons), 14 years old, 20 guns.⁵⁸

1630

October 16 - a letter of marque issued to Michael Hunt, et al., for the Ange1 Gabriel (260 tons) of Bristol and her pinnace (40 tons), Michael Hunt in command.⁵⁹

In the letters of marque the ship's tonnage is usually listed as either 220 or 300 tons. The difference is most likely due to 220 tons being "tons burden" (keel length x breadth x depth/100 = tons burden during the early seventeenth century) whereas 300 tons is the "tons-and-tonnage" (1-1/3 tons burden = tons-and-tonnage). Differences in reported tonnage were common for other ships listed.⁶⁰

Although the letter of marque was issued to Michael Hunt in 1628 and 1630, he evidently was acting for Aldworth and Elbridge, as Elbridge was issued the letter of marque in 1626, 1627, and 1629, and Hunt had been the factor of Aldworth and Elbridge who was detained in Spain, mentioned above in the petition to Lord Buckingham, 1626.

Often the owners of a ship, if one of them was not to attend the cargo, would ship a factor, or appoint the captain as their factor, to conduct their business at distant ports. After being a factor and captain for Aldworth and Elbridge for a number of years, Hunt became a

member of the SMV on July 22, 1639. He had been born in 1598 and wrote his will, in terminal illness, in 1684, leaving a small bequest to the poor at St. Thomas's parish, Bristol.⁶¹

While a privateer during the war, the Angel Gabriel was attacked by three Spanish ships near Cadiz, Spain (Fig. 1, p. 12). The battle that ensued as she beat off her attackers brought her fame, and her crew good fortune. A contemporary ballad, "The Honor of Bristol" (Appendix B), describes the battle and names the captain Thomas Netheway, the master John Mines, and the gunner Thomas Watson. The crew included forty fighting men (marines) and she was armed with twenty guns. As Netheway was registered as the captain of the Angel Gabriel only in 1627 (see p. 16) the battle is assumed to have taken place in that year.

Netheway became a member of the SMV in 1629 and was appointed Senior Warden in 1633. His father, Thomas also, had died in 1595, leaving "young" Thomas one quarter of any plunder taken by the Swan of Bristol. He had one brother, George, and was listed as living in Portugal in 1650.⁶²

As mentioned above, Bristol port records do not exist for the early 1630's. We are indebted to Dutch and Iberian accounts of a voyage to South America in 1631 for further information about the Angel Gabriel.

A Second Voyage to South America, 1631

In 1631, after the war, the Angel Gabriel appears to have been trading in Lisbon, Portugal at the wrong time. The Spanish and Portuguese were hurriedly amassing a strong fleet of twenty-seven vessels to sail to South America to protect their colonies from the Dutch. Some

of the ships belonged to the Crown, others were hired, and at least two French ships, and probably the Angel Gabriel, were requisitioned for the one-year voyage. The Angel Gabriel in the Iberian fleet records is listed as a "hulk", of 428 tons and twenty guns, while all other ships are listed as galleons or caravels.⁶³

The term "hulk" is a word foreign to Spain - there is no "lk" sound in Spanish. A hulk was an older Northern European ship type and the term may have meant an old Northern European ship to the Spanish, just as the word means an old ship today. Don Kennedy, studying ship names, found only English use of the name Angel, or its variations (although, as mentioned above, Morison reported a Dutch Angel Gabriel in 1587).⁶⁴ This hired or drafted Angel Gabriel was therefore probably an old English ship.

The Angel Gabriel of Bristol had also been armed with twenty guns, as a privateer during the preceding five war years, and she had a reputation as a strong ship after the fight in 1627 off Cadiz. The Spanish may have requisitioned her, as they did the French ships, or Aldworth and Elbridge may have hired her out to the Spanish - giving a false high tonnage, to receive more money, as was often the practice when chartering.⁶⁵

The fleet, commanded by Don Antonio de Oquendo, left Lisbon on May 5, 1631, loaded with troops to reinforce Iberian settlements in Brazil (Fig. 1, p. 12) where the Dutch West-India Company had overrun some settlements, and threatened others. A large fleet was considered essential by the Iberians as the Dutchman Piet Heyn had captured the plate fleet three years earlier. On board the Angel Gabriel were sixty

gunners and seamen and 160 Spanish soldiers - no doubt an inconvenience to the English crew.

After a fairly uneventful passage, with a short stop at the Madeira Islands, the fleet delivered the troops to Bahia or placed them on twelve caravels, to be transported up the coast. A cargo of sugar and Brazilwood was loaded into the ships for the return voyage, which began on September 3rd.

But the Dutch had been watching the fleet even as it was being created the previous year in Lisbon. Dutch Admiral Adriaan Jansz Pater had moved into the Bahia area, and attacked the Iberian fleet on September 11th with sixteen strong ships. A bloody battle ensued when the two flagships, each supported by two other ships, engaged in over six hours of hand-to-hand combat after securing to each other with cables. The Angel Gabriel was with the cargo ships just south of the battle. Two war ships were sunk on either side, but evidently the noncombatants were not fired upon. The next evening eleven of the twenty cargo ships slipped out of the convoy, against Oquendo's orders, and made for Europe before another battle began.

Whether the Angel Gabriel slipped out during the night of the 12th is not clear. Eventually all of the Iberian fleet, except the two war ships sunk and one which was captured on the 11th, returned to Europe before winter.⁶⁶

The next four years of the ship's history are uncertain. The next reference to her was in 1635.

The Last Voyage, 1635

Ferdinando Gorges, urged by John Smith's arguments that coloniza-

tion of New England could be financed by a fishing industry which would fill returning emigrant and supply ships, secured a patent for the land between the St. Lawrence River and present day Philadelphia, for the Council for New England, from King James I in 1620. Robert Aldworth and Giles Elbridge received a patent in 1632 from Gorges's Council (which administered the New England Company) for 1,200 acres around their trading settlement at Pemaquid.⁶⁷

Pemaquid had been started as a fortified trading post around 1628 by Abraham Shurt, an agent for Aldworth and Elbridge. Trade with fishermen, and with the Indians for furs, contributed to the development of the area. The New England Company granted the patentees a hundred additional acres for every new settler. Defense of the settlement was a constant consideration - there were intermittent problems with the French, and in 1632 the pirate Dixie Bull raided the post for goods.⁶⁸

During the summer of 1635 Elbridge sent the Angel Gabriel to Pemaquid with settlers and supplies (Aldworth had died in 1634). It was to be her last voyage. Unfortunately, the merchants', and the Bristol port, records cannot be located for this time period, but Richard Mather's journal and genealogical records of emigrants give many details of the voyage and aftermath.

Richard Mather, father of Increase Mather and grandfather of Cotton Mather, was a devout Puritan minister who suffered religious persecution in Anglican England. In 1635 he emigrated to Massachusetts on the James. On May 26, 1635, while waiting on board the James at Kings Road, just down the Avon River from Bristol, he wrote, "The Tuesday morning ... another ship, also bound for New-England, came

unto us; which other ship was called the Angel Gabriel."⁶⁹ And on May 27th:

On Wednesday ... our master, Captain Taylor, went aboard the Angel Gabriel, Mr. Maud, Nathaniel Wales, Barnabas Fower, Thomas Armitage, and myself accompanying him. When we came there, we found divers passengers, and among them some loving and godly Christians, that were glad to see us there.⁷⁰

While visiting on board the Angel Gabriel, Mather overheard Sir Ferdinando Gorges, patentee of New England, send a greeting to the people of Massachusetts Bay (see below). Gorges was not trusted by the colonists, whom he had sued for infringements on his land patent, but he knew that he might need to leave England soon, and was probably trying to sweeten his relationship with the settlers in case he chose to emigrate to his holdings in America.⁷¹ Mather wrote of his visit:

And soon after we were come aboard there [Angel Gabriel] there came three or four boats, with more passengers, and one wherein came Sir Ferdinando Gorge, who came to see the ship and the people there that went to Massachusetts Bay. Whereupon Mr. Maud and Barnabas Fower [from the James] were sent for to come before him. Who being come, he asked Mr. Maud of his country, occupation, or calling of life, etc., and professed his good will to the people there in the Bay, and promised that, if he ever came there, he would be a true friend unto them.⁷²

Three other ships joined the Angel Gabriel and the James at Kings Road for the Atlantic crossing. They set sail on June 4th, but a contrary wind forced them to anchor in the lee of Lundy Island, at the entrance to the Bristol Channel, for four days (Fig. 1, p. 12). They then proceeded to Milford Haven, an excellent harbor in Wales, to await favorable winds, which finally came on June 22nd.⁷³

The five ships sailed from Milford Haven on that Monday morning before a strong east wind, keeping close together for the first day in

fear of Turkish (Mediterranean) pirates who were raiding Bristol shipping at the time. Mather recorded some information about the Angel Gabriel on June 23rd:

This day, at evening, we lost sight of the three ships bound for Newfoundland, which had been in company with us from King Road; and our master thought it best for us to stay for the Angel Gabriel, being bound for New-England, as we were, rather than leave her and go with the other three. The Angel Gabriel is a strong ship, and well furnished with fourteen or sixteen pieces of ordnance, and therefore our seamen rather desired her company; but yet she is slow in sailing, and therefore we went sometimes with three sails less than we might have done, so that we might not overgo her.⁷⁴

This is the only reference to the ship being a slow sailor, and if she was built for Raleigh she most likely was not meant to be a slow ship. Old masts and rigging, which could not take the strain of much sail before the mentioned strong wind, a fouled bottom, or a number of other problems, could easily explain Mather's statement.

The next day, June 24th, the Angel Gabriel and James gave chase to a supposed Turkish pirate and her prize, which appeared to be the smallest of the English ships they had left the day before; but they could not overtake the pirates. On June 29th the captain of the James, Mather, and one other passenger went aboard the Angel Gabriel for a visit:

In the afternoon the Angel Gabriel sent their boat to our ship, to see how we did; and our master, Captain Taylor, went aboard the Angel Gabriel, and took Mathew Michel and me along with him. When we came thither, we found their passengers that had been seasick now well recovered, the most of them, and two children that had had the small pox well recovered again. We were entreated to stay there with their master, etc., and had good cheer, mutton boiled and roasted, roasted turkey, good sack, etc.⁷⁵

Late that week those on the James decided that it was safe enough

to leave the slower Angel Gabriel behind and, taking advantage of a strong wind, parted company. Mather wrote that the James lay at anchor at the Isle of Shoals, New Hampshire (Fig. 2) on the morning of August 15th when a devastating hurricane caught them by surprise:

... on Saturday morning, about break of day, the Lord sent forth a most terrible storm of rain and easterly wind, whereby we were in as much danger as, I think, ever people were. For we lost in that morning three great anchors and cables; of which cables one, having cost £ 50, never had been in any water before; the third cut by seamen in extremity and distress, to save the ship and their and our lives. And when our cables and anchors were all lost, we had no outward means of deliverance but by loosing sail, if so be we might get to the sea from amongst the islands and rocks where we anchored. But the Lord let us see that our sails could not save us neither, no more than our cables and anchors. For, by the force of the wind and rain, the sails were rent in sunder and split in pieces, as if they had been but rotten rags, so that of the foresail and spirtsail there was scarce left so much as a hand-breadth that was not rent in pieces and blown away into the sea ...

And the Angel Gabriel, being then at anchor at Pemaquid, was burst in pieces and cast away in this storm, and most of the cattle and other goods, with one seaman and three or four passengers, did also perish therein, besides two passengers that died by the way.⁷⁶

Another contemporary, Edward Trelawny, wrote to his brother of the disaster while referring to a lack of merchandise in the colony, "... the Angell Gabriell of Bristoll, who was Caste away as shee ridd att Anchor in Pemaquidd."⁷⁷

Reports of the storm suggest a powerful early season hurricane with its center just off the coast. These storms usually move along the coast at approximately forty miles (64km) per hour. This one struck Cape Ann (Fig. 2) before daybreak⁷⁸ and the Isles of Shoals, thirty miles (48km) from Cape Ann, at daybreak (about 4:30 AM in August).⁷⁹ Pemaquid was probably struck around 6:30 AM as it is eighty

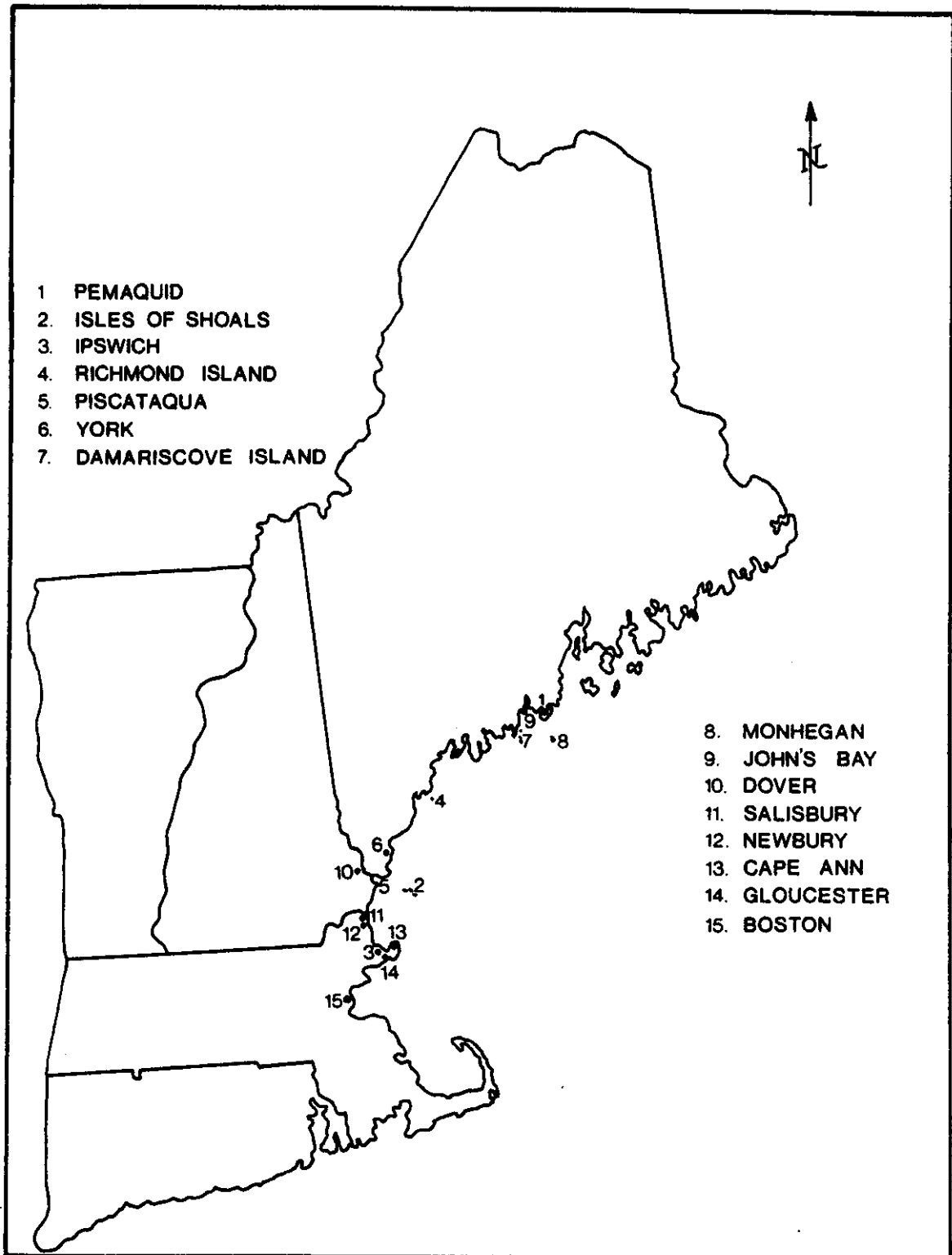


Figure 2. Map of New England in 1635.

miles (129km) further down the coast. The wind rose from the north-east early in the morning and created a twenty-foot (6 meter) storm surge which flooded and destroyed much of the settlers' crops;⁸⁰ thousands of large trees were overturned by high winds.⁸¹

Local lore maintains that most of the passengers and crew came ashore over rocks in the eye of the storm, when the Angel Gabriel wrecked on Pemaquid Point before her entrance into John's Bay; but Mather and Trelawny reported the ship at anchor at the Pemaquid settlement when the hurricane struck. Being Elbridge's ship she was most likely bringing supplies to their trading settlement. This could mean at least a few days of unloading, and many passengers and most of the crew may therefore have been ashore for the night when the storm struck early in the morning of August 15, 1635.

No detailed account of the wreck has been located, but depositions of two of the passengers, made during an inheritance hearing many years later, give us some information. In a 1676 deposition by sixty-five-year-old Samuel Haines (John Cogswell's servant):

[I] came over along with him [Cogswell] to New England in the ship (Called the Angell Gabriell) and were present with him when my master Cogswell suffered shipwrecke at Pemneyquid, which was about fourty one yeares agoe the last August when the ship were cast away.⁸²

And in a deposition by sixty-five-year-old William Furber:

I...did come over in the ship called the Angell Gabriell along with Mr. John Cogswell, Sen. from Old England and we were cast ashore at Pemneyquid; and I doe Remember that there were saved severall Cask both of Dry Goods and provisions which were marked with Mr. Cogswell, Sen. Marke and that there were saved a tent of Mr. Cogswell, Sen. which he set up at Pemneyquid and Lived In It (with the goods that he saved in the wracke).⁸³

Furber's statement would suggest that he and Cogswell were on board, and survived, when the ship broke up. But no historical information has been located which indicates the exact location of the wreck.

The Passengers in the New World

Only twenty-two passengers, and the captain, have been identified for the 240-ton Angel Gabriel. While Mather mentioned a hundred passengers and twenty-three seamen for the 220-ton James,⁸⁴ the assumption should not be made that the Angel Gabriel had a similar number of passengers. Elbridge had a growing trade settlement to supply at Pemaquid, and would have found transporting his own goods more profitable than shipping settlers' belongings and supplies. In addition, the space required for fourteen or sixteen guns, and their equipment, would have been a major consideration on the main deck, where passengers normally were stowed. Elbridge may have transported only a few passengers with their belongings, as space permitted.

A list of crew or passengers aboard the Angel Gabriel has not been located, but genealogical records and verbal family lore indicate twenty-three of those aboard.

List of Known Passengers and Crew on Angel Gabriel's Last Voyage, 1635

1. Captain Andrews, probably Robert Andrews
2. John Burnham, nephew of Andrews
3. Thomas Burnham (16), nephew of Andrews
4. John Bailey

5. John, Jr. (children)
6. Joanna
7. Ralph Blaesdell (42)
8. Elizabeth (wife)
12. William (16) (children)
13. John, Jr. (12)
14. Edward (6)
15. Mary (16)
16. Abigail
17. Hannah
18. Sarah
19. Elizabeth
20. William Furber (21)
21. Samuel Haines (33)
22. Henry Simpson
23. John Tuttle (17)

No information was located concerning Captain Andrews but his two nephews, John and Thomas Burnham, made their way to Ipswich after leaving Pemaquid. They were both on the 1648 Ipswich tax list but no other references to John were found. Thomas married Mary (no maiden name found) and had five children: John, Thomas, Lydia (born 1646), Mary (born 1652), and Joanna (born 1654).⁸⁵

Bailey

John Bailey, a weaver from Chippenham, left his wife Elizabeth and three children in England and took passage aboard the Angel Gabriel with his son John, Jr., and daughter Joanna.⁸⁶ They lived in

what became Newbury, Massachusetts for two years after the wreck. In 1637 they settled on a fifty acre plot on the banks of the Merrimac River in Salisbury where John fished and farmed. John Jr. and Joanna eventually left Salisbury and moved back across the river to Newbury. John Jr. married Eleanor Emery and Joanna married William Harrington. Elizabeth, John Sr.'s wife who had stayed in England, never came to America.⁸⁷

Blaesdell

Ralph Blaesdell, a forty-two-year-old tailor from Hawkshead, Lancashire, and his wife Elizabeth were emigrating with their three-year-old son Henry. Ralph's parents and eldest brother were dead, his sisters (one of whom resided in the family homestead) had married, and most of his other relatives and friends had emigrated to what is now York, Maine and Salisbury, Massachusetts. Ralph was distantly related to Sir Ferdinando Gorges, through the marriage of his brother, and was also related to John Avery and Anthony Thatcher, who wrecked at Cape Anne during the same hurricane which wrecked the Angel Gabriel.⁸⁸

The three Blaesdells left Pemaquid, settled in York by 1637, and in 1640 they moved to Salisbury where a number of their relatives had already settled. There, Ralph bought land in 1642. Three more children were born in America: Sarah, who died in infancy, 1646 or 1647; Mary, born 1641 or 1642; and Ralph, born 1642 or 1643. Blaesdell is listed as a tailor, innkeeper, and juryman in Salisbury; by 1651 he died; Elizabeth died in 1667. Henry, who was three years old when they left England, became a tailor in Salisbury and was admitted as

a freeman in 1677. He married Mary Haddon. Some of the decedents of the Blaesdells, who now spell their name Blaisdell, are presently living in and near Pemaquid, York and Salisbury.⁸⁹

Cogswell

Also aboard was the Cogswell family. John Cogswell had just sold the family woolen fabrics mill and other real estate preparing to sail to New England with his wife Elizabeth and eight of their children, while a married daughter remained in London. After the storm, the Cogswell family lived in their tent at Pemaquid for a few days before they and Samuel Haines sailed to Ipswich (now Essex, Massachusetts). All the livestock aboard the Angel Gabriel had been lost, but Cogswell had had two mares and two cows transported on another ship that summer; these were sent to him in Ipswich,⁹⁰ where, on March 3, 1636, he was admitted as a "freeman" (one who could vote and hold office). The town granted him a twelve acre lot in the center of Ipswich and 300 acres of land nearby.⁹¹

William, the eldest of Cogswell's sons, married Susannah Hawkes of Charlestown in 1649. They eventually had ten children together including: Elizabeth, Hester, Susannah, Ann, William, Edmund, John, Adam, and Sarah. John, Sr. gave William and John Jr. sixty acres each in 1651. Nothing has been found of young Edmund, the third son, being in America except the mention by Haines and Forbes that he immigrated with the rest of the family; he may have died shortly after their arrival.

John Cogswell, Jr.'s wife may have died around 1650, for in 1652 he sold his sixty acres to his brother William and sailed back to

England, leaving his three children (John III and two daughters) with William and his parents. Writing to his parents from England in 1653, John, Jr. stated that there was little possibility of finding a wife in England. Unsuccessful, he sailed from England but died of illness during the return voyage in 1653.

Little is known of the five Cogswell daughters. Mary, born in 1619 married [Godfrey?] Armitage in 1649. Abigail married Thomas Clark. Sarah married Symon Tuttle in 1663 and died in 1692. Hannah married Deacon Cornelius Waldo in 1652 (they were the great-grandparents of Ralph Waldo Emerson). Elizabeth married Nathaniel Masterson in 1657.

John Sr. died in 1669, leaving most of his land to William, who also was the guardian for his brother John Jr.'s three children. William eventually owned 'mills and yards' in Gloucester, Massachusetts; he died in 1700 on the family estate.⁹²

Furber

Three months after the ship wrecked, William Furber also made his way to Ipswich. In later years, he made this deposition:

In November after the ship were cast away, I the said Deponent came to Ipswich and found Mr Cogswell, Sen. Living there and hired my self with him for one yeare, I the said Deponent doe well remember that there were severall feather beds [mattresses] and I together with Deacon [Samuel] Haines as servants Lay upon one of them.⁹³

Furber, who had been born in London, moved to Dover in 1637 where he was granted land in 1652 and admitted as freeman in 1653. He married Elizabeth Clark (born 1629) in America. They had five children - William (eldest, born 1646), Jethro, Susanna (born 1664),

and two other daughters. 'Lieutenant' Furber died 1694.⁹⁴

Haines

Samuel Haines, who had been a servant to the Cogswells in England for nine years, lived with the Cogswells in Ipswich for three years before returning to England. There in 1638, he married Eleanor Neate. They returned to New England, bringing some goods back for John Cogswell, and settled in Dover (New Hampshire) where Haines was a selectman in 1653 and 1663, served on the grand jury, and bought half interest in a saw mill in 1670. He and Eleanor had three children: Elizabeth, Mathias, and Samuel.⁹⁵

Simpson

No information has been located for Henry Simpson. There was a Henry Simpson of York listed as a prisoner in Quebec in 1695, and killed by Indians in 1697, but this was most likely his son or grandson - if in the family at all.⁹⁶

Tuttle

John Tuttle, a seventeen-year-old cooper's apprentice from Bristol, received a land grant (in present Dover, New Hampshire) from the Council for New England in 1633. Family lore places him on the Angel Gabriel in the summer of 1635, and records indicate he was on his land by 1640.

Being a devout Anglican he signed a protest to keep the Puritan Massachusetts government out of Dover. John and his wife Dorothy had four children: Thomas, John ('Judge', born 1646), and two daughters; John Tuttle died in 1662. His descendants still work the farm in Dover which his son, John cleared.⁹⁷

These twenty-two people settled quite close to each other, as Ipswich, Salisbury, and Newbury are within twelve miles (20km) of one another (Fig. 2, p. 25) and Dover and York are approximately twenty-four miles (37km) north of Salisbury. The ten Cogswells and two Burnhams settled in Ipswich; three Blaesdells and three Baileys in Salisbury or Newbury; Haines and Furber, after staying in Ipswich for a few years, joined Tuttle in Dover; and Simpson may have settled in York, where the three Blaesdells had lived for a short while.

Whether these people had planned to live in the area before they left England or drifted there together after the disaster at Pemaquid is not known. As mentioned above, some already had relatives in the vicinity and one might therefore reason that they had planned to settle close by. Possibly the Angel Gabriel was scheduled to sail south to Salisbury or Newbury after landing at Pemaquid.

None of the twenty-two known passengers, however, settled in Pemaquid. Elbridge would have been granted an extra 100 acres for each household settled there (to sell or give to the settlers as he chose to offer), and an increase in Pemaquid's population would have been beneficial for trading and security. Unfortunately, complete records from the early years of Pemaquid have not been located. Perhaps more passengers did arrive on the Angel Gabriel, and remained at Pemaquid.

CHAPTER II

THE SEARCH

Pemaquid was a small trading and fishing settlement on the central Maine coast, originally established circa 1628. It consisted of a few houses and a small stockaded trading post which may have been armed with one large gun. The settlement was situated on a small peninsula, facing what is known today as the inner harbor, which opens into Pemaquid Harbor and John's Bay.¹

The first known map of Pemaquid was sketched by Col. David Dunbar in 1729 (Fig. 3).² Dunbar's map of the harbor area is somewhat distorted, but it does show the settlement in its proper position. In 1635, however, there were fewer houses than on Dunbar's map, and the fort shown was not yet built.³ The map indicates an anchorage in the inner harbor and two anchorages in the main harbor.

Pemaquid Harbor is almost completely surrounded by rocky coast, islands, rocks, and ledges. There are two deep, but narrow entrances - one at the northwest corner, and one at the southeast corner of the harbor. The present depth averages twelve meters, with a soft mud and sand bottom overlaying Pleistocene clay and bedrock.

The Wreck - 1635

In 1635 Richard Mather and Edward Trelawny each reported that the Angel Gabriel was at anchor at Pemaquid on August 15th when a hurricane struck and destroyed her on some rocks. Neither of the writers described where she was anchored or which rocks she hit.⁴

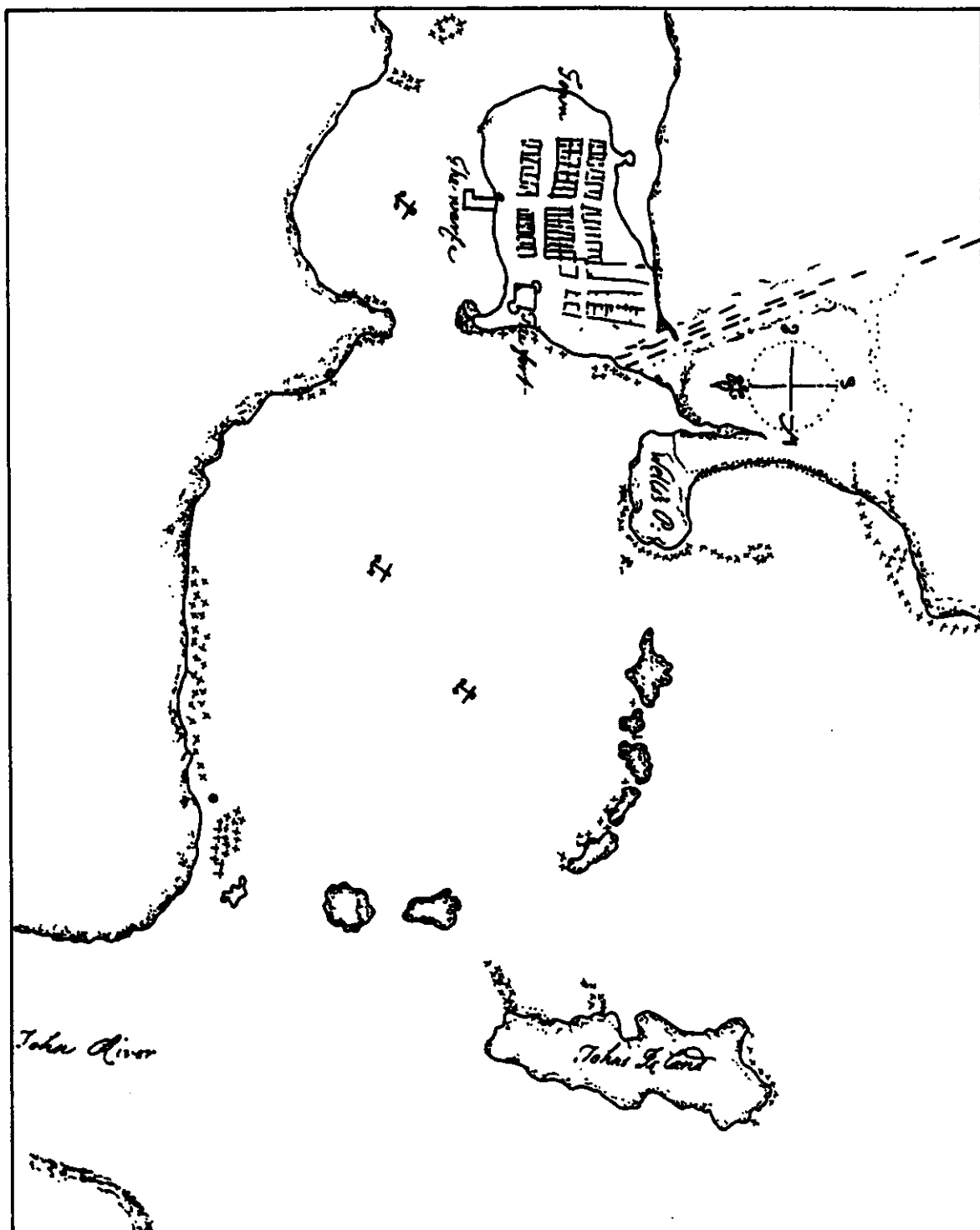


Figure 3. Col. Dunbar's map of Pemaquid, 1729. From a copy in the British Public Records Office.

It is likely that the ship did not break up in the shallow inner harbor, for if she had, most of her cargo and ordnance would have been recovered. But this did not happen, for Mather reported that all the cargo was lost. It is also doubtful that any of the ordnance was saved, because there is no indication of an immediate increase of ordnance at Pemaquid after the disaster.⁵

Both Mather and John Winthrop described the heavy winds of the storm as starting from the Northeast, but later coming from the Northwest.⁶ If the Angel Gabriel broke or slipped from an anchorage in the inner harbor when the wind was from the Northeast, she may have cleared the entrance and drifted into the main harbor. But her chances of clearing the rocks, islands, and ledges around the main harbor, and drifting into John's Bay, were quite small. Because of the possible importance of the ship to both general and nautical colonial archaeology, I decided to search the Pemaquid Harbor area for her remains.

The Survey - August 1977

Many sport divers over the years have visually searched Pemaquid Harbor, John's Bay, and Pemaquid Point (approximately 4-1/2 kilometers south of the harbor) for remains of the Angel Gabriel, but have found nothing. With the possibility that kelp beds or the soft sediment bottom may have hidden any trace of the ship, a magnetometer survey appeared to be appropriate.

A magnetometer is an electronic instrument which measures the intensity of a magnetic field. Most common is the proton (nuclear) precession magnetometer which consists of an instrument box and console, a sensor filled with a hydrocarbon fluid, and usually a chart

recorder. A pulse from the instrument box to a coil in the sensor aligns the fluid's protons to the coil. When the pulse stops the protons precess around the direction of the surrounding natural magnetic field, creating in the sensor's coil a slight current whose frequency is translated into intensity units called gammas, which are then displayed and recorded. A quality proton precession magnetometer is typically sensitive to one gamma within the earth's magnetic field of 50,000 gammas.⁷

The earth's magnetic field normally changes only gradually over an area the size of Pemaquid Harbor, but a concentration of ferrous material in the harbor would create a significant localized change in intensity. The concentration of iron would be recorded as an anomaly on a fairly constant background.

anchors, shot, some cargo, hardware, and possibly the guns of the Angel Gabriel were made of iron. Though much of the iron would have corroded and dissolved into the seawater, enough would remain to be detected by a sensitive magnetometer.

Plans for the survey included towing a magnetometer in a systematic pattern over the harbor area while the course of the magnetometer was recorded by a standard two-transit triangulation method. A magnetic contour map of the harbor area would then be constructed from the data. Any significant anomalies were then to be investigated by experienced archaeologists.

Unfortunately, the borrowed magnetometer which arrived at the beginning of the survey, was not constructed for underwater use as we had assumed, but was instead a water sensitive gradiometer type of

magnetometer. Gradiometers measure the difference in the field between two magnetometer heads, in this case mounted 2 meters apart. In addition, instead of a recording device, such as a chart recorder, the magnetometer displayed its readings on a needle gauge from which a highly skilled operator could only state "background reading" or "more than background reading". An accurate contour map of the harbor area was therefore impossible, but it seemed likely that if enough ferrous material was close, the gradiometer would indicate its presence.

We therefore mounted the gradiometer on an inflatable boat and towed the inflatable over the shallow areas of the harbor, with the Lillie M, a lobster boat loaned to us by Elbridge Wallace, a local fisherman (Fig. 4).

Charles Mazel, the gradiometer operator, estimated that the instrument would indicate the presence of the remains of a saker (thought to be one of the largest guns aboard the Angel Gabriel) at a maximum distance of 12 meters. The search area was therefore limited to the shallower sections of the harbor - even at low tide.

Because of the heavy concentration of lobster pot buoys and toggle lines which had to be avoided, and the developed, irregular, rocky shore, the common range pole method of near-shore navigation was not used. Instead, we established three transit points (one at Fort William Henry, one on Fish Point, and one on Beaver Island), and used at least two of them for triangulation at all times (Fig. 5).

To plot accurately the course of the gradiometer the person designated as recorder would radio the signal, "Mark!" every two minutes. Transit operators on shore, who had been following the gradio-

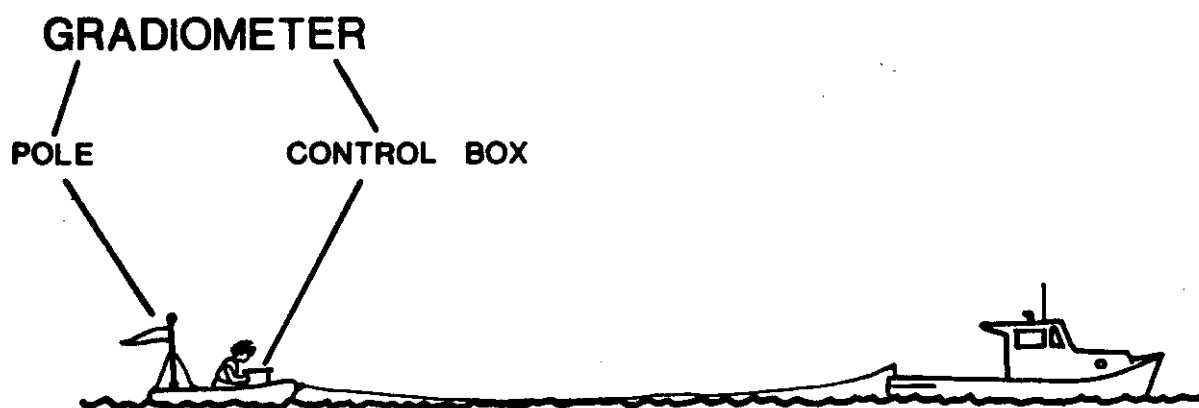


Figure 4 . Lillie M towing the gradiometer

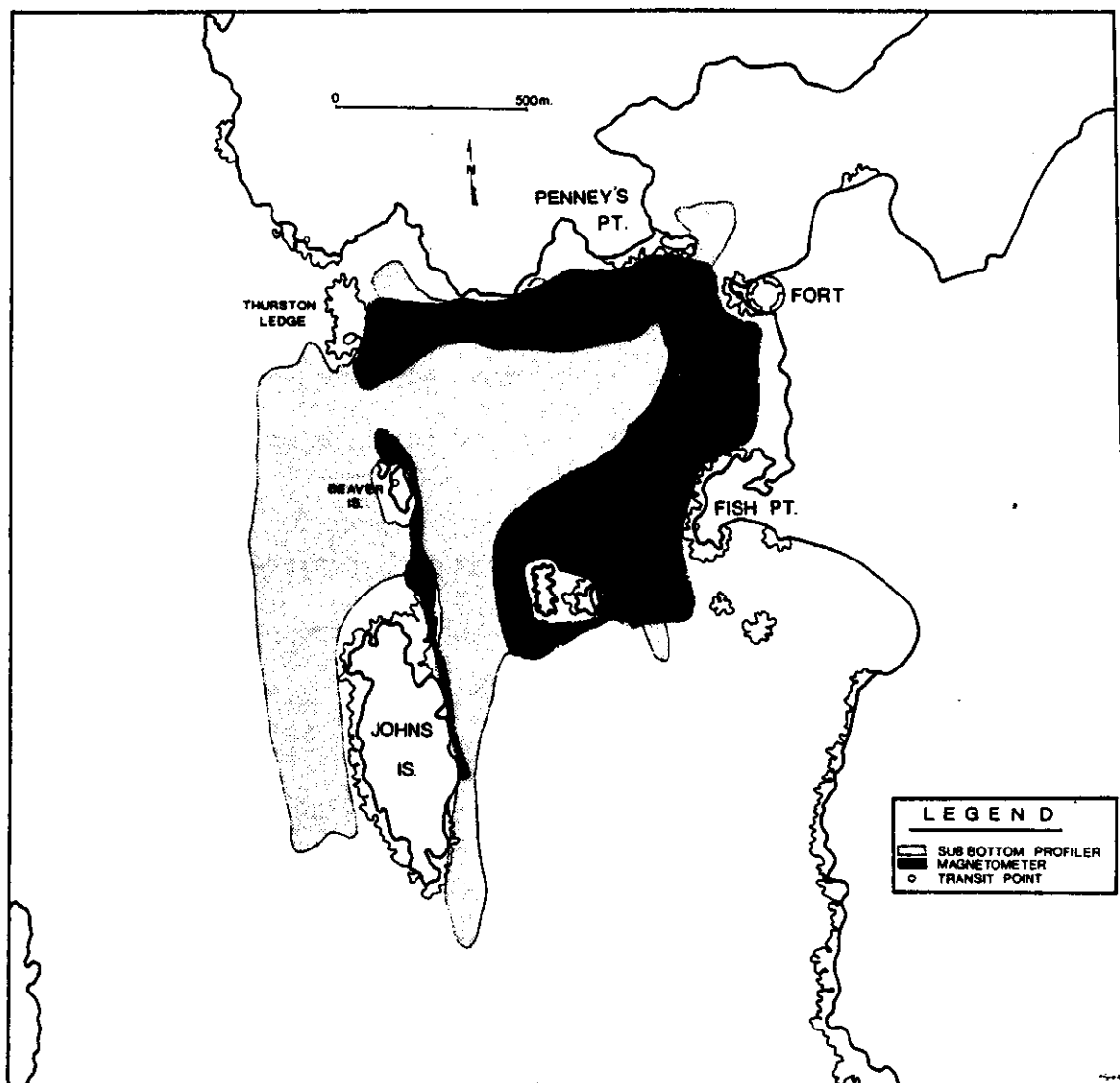


Figure 5. Map of Pemaquid Harbor showing transit points, area surveyed with the sub-bottom profiler, and area surveyed with the magnetometer.

meter pole in their cross hairs, stopped moving the transit at the signal, and recorded the angle from grid North. They then proceeded to follow the progress of the pole until the next mark.

When a magnetic anomaly was indicated in an area, the gradiometer operator and a rower were set free in the inflatable boat. They slowly rowed over the area until the operator felt a maximum reading was reached. An anchored buoy was then dropped off the inflatable to mark the spot, slack in the buoy's anchor line was taken up, and fixes were taken from the transits to the buoy's position. During the course of the survey, the positions of eight anomalies were plotted (Fig. 6).

In the evening, the path of the gradiometer was plotted on a map by crossing bearing lines from the transit points, using a vernier drafting square. The resultant series of mark points were connected to show the area covered, and were compared to the day's magnetic anomalies, for which bearings had been recorded.

Because we could not properly protect the vernier square in the lobster boat, it was not brought aboard. We therefore could not accurately determine our position, or the area being covered, while towing the instrument. Some time was lost by covering the same areas more than once.

Fog, rain, and rough seas limited electronic survey days to only seven of the fourteen project days. We used most of the foul weather time for underwater investigation of anomalies.

Each diving team consisted of two divers using standard scuba gear. At least one diver of each team was a professional or student

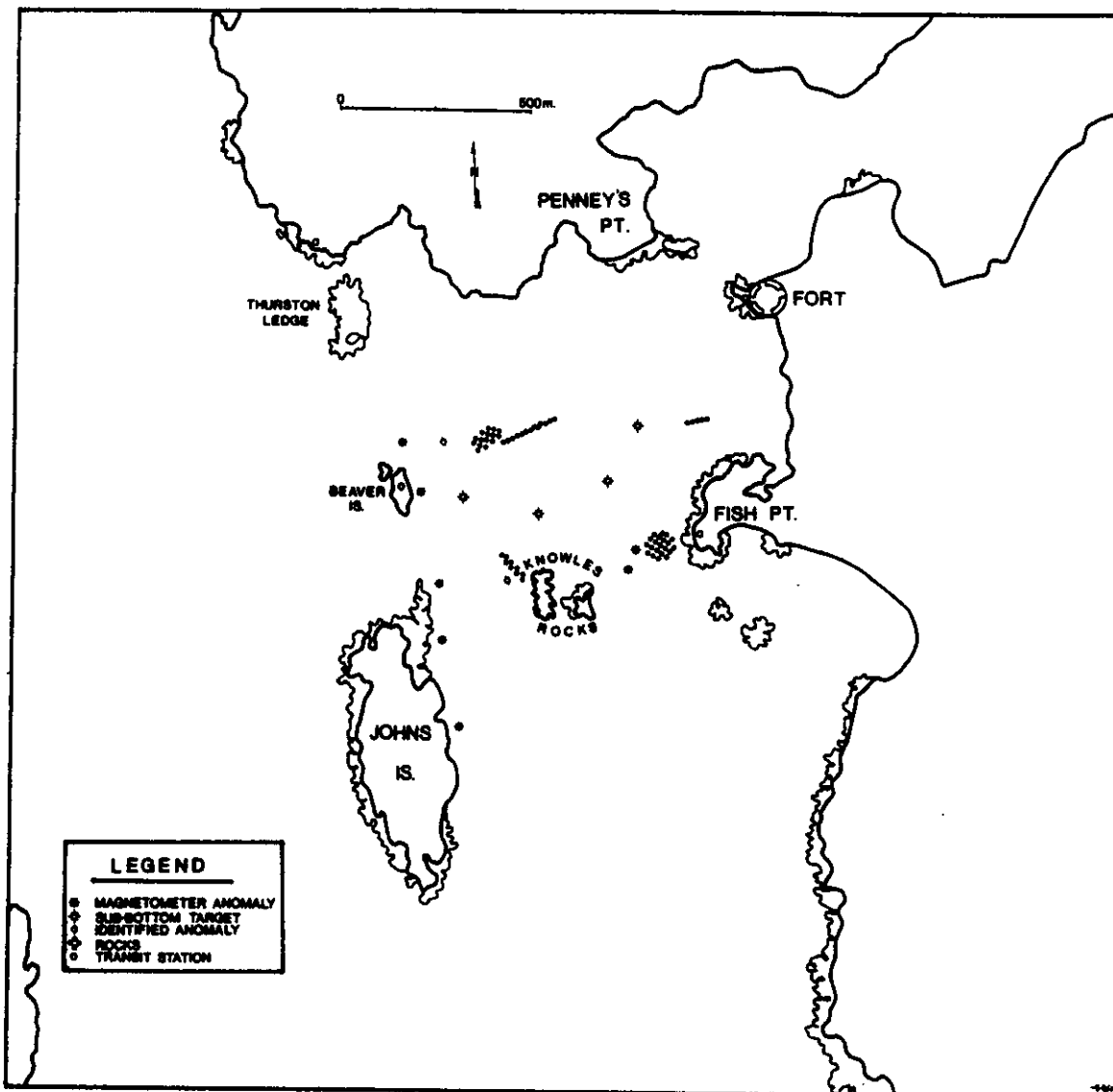


Figure 6. Map of Pemaquid Harbor showing unidentified magnetic anomalies, unidentified sub-bottom profiler targets, rocks and ledges charted with the profiler, and two unidentified anomalies.

archaeologist with underwater excavation experience. Upon reaching the bottom, the divers attached a ten meter line to the buoy anchor and, while swimming around the anchor holding the radial line, they conducted a visual search in a concentric circles pattern. If they failed to spot the cause of the magnetic anomaly, a slower search, using three foot steel probes, was conducted in the same radial pattern.

Using this search technique only one significant object was located - an iron tank weighing approximately 500 pounds. It was found in about twelve meters of water on the sediment surface northwest of Knowles Rocks. The discovery of this tank was helpful for it had produced a strong anomaly reading in the gradiometer. We then knew that the instrument, however crude, was indeed able to indicate the remains of an iron gun, anchor, or other heavy concentration of iron, in shallow water. But the causes of the other seven anomalies remained hidden below the sediment.

An air lift, a device used to excavate underwater, was available to us. But careful excavation is a slow process, and we did not know exactly where to dig, for although the approximate location of each anomaly was known at the surface, its exact location under the sediment could not be determined without an underwater magnetometer or metal detector.

On the last day of the project, an attempt was made to locate one of the hidden anomalies with a terrestrial metal detector in an underwater case. Unfortunately, a rubber gasket failed and the instrument flooded before it was of any use. After fourteen days of

searching, we were therefore forced to accept the limited results of having surveyed only a portion of the harbor and having plotted the position of eight anomalies - only one of which we could identify.

The Survey - August 1978

After consideration of the results of the 1977 survey, I decided to continue with a magnetometer search of the Pemaquid Harbor in August of 1978, and produce a magnetic contour map of the area, as had been originally planned for 1977. Only after the map was completed, would anomalies be investigated - first by a small scale magnetometer survey around each promising anomaly, and second by excavation.

Work by Harold Edgerton and Peter Throckmorton at Porto Longo, Greece, suggested that the use of a sub-bottom profiler in conjunction with a magnetometer would be helpful.⁸ A sub-bottom profiler is a sonar instrument, similar to a standard depth-finder, which can record not only the distance from the water surface to the sea floor, but also the stratigraphy of sediments and bedrock within the sea floor. This is accomplished by measuring the time required for a low frequency sound wave to reflect off each sub-bottom layer. Under proper conditions, such as a calm sea and sand bottom, a sub-bottom profiler can indicate the presence of a hull or pile of ballast stone. For example, seismic records of the Amsterdam, a seventeenth century wreck site in Great Britain, clearly show the ship in sand, but one can see from these same records that mud produces a signal similar to that of the ship.⁹ If the ship were covered by mud it may not have been distinguishable from the mud on the sub-bottom profiler records.

In addition to indicating potential sites, sonar records accurately display the depth and stratigraphy of the sea floor. The depth affects the proper use of a magnetometer which must be close to a target, and the stratigraphy of mud, sand, and clay layers over bedrock is important to the excavator. Plans were therefore made to conduct a sub-bottom sonar survey simultaneously with the magnetometer survey.

The navigation system in 1977 had been restrictively inefficient because we were not able to plot the instrument swaths until the end of each day. To overcome this problem while keeping accuracy and a limited budget in mind, Mazei designed a system during the winter, which enabled us to quickly and accurately plot the course of the towed instrument while underway in the lobster boat.¹⁰

The system, like that used in the 1977 survey, was based on triangulation from two transit points. But instead of plotting each mark point with a vernier square, a programable hand calculator mathematically translated the two transit bearings into an X and Y coordinate, which were easily plotted on a map with a small template (Fig. 7). Plotting of each mark point was made on board approximately forty seconds after the mark was taken, enabling the helmsman to see the swaths being made and to adjust the tow path accordingly.

In addition, the system required little training or practice compared to the proper use of the vernier square. One only needed to enter the two bearings into the calculator and push the A, B, C, and D buttons, in that sequence, to produce the X and Y coordinates for each mark point.

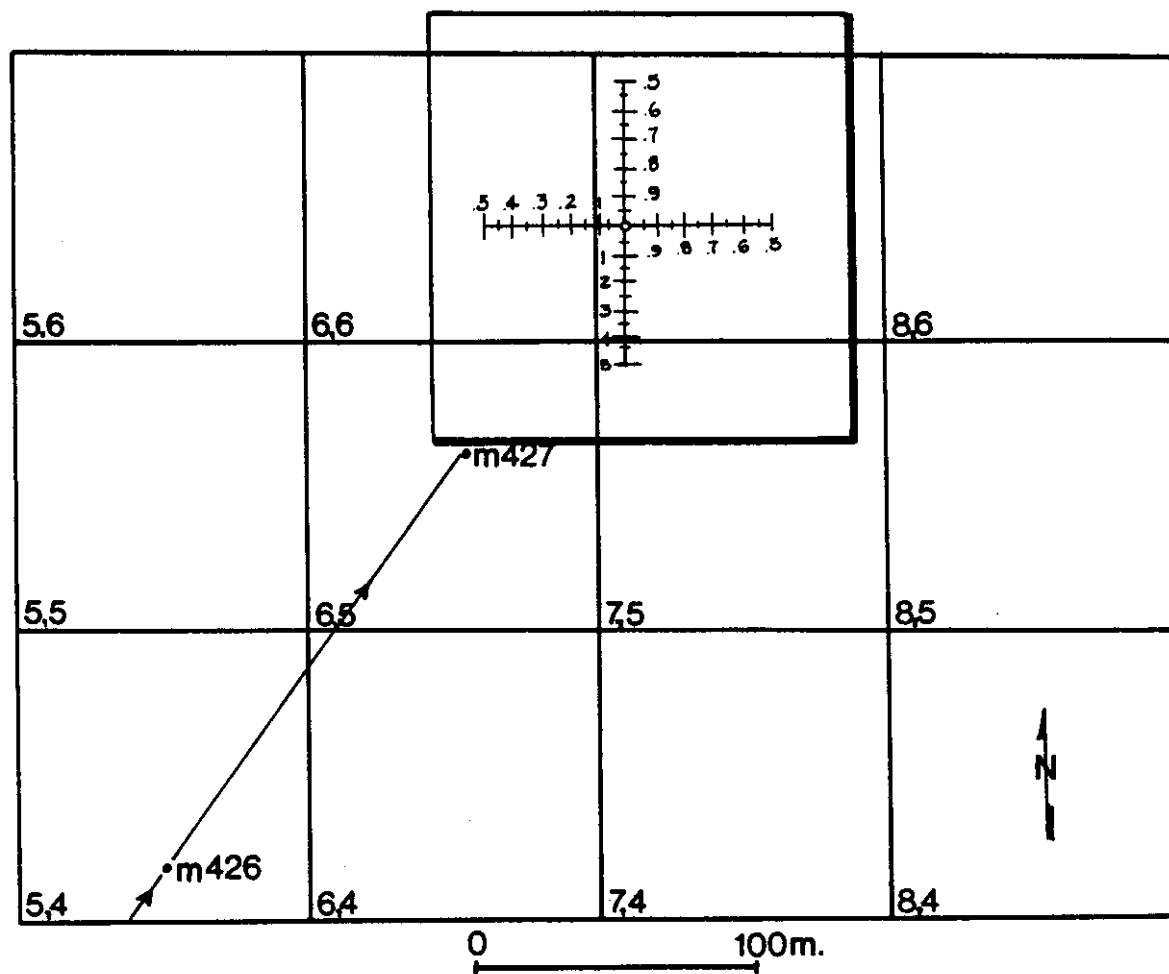


Figure 7. Template positioned over grid to plot the next mark point. $X = 7.12$, $Y = 6.42$: This would translate to 712 meters east and 642 meters north of an arbitrary bench mark.

As the crew and equipment assembled in August, it became clear that magnetometer problems were with us again. Underwater magnetometers were borrowed from two sources. One of the instruments had a dial indicator and gave erratic readings, the other was missing a special cable which arrived from England the last day of the survey.

The Oceanography Department of the University of Maine, however, loaned us an excellent sub-bottom profiler. After a local engineering firm kindly surveyed our three transit points with an electronic distance measuring instrument, we drew the harbor and transit points onto a 100-meter grid. Each day of surveying, a new piece of heavy weight tracing paper was placed over the grid. These were taken aboard the Lillie M, which we had borrowed again, allowing us to plot the tow paths while underway.

The transducer of the sub-bottom profiler was mounted just forward of the Lillie M's bow, 1/2 meter below the water surface (Fig. 8). A generator was also needed aboard because the profiler required alternating current for power. This became a problem as the first two generators broke down after only one day of service. Fortunately the third generator, loaned by the University of Maine, produced reliable power for the remainder of the project.

During the two-week project most of the harbor area was surveyed with the profiler (Fig. 5, p. 40). No large unnatural targets were clearly visible in the sonar records, but a number of smaller targets were recorded (Fig. 6, p.42). To better understand our sub-bottom data, and to test the new navigation system, we spent one morning investigating a sonar target northeast of Beaver Island which appeared,

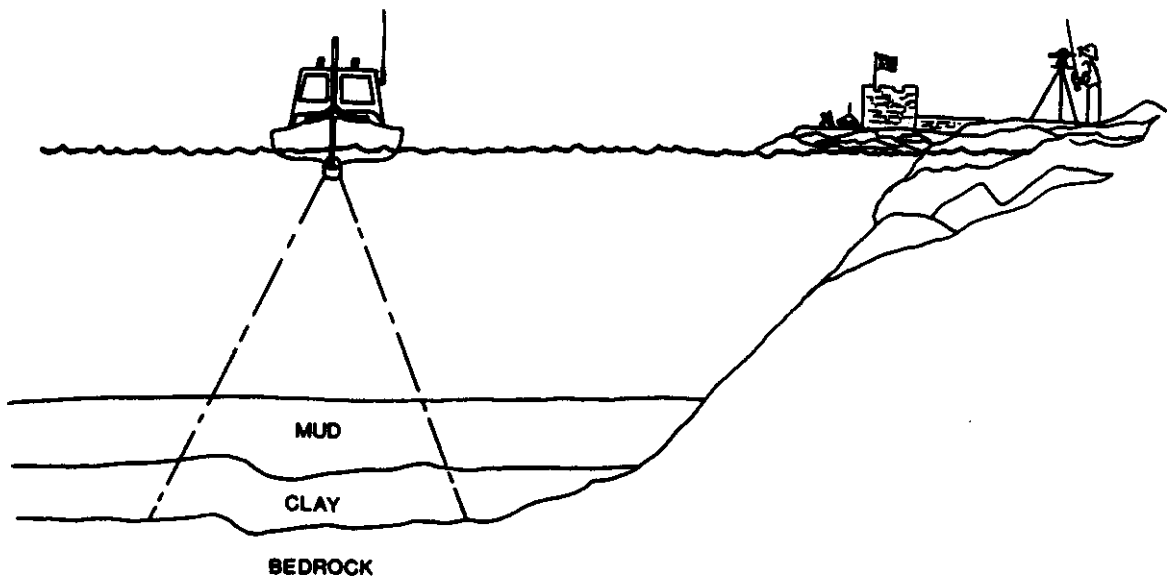


Figure 8. Sub-bottom profiler mounted on the bow of the Lillie M, showing the cone and depth to which the profiler 'sees.' The boat is cruising south, just off Fish Point; Fort William Henry is in the background (see Fig. 6, p. 42).

from the profiler records, to be a long timber buried 1/2-meter in soft mud. The target was not at any mark point, but some quick triangulation with the hand calculator indicated the position of the anomaly - theoretically to within one meter.

We preset the transits from two points to sight down the bearings which intersected over the sonar target. A buoy was then dropped, and repositioned until it was in the cross hairs of both transits. Divers with three-foot probes uncovered a birch log under about 1/2-meter of mud. The buoy's anchor had been dropped on one end of the log.

During the survey the sub-bottom profiler was purposely run over each of the 1977 magnetometer anomalies. No sonar targets were visible on the record chart, but valuable stratigraphic data was gathered for each of the eight spots.

Foul weather days were spent diving around the rocks at Beaver Island, Knowles Rocks, and Fish Point. The divers were looking for any artifacts which might have fallen between the rocks when the ship broke up, but none were found.

After the second short session, in addition to locating eight anomalies, we had determined the general stratigraphy of the area, visually inspected approximately one-third of the underwater rock outcrops, and developed a more efficient navigation technique which might be helpful to others conducting inshore marine surveys. But we had still not located the ship.

Dunbar's Map

The map of Pemaquid which Colonel Dunbar sketched in 1729 was

first brought to my attention in November of 1978 by Robert Bradley of the Maine Historic Preservation Commission (Fig. 3, p. 35). After inspecting a copy of the map, we felt that its only usefulness to the search for the Angel Gabriel was the location of the best anchorages in the harbor for a large sailing ship.

In February of 1979, Sheli Smith, a fellow archaeology student who specializes in illustration, while inspecting a copy of the map, immediately noticed a double-crossed line off Well's Point (now Fish Point) that was similar to a traditional shipwreck symbol. Because Dunbar had used x's to mark rocks in the water, I had assumed that the double-crossed line was merely two x's run together end-to-end, as can be seen elsewhere on the map. But on closer inspection, the longer line in the symbol appears to be made with one pen stroke, supporting Smith's opinion that it is a shipwreck mark.

The symbol is close to a ledge which is a few meters from Fish Point. Although we defined the extent of the ledge with the sub-bottom profiler in 1978, no other targets are visible on the sonar records. The symbol is close to the location of two unidentified magnetometer anomalies (Fig. 6, p. 42). Underwater visual searches in 1977 in the area concentrated on the rocks on the southern end of Fish Point and on the passage between Fish Point and Knowles Rocks. None had been conducted at the location of Dunbar's symbol. Plans are being made for a careful search of the Fish Point area in August 1979 to determine if Dunbar's mark is indeed a symbol to represent the location of the Angel Gabriel disaster.

CHAPTER III

CONCLUSION

Research of the history of the Angel Gabriel and her probable design and cargo has determined the importance of the ship and her contents to archaeology and has defined the most promising search area. Construction and subsequent repair details will be an important addition to our knowledge of seventeenth century ships, as she had a varied history.

Strong circumstantial evidence connects the Jason of Raleigh's fleet to Guiana (1617-1618), the Angel Gabriel in Oquendo's fleet to South America (1631), and the Angel Gabriel of Bristol which wrecked at Pemaquid (1635). At this stage of research the single identity of these ships is a theory with no proof. But, when sought, no contradictory evidence was found. Future research should help ascertain if a real connection existed between the Jason and the Angel Gabriel. Since the Jason was last known to be in government custody, dismantled in Kinsale, official records must have been made of her disposition. Inspection of the Privy Council and Kinsale port records for 1618 and 1619 may provide the needed information.

If the theoretical history presented in this study is correct, the ship served first as the vice admiral's ship on a paramilitary expedition to South America and later as a merchantman, a privateer, a troop transport, and finally a supply-emigrant ship. The history of this particular ship suggests the continued multipurpose nature of some ships, even while warships and merchantmen had become distinguish-

able. Therefore whether she was originally built as a military or merchant vessel, details of the Angel Gabriel's structure would be a valuable contribution to our knowledge of early Stuart period ship construction. In particular, the lines, dimensions, and framing of a large armed merchantman of the period are not well known, and at present we can only guess how the Bristol ships were reinforced for repeated groundings in their harbor.

Previous to this study, the Angel Gabriel had been assumed to be an immigrant ship on its way to the Massachusetts Bay colony that came to Pemaquid only to weather the approaching storm. But research into the history of the Angel Gabriel and the biographies of the passengers aboard indicate that the ship was not only carrying settlers and their belongings, but also goods of an immigrating merchant and those for the Pemaquid trading post. If located, belongings of the passengers will provide information about the early immigrants' trans-atlantic voyage and their first years in the New World.

More significantly, the discovery that the ship belonged to the owners of Pemaquid indicates that the cargo destined for the trading post would provide evidence concerning this important settlement's economy and industry. Since it is assumed that Pemaquid traded with the contemporary fishing settlement on Damariscove Island, only five miles away, the commercial cargo aboard the ship would also be helpful in the interpretation of the archaeological excavation on Damariscove being conducted by Alaric Faulkner of the University of Maine. The Pemaquid Harbor area, containing the probable site of the ship's remains, has therefore been included in the Pemaquid Archaeological Dis-

trict on the National Register of Historic Places.

Results of the two search seasons for the wreck site of the Angel Gabriel include a record of the harbor's sub-bottom stratigraphy and the location of seven unidentified magnetic anomalies. One of these anomalies is in a particularly promising area near a ledge marked by a possible shipwreck symbol on a 1729 map.

Future search efforts should include a magnetic search of the deeper areas of the harbor and an attempt to verify and identify each of the seven magnetic anomalies. If these efforts do not produce remains of the ship or its cargo, the archaeological importance of even minimum remains would justify an extension of the search area to include the rocks outside of the harbor. Plans are presently being made for further search efforts.

Epilogue

In August of 1979 a magnetometer search was conducted in Pemaquid Harbor to investigate the possible shipwreck symbol on Dunbar's map and to search the deeper areas of the harbor. A Barringer Research model M-123 proton precession magnetometer was used from the 32-foot lobster boat Elk.

The shank and ring of a large anchor were located near Dunbar's symbol. It is only datable to pre-1840-postmedieval at this time and its size is approximately that of those which the Angel Gabriel may have carried as a bower. Further investigation of the anchor is presently being conducted.

A three-meter grid was established over the area where the anchor was located. Three magnetometer readings were taken at each inter-

section of the grid system. From these data a magnetic contour map of the area will be constructed. An overabundance of bad weather and a lack of trained personnel allowed only four efficient days of magnetometer towing in the harbor. The data are presently being analyzed.

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23. Flyboat (or flute) - a small, shallow draft supply ship.

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72. R. Mather, Journal, p. 451. The Crown and Gorges were trying to keep Puritan ministries from the New World settlements. Alexander Young suggested, "Mather himself keeps in the background, probably from fear of being recognized and stopped."

73. Ibid., pp. 452-7.

74. Ibid., pp. 457-8.

75. Ibid., pp. 459-60. Live animals were generally taken aboard to be slaughtered for fresh meat, and to start farms in the New World. Sack - any strong, dry white European wine.

76. R. Mather, Journal, pp. 471-2, 478.

77. James P. Baxter, ed. The Trelawny Papers (Portland: Maine Historical Society, 1896), III, pp. 74-5.

78. Anthony Thatcher and John Avery (cousins of Ralph Blaesdell, who immigrated on the Angel Gabriel) had arrived in Boston, 3 June 1635, on another James, from London. Four days before the storm they and their families set sail from Ipswich in a bark owned by Isaac Allerton, who immigrated in the Mayflower. Thatcher narrated, "On the 14 of this August, 1635, about ten at night, having a fresh gale of wind, our sails being old and done, were split. The mariners... resolved to cast anchor till the morning. But before daylight, it pleased the Lord to send so mighty a storm, as the like was never known in New-England since the English came, nor in the memory of any Indians...our anchor came home. Whereupon the mariners let out more cable, which at last slipped away."

78. The ship broke up on a rock (now called Avery's Rock, near Thatcher's Island, off Cape Ann). Thatcher and his wife were cast upon what is now Thatcher's Island, from which they were rescued. The other 21 passengers and crew, including their four children, drowned. - A. Young, Chronicles, p. 486.

79. R. Mather, Journal, pp. 28-9.

80. Storm surge - abnormally high water, not necessarily coinciding with the regular tide, created by low barometric pressure and/or strong winds.

81. John Winthrop, History of New England, 1630 to 1649, James Hosmek, ed., (New York, Charles Scribner's Sons, 1908), I, p. 156; Rev. William Hubbard, A General History of New England from the Discovery to 1680, (Cambridge, Hillard & Metclaf, 1815), pp. 199-201; Nathaniel Morton, New England's Memorial, (Cambridge, John User, 1669), p. 29.

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83. "The Disposition of William Furber, Sen.," NEH&GR, XXIII, p. 153.

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93. W. Furber, Deposition, p. 153.

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95. S. Haines, Deposition, p. 153; "[Dover tax] Record Oct. 19th, 1648," NEH&GR, IV, p. 31.

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APPENDIX A

Bristol Port Records

British Public Records Office E 190/1135/6

Eg. / 101 + Days /

For the August Gabriel of Bristol yth to me for some M^{rs} from M^{rs} the
 Thomas Jackson mit yth of Province of Exeter yth nth lth of Exth and
 Barrow and yth of Dapari nth u
 Andren Charlton mit yth of Exth yth nth lth of Exth and to me
 done yth and and Blth u
 William Jones mit yth of Exth yth nth lth of Exth and to me
 done alth u
 Richard Dyker mit yth of Exth nth u
 William Lam mit yth of Exth nth u
 Humphry Browne mit yth of Exth nth of Exth and yth u
 John Taylor mit yth of Exth nth u
 John Tomlinson mit yth of Exth nth u
 William Pitt mit yth of Exth nth u
 Robert Aldworth mit yth of Exth nth of Exth u

October the 10th 1715

For the August Gabriel of Bristol yth to me for some M^{rs} from M^{rs} the
 Thomas Jackson mit yth of Province of Exeter yth nth lth of Exth and
 Barrow and yth of Dapari nth u
 Andren Charlton mit yth of Exth yth nth lth of Exth and to me
 done yth and and Blth u
 William Jones mit yth of Exth yth nth lth of Exth and to me
 done alth u
 Richard Dyker mit yth of Exth nth u
 William Lam mit yth of Exth nth u
 Humphry Browne mit yth of Exth nth of Exth and yth u
 John Taylor mit yth of Exth nth u
 John Tomlinson mit yth of Exth nth u
 William Pitt mit yth of Exth nth u
 Robert Aldworth mit yth of Exth nth of Exth u

APPENDIX B

A Contemporary Ballad Reprinted in J.W. Damer Powell,

Bristol Privateers and Ships of War

'The Honour of Bristol'

Showing how the "Angel Gabriel" of Bristol fought with three (Spanish) ships, who boarded us many times, whereon we cleared our decks and killed five hundred of their men, and wounded many more, and made them flye into Cales, where we lost but three men; to the honour of the Angel Gabriel of Bristol.

(To the tune of "Our Nobel King in his Progress")

Attend you and give ear awhile. and you shall understand
of a battel fought upon the seas, by a ship of brave command;
The fight it was so famous, that all men's heart doth fill,
And makes them cry, "To sea, with the ANGEL GABRIEL".

The captain, famous Netheway, so was he call'd by name;
The master's name John Mines, a man of noted fame;
The gunner Thomas Watson, a man of perfect skill:
With other valient hearts, in the ANGEL GABRIEL.

The lusty ship of Bristol sail'd out adventurously,
Against the foes of England, their strength with them to try;
Well victual'd, rig'd, and man'd, and good provision still:
Which makes men cry, "To sea, with the ANGEL GABRIEL"!

They waving up and down the seas, upon the ocean main;
"It is not long ago", quoth they, "since England fought with Spain!
Would we with them might meet, our minds for to fulfill;
We would play a noble bout with our ANGEL GABRIEL.

They had no sooner spoken, but straight appear'd in sight
Three lusty Spanish vessels of warlike force and might;
With bloody resolution they sought our men to spill,
and vow'd to make a prize of our ANGEL GABRIEL.

Then first came up their admiral, themselves for to advance;
 In her she bore full forty-eight piece of ordnance;
 The next that then came near us was their vice-admiral,
 Which shot most furiously at our ANGEL GABRIEL.

Our gallant ship had in her full forty fighting men;
 With twenty pieces of ordnance we play'd about them then;
 And with powder, shot, and bullets we did employ them still,
 And thus began the fight with our ANGEL GABRIEL.

Our captain to our master said, "Take courage, master bold".
 The master to the seamen said, "Stand fast, my hearts of gold";
 The gunner unto all the rest, "Brave hearts, be valient still"
 Let us fight in the defence of our ANGEL GABRIEL".

Then we gave them a broadside, which shot their mast asunder,
 And tore the bowsprit of their ship, which made the Spaniards wonder;
 And caused them for to cry, with voices loud and shrill,
 "Help! Help! or else we sink, by the ANGEL GABRIEL".

Yet desperately they boarded us, for all our valient shot;
 Three score of their best fighting men upon our decks were got,
 And then at their entrance full thirty we did kill,
 And thus we clear'd the decks of the ANGEL GABRIEL.

With that their three ships boarded us again with might and main,
 But still our noble Englishmen cry'd out, "A fig for Spain!"
 Though seven times they boarded us, at last we shew'd our skill,
 And made them feel the force of our ANGEL GABRIEL.

Seven hours this fight continued. and many brave men lay dead,
 With purple gore and Spanish blood the sea was coloured red;
 Five hundred of their men we there outright did kill;
 And many more were maim'd by the ANGEL GABRIEL.

They seeing of these bloody spoils, the rest made haste away.
 For why? they saw it was no boot any longer for to stay;
 They then fled into Cales and there they most lye still,
 For they never more will dare to meet our ANGEL GABRIEL.

We had within our English ship but onely three men slain;
 And five men hurt, the which, I hope, will soon be well again;
 At Bristol we were landed, and let us praise God still,
 That thus hath blest our men and our ANGEL GABRIEL.

Now let me not forget to speak of the gift given by the owner
Of the ANGEL GABRIEL, that many years has known her;
Two hundred pounds in coyn and plate he gave with free good will
Unto them that bravely fought in the ANGEL GABRIEL.

(probably by Lawrence Price).

(Bristol: Arrowsmith, Ltd., 1930), pp. 70-3.

APPENDIX C

Approximate Hull Construction Details of Angel Gabriel

Dimensions

In order to develop a hypothetical design for the Angel Gabriel, an English treatise on shipbuilding, probably written between 1620 and 1625, was considered.¹ The treatise describes the proper proportions of a 550 ton vessel, but the anonymous author states that any ocean-going ship would be built similarly. The best proportions of a ship described in the treatise are "breadth [at midships] to the depth [of hold] is as 7 to 3, and of the breadth to the length [of keel] as 9 to 25." This would indicate a length-to-breadth ratio of 2.8. The following is therefore true:

if D = depth of hold, B = breadth, and L = length of keel,

then,

$$B = 7/3 D$$

$$L = 25/9 B$$

$$B = 2.33 D$$

$$L = 25/9 (7/3 D)$$

$$L = 6.48 D$$

From the same manuscript we are given, "these three [B, D, and L] being multiplied cubically one into another and that product divided by 100 by the ordinary rule of measuring do give the burthen of the ship."² Therefore:

if T = tons burthen,

$$\frac{B \times D \times L}{100} = T$$

$$\frac{(2.33 D) D (6.48 D)}{100} = T$$

$$D^3 (2.33 \times 6.48) = 100 T$$

$$D^3 = \frac{100}{15.10} T$$

$$D^3 = 6.62 T$$

for a 240 ton ship, such as the Angel Gabriel:

$$D^3 = 6.62 (240)$$

$$D = 11.67' \text{ or } 12 \text{ Feet}$$

$$B = 27.10' \text{ or } 27 \text{ Feet}$$

$$L = 75.62' \text{ or } 76 \text{ Feet}$$

Structural Details

The seventeenth century treatise gives various structural details of an ocean-going vessel. From this information I have hypothesized the probable dimensions of the Angel Gabriel. These dimensions and structural details of major ship members are presented below to assist archaeologists who will locate the ship's remains (Plates I and II):

Keel: Seventy six feet long; moulded and sided 1 to 1-1/2 feet; mortise in the top of the after end; scarf at the forward end; made from two or three timbers scarfed and bolted end-to-end. Although many ship's keels were made of oak, elm was also a favorite material and is called for in the treatise. Elm, as strong as oak, was usually found in longer knot-free lengths than oak, and its twisting grain was known to retain the timber's resilience longer than straight grained wood. The English-built Sparrow-Hawk, which wrecked in 1626, had an elm keel.³

False Keel or Shoe: Two to 6 inches thick; sided dimension same as the keel. This piece would have been repaired or replaced more than once if the ship had a history as a Bristol Merchantman. An examination of nail or peg holes on the bottom of the keel would indi-

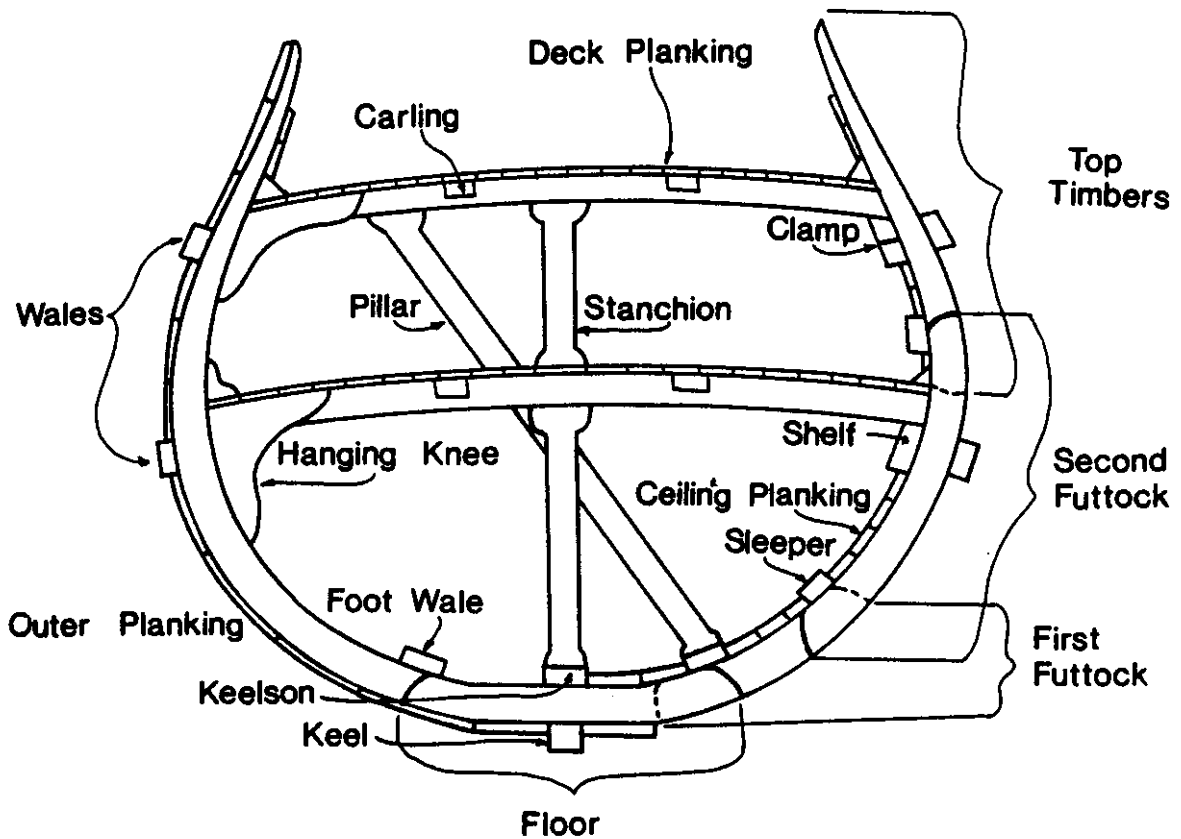


Plate I. Cross section of an early seventeenth century ship at the midship bend. For clarity, some members are shown larger than scale. Details are from W. Salisbury's Treatise and W. Baker's Mayflower II.

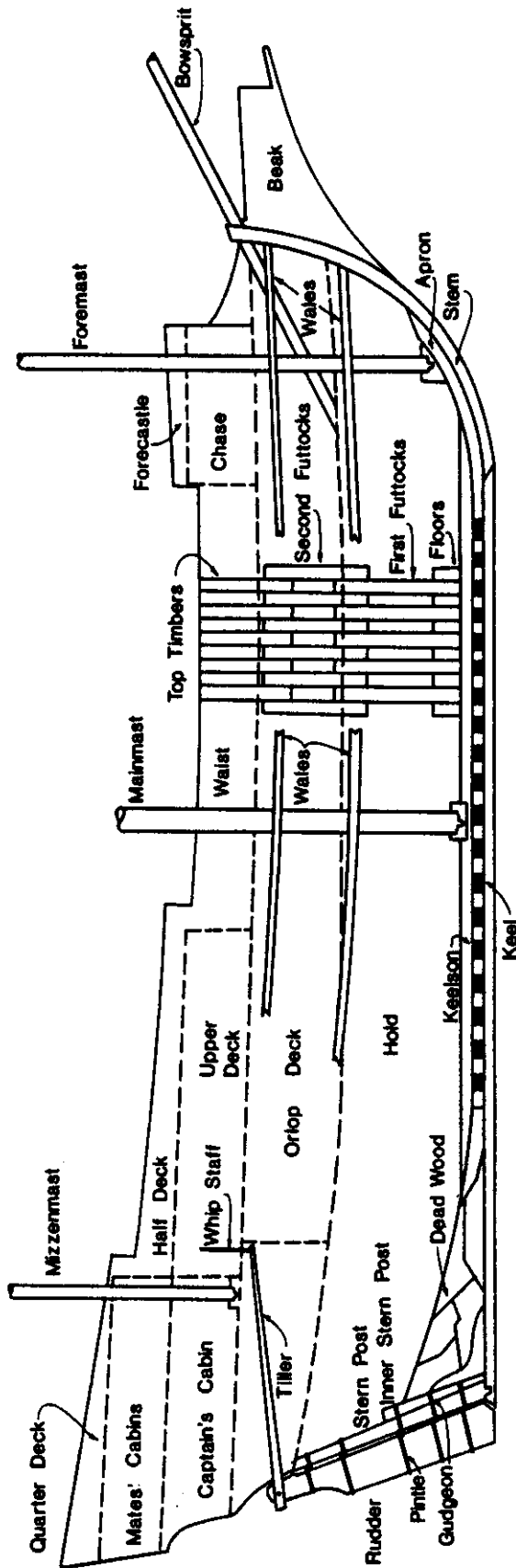


Plate II. Cutaway side view of an early seventeenth century ship. Note that the framing and wales run the length of the ship. Details from W. Salisbury's Treatise, and W. Baker's, Mayflower II.

cate whether the false keel or shoe was replaced.

Stem: Sided dimension the same as the keel, and constant; moulded dimension larger at the head and tapering to meet the keel.

Apron: Cross-section of 1 foot.

Sternpost: Eighteen feet tall; 18° - 22° rake; cross-section of 1 foot at the head and tapering to meet the keel.

Floor Timbers: One foot cross-section at the center; sided dimension tapering to a few inches at either end; approximately twenty-five floor timbers placed at 1 foot intervals in the floor of the hull. Merchantmen, for which larger hull capacity was preferred to speed and maneuverability, generally were broader than warships. A well proportioned warship of the Angel Gabriel's size would have a floor about 7-1/2 feet wide at the midsection, while a merchantship of the same size might have a floor over 9 feet wide. If found, floor timbers may provide further evidence of the original use of the Angel Gabriel.

Futtocks: Tapering from 1 foot at the floor to a few inches at the head of the top timbers. To add extra strength at the turn of the bilge in a seventeenth century English galleon, the first futtock overlapped the floor timber by a few feet. Placed beside the floor, they formed a wide band of almost solid oak in an area of particular stress. This pattern was repeated up the side of the hull and because these overlapping timbers were not fastened together, a foot wale was placed over them and fastened to each.

Keelson: Moulded and sided 1 to 1-1/2 feet.

Deadwood: Sided 1 to 1-1/2 feet; approximately 2 tons total weight.

Rudder: Twenty feet high:

Ceiling and Outer Planking: Two to 3 inches thick; lightly scorched (from bending during construction); possibly covered with a mixture of pitch and horse hair or felt, which in turn would be covered by thin softwood planks. Often, on warships of the period, only a few strakes of ceiling planking were spaced between the foot wales and first clamps. Intervals between the strakes allowed better ventilation of the ship's timbers and facilitated locating leaks in the hull. Merchant ships, however, were tightly planked on the interior to keep cargo dry. If the top side of the Angel Gabriel's framing shows wear below only some of the ceiling strakes, former use as a warship might be indicated.

Wales and Clamps: Four to 6 inches thick.

Deck Beams: Cross-sectional area of 1 foot at the center and 8 inches at either end; maximum length of 25 feet (for midship bend).

Knee: Each leg would be 2 to 3 feet long; cross-section at the angle would be 6 inches square, tapering out to the end of each leg.

Mainmast: Two feet in diameter.

Pillars: Various lengths and cross-sections. A seventeenth century Bristol merchantman would have had particularly strong and/or numerous pillars to support the hull when it was aground, because low tide in Bristol Harbor left the ships dry on the mud bottom.⁴

Ballast: Ten to 15 tons; flint, lead, and/or pig and scrap iron.

Blocks: Sheaves of oak. Historically, most blocks had sheaves made of lignum vitae, a very dense wood, but the English did not have ready access to this species until after 1650.⁵

Ordnance: Fourteen to 16 iron minions (4-pounders) and/or sakers (5-1/4 pounders); solid and bar shot with pre-erosion diameters of about 3 inches (minions) and 3-1/2 inches (sakers); grape shot and respective stands.⁶

Anchor: Eight to 12 foot shank of wrought iron; wood stock; 14 to 20 inch diameter cable ring.⁷ Since the Angel Gabriel was swept from her anchorage when the hurricane struck, only the replacement anchors, still in the hold, would probably be found at the wreck site.

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APPENDIX D

Remains of the Cargo

A variety of cargo related artifacts may exist at the site of the wreckage. To assist archaeologists with recognition of period artifacts and identification of the site, the most common of the datable objects are considered below.

Ceramics

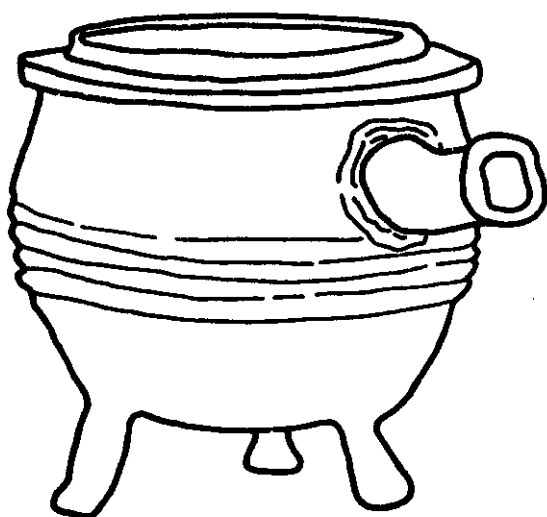
Glazed Earthenware: Mottled tortoise-shell patterns in yellow or apple-green glaze; red, red-yellow or green body. Common shapes -- mugs, pitchers, chamber pots, dishes, candlestick holders, bowls, pudding pans, stew pots, storage jars, pipkins (Plate III: a), milk pans.¹

Essex Metropolitan Ware (circa 1630-1660): Yellow slip; red body, ginger-brown on surface. Common shapes -- dishes, pitchers, small mugs, and chamber pots.²

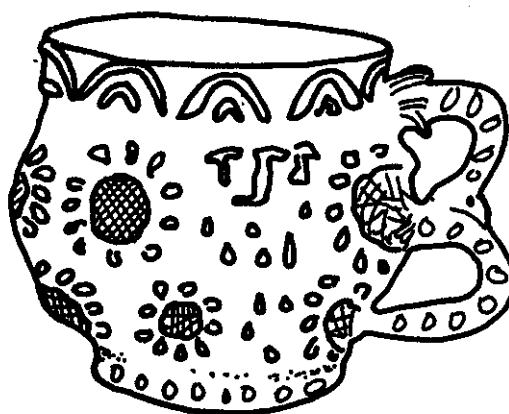
Wrotham Ware (circa 1612-1700): Busy floral decoration of manganese darkened lead glaze; white slip background; red body. Most common shape -- double-looped handled drinking cup (Plate III: b).³

Galley Ware (delftware, majolica, or maiolica): Vigorous and spontaneous decoration; white tin-oxide and lead glaze background; pale yellow or pink body. Common shapes -- apothecary pots (Plate III: c), wide rimmed plates, pseudo-Bellarmino jars (see Stoneware).⁴

Stoneware: Mottled brown iron oxide glaze; gray, hard-paste body. Common shape -- Rhenish Ware Bellarmino Jar (Plate III: d); decorated with moulded clay bearded face.⁵



a



b



c



d

Plate III. Ceramics. a, pipkin; b, Wortham Ware double handled drinking cup; c, Galley Ware apothecary pot; d, Stone-ware Bellarmine Jar.

Coins

Farthing and Half-Farthing: Copper; 0.6 inches diameter (circa 1613-1625); 0.5 inches diameter (circa 1625-1635). No date on coin; 'IACO D G MAG BRIT' and crown and crossed sceptres on reverse; 'FRA ET HIB REX' and crowned harp on reverse.⁶

Jettons: Very thin brass; similar to small British coins; used as mathematical aids when loading and transporting goods; occasionally traded with Indians for furs.⁷

Copper

Skillets: Copper or sometimes bronze; animal shaped feet; no ring support for handle.⁸

Glass

Wine Bottles (circa 1630-1660): Dark green color; long neck; onion-shaped body (Plate IV:a).⁹

Pharmaceutical Bottles (first half of 17th century): Green to amber in color; sided, spherical, or cylindrical in shape (Plate IV:b, c, d). Sided bottles may have four, six, seven, or eight sides. Kicks tend to be small.¹⁰

Wine and Beer Glasses: Clear glass; cone or bell-shaped bowl; hollow or solid stem with wide foot. Datable stem shapes--Laddered stem (circa 1600-1630), Cigar stem (circa 1620-1650), Inverted Baluster stem (circa 1590-1630) (Plate IV:e, f, g). Decorations of solid stem beer glasses--vertical stripes of opaque white cane or spiral colored stripes with a metal base. Decorations of solid stem wine glasses--coiled cane-work, figure eight, or pincer-wing.¹¹

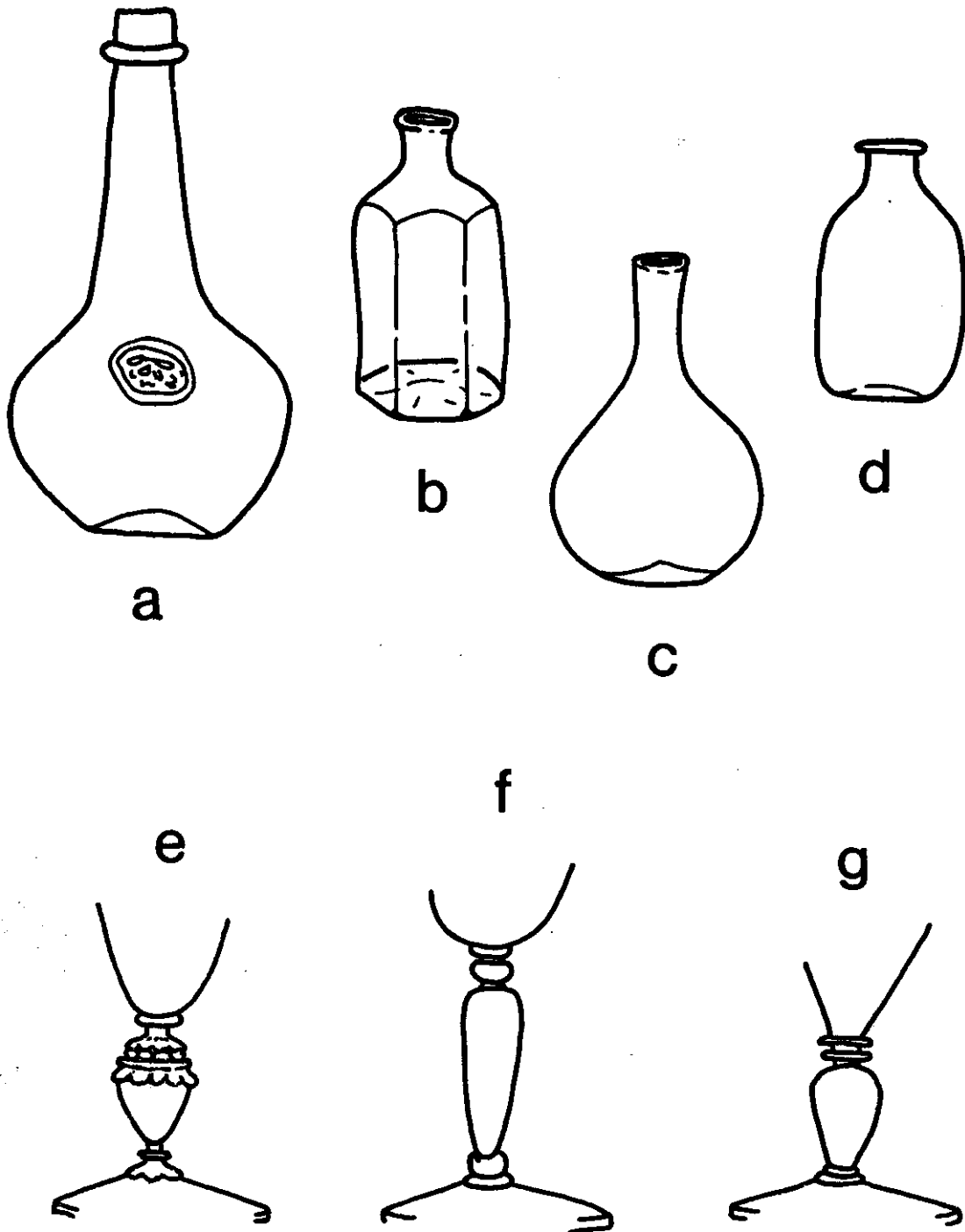


Plate IV. Glass. a, wine bottle, onion-shaped. Pharmaceutical bottles: b, sided; c, spherical; d, cylindrical. Wine and beer glass stems: e, laddered; f, cigar; g, inverted baluster.

Window Quarrels: Greenish-blue or greenish-yellow color; diamond shaped; elongated, rather than curved, bubbles in glass.¹²

Iron

Cooking Pots: Cast; three legs tapered downward to midpoint, then enlarging again with two to three globes at end.¹³

Scissors (early 17th century): Wrought; hollow ground blades; unattached loop ends (Plate V:a).¹⁴

Gunlocks: Matchlock; serpentine and primitive triggering device (Plate V:b). Snaphaunce; battery separate from pan cover; primitive lock device (Plate V:c). Dog-Lock; combined frizzen and pan cover; dog to lock the cock (Plate V:d).¹⁵

Body Armor: Wrought; types--corselet, cabasset, morion, and burgonet (Plate V:e, f, g, h).¹⁶

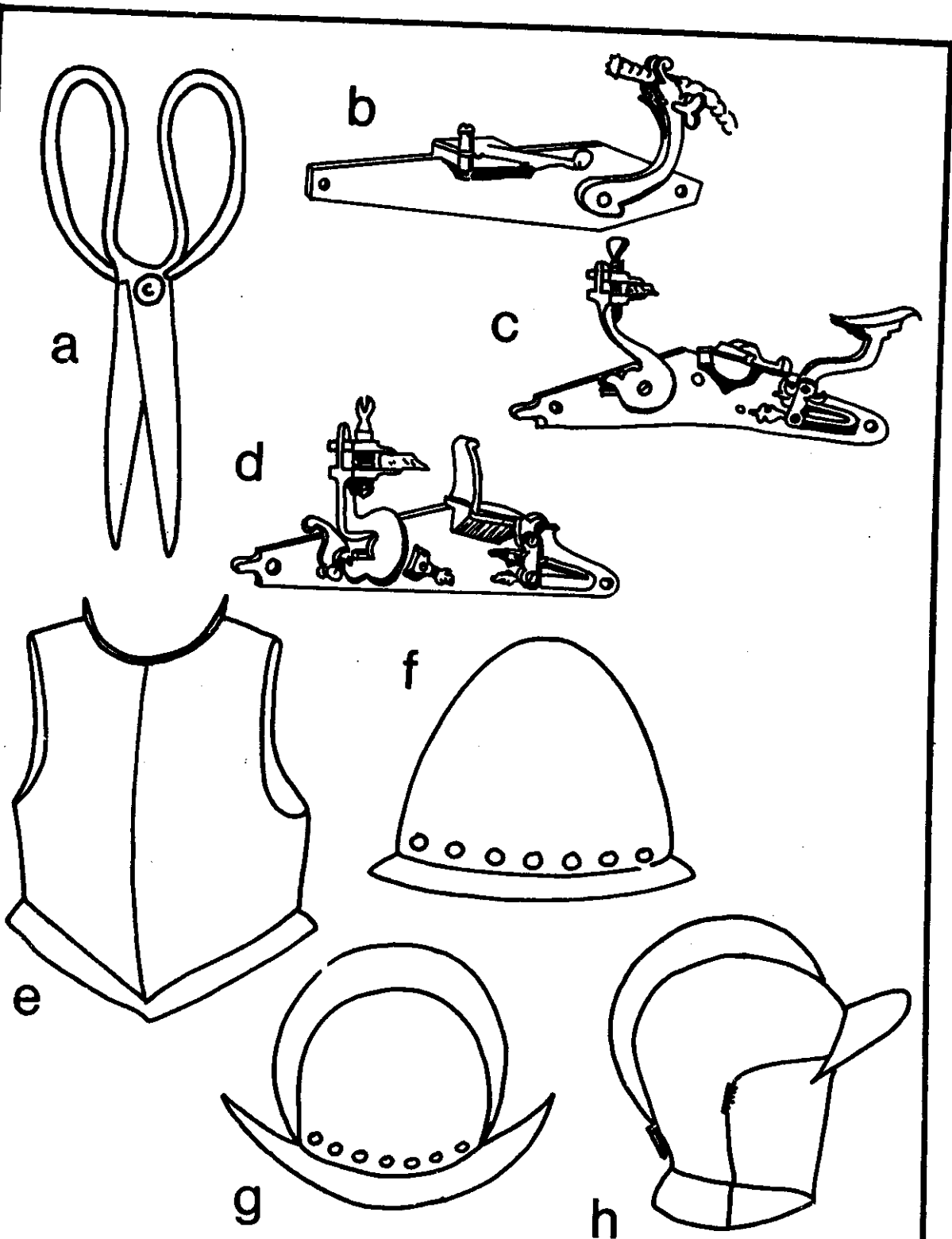
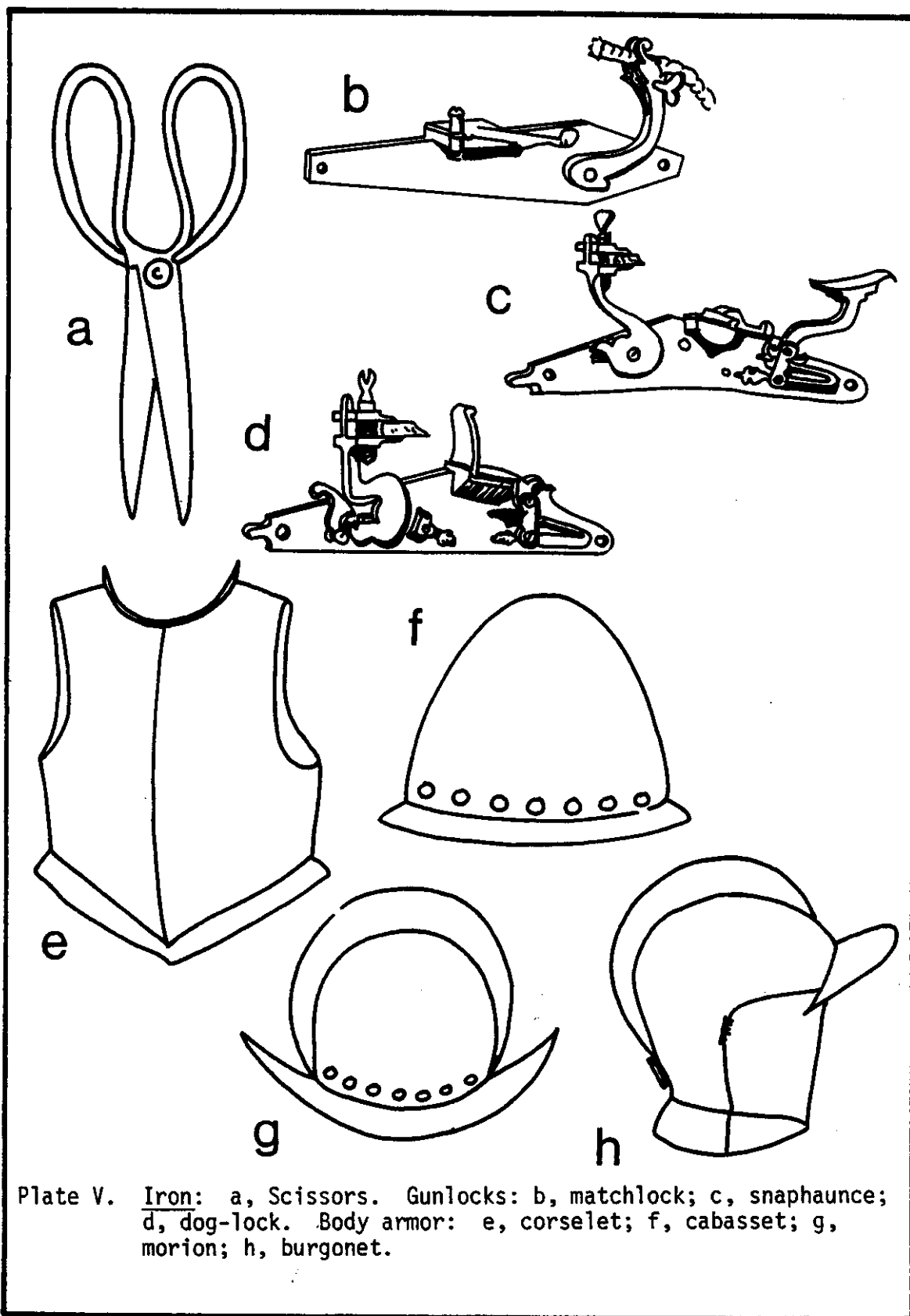


Plate V. Iron. a, Scissors. Gunlocks: b, matchlock; c, snaphaunce; d, dog-lock. Body armor: e, corselet; f, cabasset; g, morion; h, burgonet.



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APPENDIX E

Regression Formula for Dating Pipe Stems

If Y = mean date for the group, and X = mean hole diameter
in 64ths,

$$Y = 1931.85 - 38.26 X$$

for 1635:

$$1635 = 1931.85 - 38.26 X$$

$$1635 - 1931.85 = -38.26 X$$

$$1931.85 - 1635 = 38.26 X$$

$$\frac{1931.85 - 1635}{38.26} = X$$

$$X = 7.76$$

By Binford's formula, pipe stem hole diameters should average 7.76/64
inches on the Angel Gabriel site.

APPENDIX F

Glossary

Apron - reinforcing timber fastened with iron bolts to the inner surface of the stem, overlapping at the stem's scarf.

Carlings - straight timbers running fore-and-aft along notches cut in the tops of the deck beams.

Ceiling planks - boards cut and bent to form the inner surface of the hull. Ceiling planks were often nailed to the framing of a ship.

Clamps - thick ceiling strakes mounted opposite the wales on the inside of the hull. They were bolted through frames and wales and were positioned to reinforce the ends, or scarfed joints, of framing timbers.

Deadwood - timbers stacked above the keel in the after section of the hull, to fill out and strengthen that area. They were secured with long drift bolts.

Deck beams - large timbers placed athwartships to support a deck.

Floor timbers - flattened "V" shaped timbers placed athwartships on the keel, extending out to the turn of the bilge (where the hull turns up).

Foot wales - heavy strakes of ceiling planking, about the size of a wale or clamp, positioned to hold down the lower ends of the first futtocks. They were the third or fourth strake from the keelson.

Futtocks - timbers which extended the length of the floor timbers to form the framing of a vessel. They were designated, from bottom to top: 1st futtock, 2nd futtock, etc., and top timber.

Garboards - first strake of outer planking next to the keel. They were often thicker than other planking, and adzed to form a smooth hollow curve between the keel and other outer planking.

Gudgeons - see 'pintles and gudgeons'.

Keel - a large timber which formed the backbone of the hull.

Keelson - a large longitudinal timber laid over floor timbers and usually secured to them and the keel with iron bolts.

Knees - angular braces made of naturally curved hard wood. "Hanging knees" were placed vertically beside each deck beam, being treenailed or bolted to the sides of the deck beams and the sides of the hull. "Lodging knees" were attached in a horizontal position on either side of each deck beam.

Limber boards - short pieces of ceiling planking located next to the keelson, which could be removed for cleaning the water courses to permit free passage of bilge water.

Midship bend - the widest cross section of a vessel. For the Angel Gabriel this was at about one-third of the length of the keel aft of the keel-stem scarf joint.

Outer planks - boards cut and bent to form the outer surface of a hull. Outer planks were most often treenailed to the framing of the ship.

Pillars - straight timbers, bolted at various angles throughout the hull to support the sides and turn-of-the-bilge when the ship lay aground.

Pintles and gudgeons - hinges used to secure the rudder to the stern-post.

Riders - curved timbers shaped much like floor timbers and placed over the keelson, just as floor timbers were placed over the keel.

Shelf clamps - clamps, usually notched, positioned to support deck beams.

Stanchions - vertical, straight timbers which support deck beams.

Stem - forward extension of the keel that curved up to form the bow, often made of two or more pieces of timber scarfed together.

Sternpost - nearly vertical timber whose lower end usually formed a tenon to fit into a mortise in the after end of the keel. An inner sternpost was often fastened to its inner surface for reinforcement.

Strake - a line of planks running from stem to stern. Planks at either end of the strakes usually fit into rabbets (grooves) cut into the stem and stern.

Tiller - a long timber, attached horizontally to the head of the rudder, by which the rudder was turned.

Wales - extra thick outer strakes positioned above the waterline, to give support to the hull where there was no water to do so. They were positioned to reinforce the ends, or scarfed joints, of framing timbers.

Whipstaff - a vertical piece of fir or ash attached to the forward end of the tiller. It pivoted around an iron pin above the tiller, and was controlled by the helmsman at its upper end. This system was later replaced by a wheel and cables.

VITA

Warren Curtis Riess was born October 22, 1947 in Norwich, Connecticut to Herbert and Sophie Riess.

He attended Worcester Polytechnic Institute between 1965 and 1969, majoring in physics and engineering. Riess then transferred to the Government Department at Nason College in Springvale, Maine where he received a Bachelor of Arts degree in 1972.

His first introduction to nautical archaeology took place in 1969 when he participated in the excavation of a fourth-century A.D. Roman shipwreck at Yassi Ada, Turkey. During 1975 and 1976 Riess helped part time at the excavation of the Revolutionary War privateer Defence in Stockton Springs, Maine. He entered the Anthropology program at Texas A&M University in September 1976, specializing in nautical archaeology. Since then he has been a staff member on the 1977 and 1978 Defence expeditions and has worked with the Maine State Museum as a conservation technician and a structural wood recorder for the Defence project.

From August 1978 until May 1979 Riess was a research assistant with the Peabody Museum (Cambridge, Massachusetts). In the summer of 1979 he participated in a survey of an early seventeenth century fishing community on Damariscove Island (Maine).

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