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## **Cedars, Sloops and Slaves: The Development of the Bermuda Shipbuilding Industry, 1680-1750**

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CEDARS, SLOOPS, AND SLAVES:  
THE DEVELOPMENT OF THE BERMUDA SHIPBUILDING  
INDUSTRY,  
1680 - 1750

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A Thesis  
Presented to  
The Faculty of the Department of History  
The College of William and Mary in Virginia

In Partial Fulfillment  
Of the Requirements for the Degree of  
Master of Arts


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by  
Michael J. Jarvis  
1992

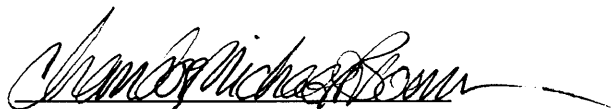
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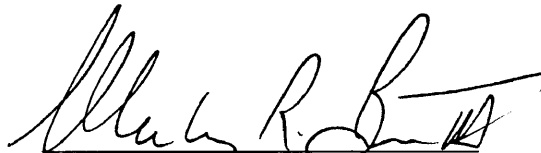
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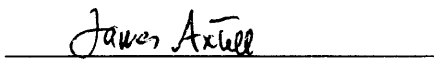
Master of Arts


  
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**Cedars, Sloops and Slaves:  
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1680 - 1750**

--ABSTRACT--

The Bermuda shipbuilding industry was born out of economic hardship in the closing decades of the seventeenth century. As the colony shifted from an agricultural to a maritime economy, Bermudians began to build ships in increasing numbers to support its carrying trade and salt industry. The success of the shipbuilding industry was founded on three crucial ingredients: cedars, sloops and slaves. The wood of the indigenous Bermudian cedar produced swift, light, vessels which were remarkably durable. The design of the sloop, originally developed by the Dutch, was modified and improved by Bermudians to produce a fast-sailing vessel which could gain access to any Caribbean or American port year-round. Slaves were used to build and sail the sloops for their owners, many of whom also served as masters of their vessels. Together, these factors produced a unique ship which was acclaimed by contemporaries as the best sailing vessel of its time. Shipbuilding and sailing became the mainstay of Bermuda's economy for over one hundred and fifty years; an understanding of the organization and operation of this industry is crucial to interpreting the early history of both Bermuda and the British American Atlantic trading community.

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## Introduction

When Richard Dunn published his much acclaimed Sugar and Slaves: The Rise of the Planter Class in the English West Indies, 1623 - 1713 in 1973, he initiated a wave of scholarship devoted to the economics, institutions, and social structure of the colonial Caribbean. Over one hundred articles, theses, dissertations, and books have been written since then, many focusing on slavery in the Sugar Islands. Yet within the British Atlantic economy, one island has been largely neglected by colonial historians: Bermuda.

The neglect of Bermuda is understandable because of its location; as a lone outpost in the Mid-Atlantic, it seems peripheral to both Caribbean and mainland British American colonies. Because Bermuda never successfully developed a staple crop such as sugar cane or tobacco, it has traditionally been viewed as a colonial "backwater."

Although some attention has been given to its early history in relation to Virginia,<sup>1</sup> the few works that have been written, mostly by native Bermudians, deal almost exclusively with local history. The notable exception to this is Henry Wilkinson's narrative trilogy,<sup>2</sup> which also tends to focus intensively on local personalities and politics and lacks any discernible

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<sup>1</sup>Wesley Frank Craven, An Introduction to the History of Bermuda Under the Virginia Company (New York: New York University Press, 1938).

<sup>2</sup>The Adventurers of Bermuda: A History of the Island from its Discovery until the Dissolution of the Somers Island Company in 1684 (London: Oxford University Press, 1933), Bermuda In The Old Empire (London: Oxford University Press, 1950), and Bermuda From Sail To Steam (2 vols., London: Oxford University Press, 1973). Combined, these books cover Bermuda history from 1609 until 1901.

analytical framework. Recent scholarship using the methodology of social history has produced two works on slavery in Bermuda, both published in the 1970s.<sup>3</sup> While both works provide a descriptive picture of the remarkably mild form of slavery that existed on the islands from the seventeenth through the early nineteenth century, they fail to adequately tie slavery to the political and economic development of the colony.

Bermuda has not gone unnoticed, however. In 1985 John McCusker and Russell Menard made a plea for research on Bermuda, especially in conjunction with shipbuilding. Within a general call for more research on colonial shipbuilding, they noted that "considerable shipbuilding took place in early British America outside the continental colonies, notably in Bermuda. Bermuda sloops, recognized for their speed and grace, were the colony's prime export. Little is known about them or the industry that built them."<sup>4</sup> In a larger Atlantic context, ship construction made a substantial contribution to the diversification of the colonial economy in the late seventeenth and eighteenth centuries. Given its importance, it is surprising that the industry has not attracted more attention. This work is intended to fill that gap by investigating the development and organization of shipbuilding in Bermuda.<sup>5</sup>

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<sup>3</sup>Cyril Outerbridge Packwood, Chained On The Rock (New York: Eliseo Torres & Sons, 1975) and James Smith, Slavery in Bermuda (New York: Vantage Press, 1976).

<sup>4</sup>The Economy of British America, 1607 - 1789. Chapel Hill: University of North Carolina Press (1985), pp. 320 - 321.

<sup>5</sup>Two other authors who have, in recent years, incorporated Bermudian history into their works are Jack P. Green and D. W. Meinig. In The Pursuit of Happiness: The Social Development of Early Modern British Colonies and the Formation of American Culture (Chapel Hill: University of North Carolina Press, 1988, pp. 42-43, 152-54), he places Bermuda's societal evolution firmly within a "developmental model" of colony formation. I

In preparation for this study, I have used a number of traditional sources in new ways. Most previous histories of Bermuda have drawn extensively upon the "Correspondence with the Board of Trade" deposited in the British Public Records Office.<sup>6</sup> The letters of the various royal governors, while valuable for their physical descriptions of Bermuda, are often colored by their biases or ignorance. A more reliable and quantitative source is the Naval Office Shipping Returns, which cover the years 1715 -1751.<sup>7</sup> I used information from these returns to compose a statistical picture of Bermuda's shipping fleet in the early eighteenth century. Registration information and ship- and shipbuilding-related imports reveal the incredibly important role the industry came to play during this period.

I have also extensively surveyed contemporary shipwrights' manuals and secondary shipbuilding literature with a particular emphasis on timber and its characteristics. The Bermuda cedar, the primary wood used in the islands'

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would propose instead that Bermuda developed as an agricultural colony until the 1680s and then experienced a declension of social institutions and economic organization during the shift to a maritime economy. After the economic transformation, Bermuda developed new institutions and social organizations shaped by different economic concerns, which redefined wealth and power in that society.

In The Shaping of America: A Geographical Perspective on 500 Years of History (New Haven: Yale University Press, 1986), Meinig looks at the coterminous development of all the European colonies in Atlantic America from 1492 to 1800. His work places Bermuda's development in context with other English, French, and Spanish colonies and appreciates the mutual influence these colonies had upon one another. Although he notes Bermuda's wide-ranging connections through commerce and out-migration and its increased emphasis on seafaring in the late seventeenth century, he does not broach the subject of how these factors shaped the actual organization of Bermuda's shipbuilding industry and its carrying trade.

<sup>6</sup>Colonial Office Class 37, vol. 1 - 73.

<sup>7</sup>Colonial Office Class 41, vol. 6 - 7.

shipbuilding industry, possessed characteristics that made it unique as a building material for ocean-going vessels; by studying the properties of cedar and other shipbuilding woods, it is possible to estimate the potential life-span of Bermudian vessels and their sailing performance.

In my analysis of shipbuilding on Bermuda, I will examine the development of the industry and isolate factors which fostered its growth. I will discuss the origin and development of the Bermuda sloop, ship construction on Bermuda, and the volume of ship production over time. By establishing the importance of shipbuilding and the carrying trade to Bermuda in the late seventeenth and eighteenth century, we can then place social, economic, and political developments within their proper historical context. In outlining the technological development of the Bermuda sloop and describing patterns within the shipbuilding industry and Bermudian shipping fleet, maritime historians and colonial economic historians will be able to establish Bermuda's role within the British Atlantic economic network.

### Shipbuilding Under The Somers Island Company

It is striking that during the first seventy years of Bermuda's history, a mere fifteen vessels were built on this island colony. An overwhelming emphasis on agriculture and the Somers Island Company's ability to supply most of the colony's material needs eliminated the necessity for settlers to own their own vessels. It was only with the collapse of Bermuda's established economic superstructure that natives first felt the impetus to build ships.

By the 1670s it was obvious both to the inhabitants of Bermuda and to the proprietors of the Somers Island Company that the islands' economy was in decline. Early ventures into procuring precious commodities such as pearls, ambergris for perfumes, and silk had met with failure. Tobacco and sugar cane cultivation became the main focus of the colony's economy in the 1620s. While initially successful, both crops suffered with the increasing deforestation of the islands caused, in part, by clearing the very fields in which they grew. Tobacco and sugar cane thrived in the flat interior regions of the island, where both crops were particularly susceptible to the force of hurricanes once the native cedars, the island's natural windbreaks, were cleared away.<sup>8</sup> Tobacco and sugar cane also suffered from native Bermudian ants and

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<sup>8</sup>John Matthew Jones, an English naturalist visiting Bermuda in 1859, noted that "the cedar affords protection to the agriculture of the island in the face of hurricanes and storms." Extensive deforestation therefore resulted in making both crops and structures more vulnerable to the elements. The Naturalist in Bermuda: A Sketch of the Geology, Zoology, and Botany of that Remarkable Group of Islands (London: Reeves and Turner, 1859), p. 132.

tobacco worms, which were probably introduced from abroad in the 1630s or 1640s.<sup>9</sup>

Bermuda's native cedar was initially viewed as an obstacle to cultivation. Robert Rich found his land full of "many litle ceders, worth nothing" in 1617.<sup>10</sup> Cedar timber was widely used in framing post-and-beam houses with lath and plaster walls and cedar shingles.<sup>11</sup> The chests and hogsheads used to pack the colony's tobacco were also fashioned from cedar staves.<sup>12</sup> Cedar was used for both domestic firewood and as a fuel for producing salt from kettles of sea water.<sup>13</sup> Extensive use of cedar coupled with the firing of several islands in an effort to cut down the enormous rat population led to widespread deforestation on St. George's Island by the 1620s.<sup>14</sup> Although some efforts were made to conserve cedar through limiting or banning its exportation, much of the rest of the island was cleared by the 1660s.<sup>15</sup>

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<sup>9</sup>C.O. 37, v. 10, "A Description of the Bermudas or Somers Islands in America in the Year 1722" by Gov. John Hope, p. 219.

<sup>10</sup>Vernon Ives (ed.), The Rich Papers: Letters From Bermuda 1616 - 1646 (Toronto: University of Toronto Press, 1984), p. 20.

<sup>11</sup>Ibid., p. 96.

<sup>12</sup>Ibid., p. 146.

<sup>13</sup>William Strachey, "A True Reparatory of the Wracke and Redemption of Sir Thomas Gates, Knight" in Louis Wright, A Voyage to Virginia in 1609, p. 28. Terry Tucker, Bermuda: Today and Yesterday: 1503 - 1973 (Bermuda: Baxter's Ltd., 1975), pp. 43, 59.

<sup>14</sup>Ibid., p. 65.

<sup>15</sup>Conservation laws were passed as early as 1635. In 1659, Governor Seymour refused to "suffer any Timber to be transported out of the Islands for England or any other place...half the island hath not wood for fuel, and yet I do perceive that few or none looketh after their owne good or after generations to come." This care-free attitude toward cedar would change drastically with the advent of the shipbuilding industry in the 1690s. Lefroy, Memorials, pp. 126, 131, 593.

Citrus trees imported from the West Indies met a fate similar to that of tobacco and sugar cane. Early in the century, the island had sent "greate quantities of oranges yearly to England and to the Northern Plantations on the continent (New England)." By the 1660s and 1670s tropical fruits, including oranges, lemons, dates, mulberries, papayas, plantains and pineapples were also disappearing. In the words of Governor John Hope, by 1722 there was "little but the remembrance of them left, all those trees and plants having been destroyed by blasts of hurricanos. Any of them that remain seldom bear any fruit."<sup>16</sup>

In an effort to maintain revenue from Bermuda's dwindling resources, in 1663 the Somers Island Company placed a ban on building ships greater than five tons without special permission. While ostensibly enacted to preserve Bermuda's timber resources, the company's real motivation was to preserve its monopoly on the tobacco trade. It feared that "when the inhabitants have shippes of their own, occasion will be given to steale and carry awaie the Tobaccos," thus depriving the proprietors of their rents and the Company of its duties and freight charges. The Company argued that "the magazeene shippes sent from the company willbee [sic] disappointed of their Freight (or) at least entertained at great uncertaintye, and lastly the members of the Company and owners of Lands here (in Bermuda) will lose their rents," which amounted to one-half of each crop. Furthermore, once

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<sup>16</sup>C.O. 37, v. 3, pp. 47-53, Letter submitted to the Vice Admiralty Court by Edward Randolph (Nov. 15, 1700); C.O. 37, v. 10, pp. 214-226, "A Description of the Bermudas or Somers Islands in America, in the Year 1722" by Gov. John Hope.

Bermudians obtained their own ships, they would no longer be forced to buy goods exclusively from company supply ships at company-set prices.<sup>17</sup>

This order flew in the face of the Navigation Acts passed in 1661 which provided that "sugar, tobacco, cotton, wool, indigo, ginger, fustick, or dying wood of the growth, production, or manufacture of any English plantation in America, Asia, or Africa shall be shipped, carried, conveyed, or transported" only to England or English plantations.<sup>18</sup> English or colonial vessels and crews were designated the exclusive agents of shipping. At a time when Parliament and the expanding British Atlantic community were creating enormous demands for colonial ships and sailors, the Somers Island Company sought to cut off Bermuda from the rest of the empire.

Bermudians pleaded in the General Assembly for a repeal of the shipbuilding ban. They argued that "if the maritime places abound in shipping of their own, the more the prosperity and the richer the place, as is visible in the maritime parts of England, Holland, etc. This plantation which for want of vessels is yearly forced to be beholding to New England and others to supply (us) with salt, earthenware, and other necessities at great prise, and giving small for our commodities, must necessarily be impoverished and our means exhausted." In recognition of the Navigation Acts, Bermudians

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<sup>17</sup>Gov. Henry LeFroy, Memorials of the Bermudas, vol. 2, pp. 204, 209, 472. The ban was reaffirmed in 1668 and 1679 despite vigorous protest on Bermuda.

<sup>18</sup>The Navigation Acts of 1661 were cited as the grounds for impounding a number of Bermudian vessels for illegal trade throughout the late seventeenth and eighteenth centuries. The Acts declared any vessel carrying foreign goods forfeit unless proper duties had been paid prior to their importation. Exceptions to the Act did allow Madeira wine and lumber to be imported and allowed salt to be exported to Spain and the Mediterranean countries. While the Acts provided opportunities, they also imposed limitations for Bermudian merchants-shipbuilders. C.O. 37, v. 10, pp. 3-11.



"conceived tending unto the prosperity of the Plantation, the employment of our youths in navigation to serve his Majesty." They even offered to send sawyers to Roanoke to obtain timber, planking and masts in order to conserve the islands' trees. Caught between local interest and company policy, Governor Seymour, a native-born Bermudian, was sympathetic but could not persuade the proprietors to rescind the order.<sup>19</sup>

Fifteen years later, Bermuda's population and economic demands had increased to such an extent that the fight to lift the shipbuilding ban was renewed. In 1677, Perient Trott, Robert Stevens, John Wiley and George Day, went to London in person to petition the Crown for the law's repeal. These men appealed on the grounds that "some of the Company, on purpose to destroy the trade of those parts, have made a law that no ship should be employed in those islands, refusing them leave to send for their own commodities with their own ships. The company sends but one ship per year...to the great loss of the planters. The King is prayed for the encouragement of Navigation and of the petitioners in their trade to direct that a free trade<sup>20</sup> may be allowed to the said islands for his majesties subjects (and) to order the repeal of all laws to the contrary."<sup>21</sup> Unfortunately, the Lords of Trade thought the issue "frivolous" and rejected their petition.<sup>22</sup>

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<sup>19</sup>Lefroy, Memorial, pp. 193-94. Governor Florentius Seymour was a first-generation native Bermudian who had worked his way up to governor over the course of twenty-five years.

<sup>20</sup>By "free trade," the petitioners meant freedom from company dictates, rather than freedom from the restrictions of the Navigation Acts. It should be noted that the petitioners were among the largest exporters of Bermudian tobacco in the 1670s.

<sup>21</sup>LeFroy, Memorials, vol. 2, pp. 448.

<sup>22</sup>Ibid., pp. 449, 478.

Despite this legislative obstacle, a few Bermudians had obtained permission to build and sail ocean-going vessels by the 1670s. Below is a list of vessels built in the Bermudas before the dissolution of the Somers Island Company:<sup>23</sup>

<u>Year</u>	<u>Ship Name</u>	<u>Type</u>	<u>Owner/Builder</u>
1656	<b>Elizabeth and Ann</b>	barque	John Stowe <sup>24</sup>
	<b>Employment</b>	ship	Perient Trott
1657	<b>Martin Galley</b>	galleon	John Wentworth
1661	<b>Hopeful James</b>		George Tucker, Paul Trimmingham
1662	<b>John Adventure</b>	small cedar vessel	John Perenchief
1664	<b>Thomas and Marie</b>	small cedar vessel	Edward Atwood
1667	<b>Elizabeth and Marie</b>	barque	
	<b>Blessinge</b>	small cedar vessel	Anthony Peniston
1668	<b>Bettie</b>	shallop	Anthony Jenour
	<b>Samuells Adventure</b>	ship	Samuel Stone
1669	<b>Recoverie</b>	ketch	John Darrell, Hugh Wentworth
1673			David Ming
1674	<b>Seaflower</b>	ship	John Jennings <sup>25</sup>

<sup>23</sup>Ibid., vol. 1, pp. 726-37; vol. 2, pp. 68, 83, 99, 142, 379, 452, 484.

<sup>24</sup>The **Elizabeth and Ann** was listed as a "shipp" in 1661. LeFroy, Memorial, vol. 2, p. 148.

<sup>25</sup>In 1674, John Jennings was fired upon by the fort at Castle Harbour which mistook him for an enemy vessel. Jennings was forced to pay 6s. 8d. for the powder and shot fired, illustrating the value of munitions due to short supply throughout much of the seventeenth and eighteenth centuries on Bermuda. LeFroy, Memorials, vol. 2, p. 379.

<u>Year</u>	<u>Ship Name</u>	<u>Type</u>	<u>Owner/Builder</u>
1677	Resolution	barque	Samuel Raynor, John Darrell
1679	Owner's Advice	ship?	William Righton Jr. <sup>26</sup>

Most of these vessels were built, owned and operated by the large planters of the islands, who had to offer a bond of L 1,000 for vessels under 100 tons and L 2,000 for vessels of 100 tons or more.<sup>27</sup> Ships, which in maritime terminology were vessels of 100 tons or more burthen, transported Bermuda tobacco to London and imported English finished goods to the islands. The owners of these vessels thus avoided paying the freight charge of 1 1/4 penny per pound of tobacco levied by the Somers Island Company, but still had to pay its penny-per-pound duty.<sup>28</sup> Bermudian shipowners could also buy English goods at market prices, instead of being forced to purchase goods from the magazine ships at exorbitant prices. John Hardy, a sailor on the magazine ship *Marigold*, bought the island's commodities for "three pence on the shilling" from the natives.<sup>29</sup>

Other shipbuilders built smaller craft for emerging markets in the West Indies. These barques, shallops, ketches, and other small vessels

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<sup>26</sup>Righton's vessel was seized and condemned by company officials for being built "in Contempt of the (band on shipbuilding) law" in 1679. The company then made him master of his own impounded vessel and sent him to London that spring. LeFroy, *Memorials*, vol. 2, pp. 484, 489.

<sup>27</sup>C.O. 37, v. 10, p. 3.

<sup>28</sup>The majority of planters, however, lacked their own ships and faced hard times in the 1660s and 1670s, as the price of tobacco fell below the costs of marketing it.

<sup>29</sup>John Hardy, *A Description of the Last Voyage to Bermudas in the Ship Marigold, S. P. Commander* (London: R. Reynald, 1671), p. 6.

probably ranged from ten to forty tons and were constructed after English models. Oddly, no documents mention sloops, for which Bermuda would become famous in the eighteenth century. Even if the "small cedar vessels" listed in the records were in fact sloops, they made up a distinct minority among the Bermudian shipping fleet.

Bermuda's early shipowners seem to have constructed their vessels on their own land using their own timber. John Darrell, for instance, owned over 170 acres in four different parishes, including 74 acres on White Heron Bay in Warwick, a site which William Riddell would use to great advantage in the eighteenth century.<sup>30</sup> David Ming owned all of Cooper's Island (77 acres) in Castle Harbour.<sup>31</sup> Perient Trott owned over 640 acres in six different parishes, including properties fronting on Castle Harbour, Shelly's Bay, the Flatts, Crow Lane, and Hogg's Bay.<sup>32</sup> Although these figures seem small relative to land ownership on the continent, they represent sizeable tracts on an island that is only twenty-two miles long and seldom wider than one mile (see Figure 1).

Many of these early shipowners represented the island's political elite as well as its economic elite. The vast majority were also among the first generation of native-born Bermudians and thus felt less loyalty to the Somers Island Company.<sup>33</sup> John Darrell was the justice of the peace for Warwick, a captain in the militia, and one of the leading merchants on the island.<sup>34</sup>

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<sup>30</sup>Richard Norwood's 1663 survey of Bermuda, in LeFroy, Memorials, vol. 2, pp. 678, 691, 697-99.

<sup>31</sup>Ibid., p. 650.

<sup>32</sup>Ibid., pp. 649-50, 661-64, 672, 679, 692, 694, 696, 702, 710, 713, 714-6.

<sup>33</sup>Of the seventeen known shipowners of this period, only John Wentworth, Perient Trott, and John Jennings were born in England. Ibid., pp. 475-76.

<sup>34</sup>LeFroy, Memorials, vol. 2, pp. 148, 228, 291.

George Tucker served as commander of Paget's Fort and Counsellor of State.<sup>35</sup> Anthony Jenour was the Secretary of Bermuda until he was succeeded by George Tucker's brother Henry in 1658. Jenour also served as sheriff for the Somers Islands until his death.<sup>36</sup>

Several early shipowners contributed important skills toward founding the industry of shipbuilding. David Ming and Anthony Peniston were both well-known carpenters on the island. In 1660, Ming had received L 360 for the "squaring of joyce (joists) and making trussells for the platform at the King's Castle and Southampton fforte."<sup>37</sup> Peniston sawed timber for the construction of Southampton Fort and was contracted by the governor to repair the bridge at Flatts in 1674.<sup>38</sup> John Stowe served as pilot for the colony, leading company ships into Castle and St. George's Harbours.<sup>39</sup> John Wentworth was navigating the West Indies as early as 1657. In 1665, as the master of the *Charles*, he became the first of a long line of Bermudian privateers when he sacked a Dutch plantation on Tortola in the Virgin Islands and took a small prize vessel and seventy slaves.<sup>40</sup> The early ventures of these ships also provided training for hundreds of young men in both navigation and practical sailing experience as well as ship construction. The success of the first maritime generation in Bermuda, who came of age in the 1690s and 1700s, was firmly rooted in the shipbuilding pioneers of the 1660s and 1670s.

The paucity of ships in seventeenth-century Bermuda is best explained in light of contemporary market configurations. Before the 1670s, the

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<sup>35</sup>Ibid., pp. 133, 138.

<sup>36</sup>Ibid., pp. 39, 77, 119, 329, 364, 393, 397, 434.

<sup>37</sup>Ibid., p. 173.

<sup>38</sup>Ibid., pp. 144, 407.

<sup>39</sup>Ibid., p. 53.

<sup>40</sup>Ibid., pp. 99, 231-33, 260.

London market was the only viable outlet for the colony's produce. Virginia did not need more tobacco and New England did not want it. With the emergence of the English West Indian colonies and Bermuda's expansion into salt raking at Turks Island in the Bahamas, new economic avenues opened to the islanders. The expanding web of English trade in the Atlantic put Bermuda at the crossroads of the empire. Within fifteen years, Bermuda would be transformed from a company prison into a flourishing center of commercial exchange.

The Foundations of an Industry

In the age of sail, Bermuda was ideally located at the nexus of the Atlantic trade community (see Figures 2, 3, and 4). The island was situated 32 degrees 20 minutes north of the Equator and 64 degrees 41 minutes west of the Meridian. Patterns in winds and currents would insure that almost all British colonial shipping passed within forty leagues of Bermuda. Isaac Richier, Bermuda's second English royal governor (1691-1692), described the islands' strategic location in a letter to the Lords of Trade:

New England as bearing from itt N.N.W. To the Westward lyes New York, Pennsilvania, Maryland, Virginia, Albemarle, and Carolina. all which places are about 200 leagues distant. Barbados bears S.S.E. The Leeward Islands about 5. by E. so that all shipp passing to and from Barbados and the Leeward Islands from the (northern) colonies cross the latitude of Bermuda nigh the island. All shipp bound from Barbados and the Leewards to England... pass but a little to the Eastward of the Island. Ships Bound from Jamaica...and from Virginia, Carolina, &tc. unavoidably pass nigh Bermuda to and from England...Is the island was in an Enemies hands, with a small number of cruisers...it would hazard all passing ships.<sup>41</sup>

The islands themselves were difficult to reach. "They are quite surrounded by rocks that lie some four leagues from land so that they are inaccessible but from the South East side, where there is likewise a reefe of rocks, but they lye near the shoar."<sup>42</sup> The Main Island and St. George's Island stretch twenty-two miles in length but were never more than two miles wide. The only town, St. George, was situated next to the island's most accessible harbor and was the

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<sup>41</sup>C.O. 37, v. 25, Gov. Richier to the Lords of Trade, July 3, 1691.

<sup>42</sup>C.O. 37, v. 10, Hope, "Description of the Bermudas..." 1722.

center of government and industry. St. George's Harbour measured two miles wide, offered a good anchorage and could be entered only through a narrow channel that was eighteen feet deep and guarded by two gun platforms (Smith's and Paget's Forts). Castle Harbour to the west allowed ships drawing as much as twenty-two feet to enter safely and was guarded by a series of gun platforms on Castle and Southampton Islands. Castle Harbour was invariably used by the Somers Island Company magazine ships, since it allowed greater access to the interior of the main island.<sup>43</sup> Most of the rest of the island's bays were accessible only to locals, who had come to know the island's channels and reefs while fishing in the seventeenth century.<sup>44</sup> Despite Bermuda's numerous forts, shelves and rocks would remain the island's "chiefest defence" throughout most of the eighteenth century, because of the shortages of powder, shot, and soldiers to man the forts.<sup>45</sup>

With the dissolution of the Somers Island Company in 1684 and the lifting of the ban on shipbuilding in 1687, Bermudians were empowered to

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<sup>43</sup>Hardy, A Description of the Last Voyage..., p. 6.

<sup>44</sup>Edward Randolph informs us that "Elyes Harbour at the west end of the island has 14 feet (of draft) at high water. The entrance is difficult and used only by those inhabitants in small vessels." The reefs imposed a constraint that in part shaped the formation of the sloop as it developed in Bermuda. C.O. 37, v. 10, 1700. Samuel Clarke, in A True and Faithful Account of the Four Chiefest Plantations of the English in America (London: R. Clavel et. al., 1670) related that Bermuda's tides did not ebb and flow more than five feet. This meant that high tide did not greatly aid navigation, as was true in other ports, pp. 18-19.

<sup>45</sup>C.O. 37, v. 1, p. 29. Gov. Richier to Lords of Trade, Feb. 4, 1691. Before 1814, No sea chart had ever been produced for Bermuda. Throughout the eighteenth century, knowledge of the reefs and channels remained oral and was closely guarded, since the reefs did much to dissuade foreign forces from invading. The first published sea chart, Heather's Improved Chart of the Bermudas (1814) was compiled by J. W. Norie, an hydrographer, in 1812-3.



leave their island in search of gain. Three crucial ingredients combined to insure the success of shipbuilding as it developed at the close of the seventeenth century: cedars, sloops, and slaves. The indigenous Bermudian cedar served as the raw material for ship construction. Its wood possessed properties which made Bermudian vessels better than any other English or colonial craft. The sloop became the hallmark of the Bermudian shipping fleet. Its unique hull design and rigging gave the sloop superior sailing characteristics which allowed its masters to penetrate foreign markets and to avoid maritime predators. Slaves provided the labor needed to build and operate Bermuda's shipping fleet. They served to minimize the capital needed to construct sloops and the operating expenses needed to sail them.

### Bermuda Cedar

The Bermudian cedar, Juniperus bermudiana, evolved with the island itself over the course of thousands of years. A close relative of Juniperus virginiana and Juniperus barbadensis, its seeds were carried to the islands by migrating seabirds. During the ice ages, Bermuda's reefs were exposed as dry land, forming a massive 600 square-mile forest characterized by a diversity of tree species. As Bermuda emerged from the last ice age, however, the indigenous cedar asserted its dominance over the small area of the islands that remained above sea level.<sup>46</sup>

When Europeans first landed on Bermuda in the sixteenth century, many did so as survivors of shipwrecks. These involuntary visitors sought to escape these "ya de demonios," or Islands of Devils, as Bermuda had come to be

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<sup>46</sup>William Beebe, Nonsuch: Land of Water (New York: New York Zoological Society, 1932), pp. 16, 20.

known.<sup>47</sup> Thus, cedar was first used as a shipbuilding material. In 1593, a French vessel wrecked on the north reef, losing half her crew. The survivors, including Englishman Henry May, managed to row the seven miles to shore with tools, rigging, and sails salvaged from the wreck. They spent the next five months building "a small barke of some eighteen tons" and departed in May 1594.<sup>48</sup> The survivors of the famous **Sea Venture** wreck in 1609 built two small vessels, mostly of cedar. The English initially thought cedar was a poor shipbuilding wood; they found it "wondrous false inward and...so spalled (spoiled) and brickle (brittle) that it will make no good planks."<sup>49</sup> All of the beams used in the **Deliverance** were of oak salvaged from the wreck of the **Sea Venture**. The **Patience**, built by Thomas Gates on the Main Island, was apparently fashioned entirely of native cedar.<sup>50</sup> These two vessels, of eighty and forty tons respectively, took five months to frame and plank and an additional four months to make seaworthy.

Bermuda's settlers quickly learned to use cedars to fashion all the necessities of life, from "cradles to coffins."<sup>51</sup> While shipbuilding was either unnecessary or banned throughout the seventeenth century, boat building was extremely important. Boats were necessary for catching the fish and turtles that made up a large portion of the early colonists' diet. Once tobacco agriculture had been established, boats were needed to convey the packaged

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<sup>47</sup>Tucker, Bermuda, p. 25. When William Strachey was wrecked on Bermuda in 1609, he said that the islands were "no habitation for men;" rather, they were "given over to devils and wicked spirits." Silvester Jourdain, a fellow castaway, agreed with Strachey and called Bermuda "an enchanted place." Wright, Voyage to Virginia, pp. 16, 108.

<sup>48</sup>Tucker, Bermuda, pp. 26-27.

<sup>49</sup>Strachey in Wright, Voyage to Virginia, p. 57.

<sup>50</sup>Ibid., pp. 57-58.

<sup>51</sup>Beebe, Nonsuch, p. 21.

tobacco from shore to ship.<sup>52</sup> Boats were employed in whaling ventures in the 1660s and 1670s, sponsored by several early shipowners.<sup>53</sup>

Boat construction allowed Bermudian carpenters to learn the uses and limitations of cedar as a building material. Cedar wood proved remarkably resistant both to deterioration in salt water and to the attack of the *Teredo* and *Bankia* worms, the bane of all ships in the Southern Atlantic.<sup>54</sup> *Juniperus bermudiana* had developed a strong resistance to both winds and waves over time. It was, in the words of one nineteenth-century naturalist, "the only tree that can withstand the fury of the elements."<sup>55</sup> High resin levels within the wood not only provided resistance to water and parasites, but also produced almost no shrinkage in the volume of cedar timber after it was cut.<sup>56</sup> While shipbuilding timber in England and the American colonies had to be seasoned for at least six months, Bermudian shipwrights could use "green" wood, and thus minimize the time needed to produce vessels. When the shipbuilding industry suddenly expanded in the late seventeenth century, it grew out of an existing local skills. Craftsmen

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<sup>52</sup>Hardy, *A Description of the Last Voyage...*, p. 7.

<sup>53</sup>LeFroy, *Memorials*, vol. 2, pp. 302, 359, 437. Contributors to the whaling venture included Gov. Sayle, Gov. Seymour, John Stowe, John Darrell, Hugh Wentworth, Samuel Trott, William Righton (Sr. and Jr.) and Richard Jennings (father of John). Whaling in the seventeenth century never amounted to very much; large-scale commercial whaling did not take place in Bermuda until the mid-nineteenth century.

<sup>54</sup>Samuel Record and Robert Hess, *Timbers of the New World* (New Haven: Yale University Press, 1943), p. 8.

<sup>55</sup>Jones, *A Naturalist in Bermuda*, p. 132. Linnaeus himself classified *Juniperus bermudiana* and *barbadensis* from samples brought back from the islands. Beebe, *Nonsuch*, p. 22.

<sup>56</sup>Jones, *Naturalist*, p. 132.

such as Anthony Peniston and David Ming could draw upon over sixty years of acquired experience in working with cedar.

Although the Bermuda cedar could grow up to one hundred feet, most were probably thirty to fifty feet in height. Early examples were wide enough to yield planks measuring twelve feet long and up to a yard in width.<sup>57</sup> Bermuda cedar's reddish-brown heartwood had a very fine straight grain with a uniform texture. Carpenters found it firm under tools and easy to cut in any direction. The wood was fairly hard and held its place well when used in framing or furniture construction, despite its light weight.<sup>58</sup> Cedar's fine aroma made it desirable for storage chests and furniture; it was even reputedly burned as incense on occasion.

Cedar's specific gravity (0.44) was significantly lower than that of the American white oak (Quercus alba, 0.55 - 0.6), the primary material for shipbuilding in the New England colonies.<sup>59</sup> Cedar's weight, at thirty to thirty-five pounds per cubic foot was also much lower than the forty to fifty pounds per cubic foot that English oak (Quercus pedunculata) weighed.<sup>60</sup>

The peculiar qualities of Bermuda's indigenous cedar imparted characteristics to the boats and ships built on the island that made them

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<sup>57</sup>Tucker, Bermuda, p. 70.

<sup>58</sup>Juniperus bermudiana was all but wiped out in a blight in the 1950s; due to this blight, there is no specific scientific information available regarding J. bermudiana. However, the characteristics of J. virginiana are close enough to those of the Bermuda cedar to provide a reasonable approximation for comparative purposes. Record and Hess, Timbers of the New World, pp. 8-9.

<sup>59</sup>H. P. Brown and A. J. Panshin, Identification of the Commercial Timbers of the United States (New York: McGraw Hill, 1934), pp. 122, 137.

<sup>60</sup>E. H. B. Boulton and B. Alwyn Jay, British Timbers: Their Properties, Uses and Identification (London: Adam and Charles Black, 1944), pp. 54, 100.

superior to English and American colonial vessels. While oaken ships rotted within ten or twelve years, Bermudian vessels enjoyed a longevity of twenty to thirty years.<sup>61</sup> Because Bermudian cedar did not need to be seasoned, more ships could be built annually despite the fact that shipbuilders could only draw upon a small timber hinterland. Its relatively lighter wood displaced nearly one-third less water; as a result, Bermudian vessels measured by water displacement when launched were actually larger than American or English vessels of comparable listed tonnage.<sup>62</sup> Contemporaries agreed that Bermuda cedar "answers in every respect to oak timber" as a shipbuilding material.<sup>63</sup>

With the decline of tobacco cultivation in the 1670s and 1680s, fields were planted with cedars or turned over to livestock.<sup>64</sup> The shipbuilding industry made cedar wood a valuable resource, causing a revolution in the building of houses on the island. Throughout the seventeenth century, the huts, houses, and mansions the colonists had made used post-and-beam construction techniques with lath-and-plaster walls. In the 1690s, the prohibitive cost of wood led to the widespread construction of houses using limestone blocks

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<sup>61</sup>Wilkinson, Bermuda in the Old Empire, p. 18.

<sup>62</sup> This discrepancy makes any comparison between the volume of trade carried by Bermudian and American ships as measured by tonnage alone invalid, since the larger Bermudian vessel could carry more freight despite its identical tonnage listing.

Before the nineteenth century, there were two methods of determining vessel tonnage among merchant and naval ships: by measuring water displacement or by using a mathematical formula outlined in William Sutherland's The Shipwright's Assistant (1711) and other shipwright manuals. The tonnage of Bermudian vessels was underestimated by both methods. The faults of the mathematical formula for tonnage derivation will be discussed in the section on sloop design and structure.

<sup>63</sup>The World Displayed (1760), vol. 4, ch. 12.

<sup>64</sup>Wilkinson, Bermuda in the Old Empire, p. 17.

quarried from the bedrock beneath the house for wall and roofing material. This served the dual purpose of creating cheaper houses that were more resistant to hurricanes and creating cellars for storage and slave quarters. By 1703, Governor Benjamin Bennett had declared that any house in St. Georges that was not rebuilt using stone within four years would be forfeited to the government.<sup>65</sup> As cedar came to fuel Bermuda's shipbuilding industry, its careful conservation became a matter of national concern, resulting in widespread shifts in land use and resource management.

### The Bermuda Sloop

By the second quarter of the eighteenth century, the term "Bermuda sloop" had come to represent a unique combination of hull design and rigging (see Figure 5). Its graceful curves and reputation for speed made it highly sought after in the American and West Indian colonies. Merchants were willing to pay up to twice as much for vessels manufactured in Bermuda, rather than to settle for locally made ships of the same type.<sup>66</sup> This foreign demand, coupled with the needs of Bermudian merchants, supported a burgeoning shipbuilding industry on Bermuda for over one hundred and fifty years.

Although the origins of the Bermuda sloop remain shadowy, it is certain that it underwent a period of development and refinement lasting from its introduction into the islands until the end of Queen Anne's War, or roughly from the mid-1680s until 1714. Various economic and logistical constraints shaped its size, design, and production. The evolution of the Bermuda sloop was a result of a complex interplay between the ingenuity of

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<sup>65</sup>Tucker, Bermuda, pp. 80-81.

<sup>66</sup>Wilkinson, Bermuda in the Old Empire, p. 18.

Bermuda's shipbuilding mariners and their need to gain access to West Indian and American markets, despite the elements and the pirates and privateers who freely roamed the shipping lanes during this period. In order to understand how Bermuda sloops came to be considered "the best in the world," one must first look to the crucible in which they were formed.<sup>67</sup>

The seventeenth century was a transitional period for maritime technology. Shipbuilders abandoned traditional ship designs, based largely on ship-of-war models, and began to create a wide range of ships adapted for specific commercial purposes. A multitude of smaller vessels built for local trade augmented an English and colonial shipping fleet that had been previously dominated by large ships of 200 tons or more. Shallops, ketches, and barques were prevalent early, only to be replaced by more refined sloops, brigantines, and schooners in the closing decades of the seventeenth century (see Figure 6). It is important to remember that the vessels of this period were in the dynamic process of development and exhibited a great deal of variation as they evolved toward the finished forms they would take in the eighteenth century. The Bermuda sloop was no exception.

Ships of the seventeenth century were differentiated solely on the basis of their rigging. At any given moment, one could find a great deal of variation in the hull designs within a particular type of vessel based on the tradition of the shipbuilder, the use for which the craft was intended, and the region where the vessel was built.<sup>68</sup> Sloops were an innovation of the Dutch, spreading from the North Sea to the Caribbean during the second quarter of

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<sup>67</sup>Wilkinson, Bermuda in the Old Empire, p. 18.

<sup>68</sup>Joseph Goldenberg, Shipbuilding in Colonial America (Charlottesville: University Press of Virginia, 1976), p. 77.

the century.<sup>69</sup> They had a single mast and fore-and-aft sail plan. The sloop rig was quickly adopted in England, the West Indies, Bermuda, and New England between 1660 and 1710. In England, Richard Deane's shipyard alone produced at least five sloops between 1666 and 1673, ranging from 45 to 60 feet in length and from 28 to 46 tons burthen.<sup>70</sup>

The Dutch West India Company used sloops in the Caribbean in the 1650s.<sup>71</sup> Jamaican colonists seem to have adopted the sloop rig from the Dutch some time in the 1660s. The Jamaicans had a thriving shipbuilding industry and produced a number of sloops before extensive deforestation cut production.<sup>72</sup> When Bermudians belatedly entered the West Indian trade in the 1660s and 1670s, they found sloops in every port.

Diffusion of the sloop design seems to have penetrated into Bermuda in the late 1670s or early 1680s. It is impossible to determine how much of the hull design was influenced by the Dutch and Jamaican vessels observed in the Caribbean and how much of it came from the traditional twin-masted boat design that had evolved on the islands during the mid-seventeenth century. John Hardy's description and illustration of Bermuda's boats in 1671 (see Figure 7) reveal that both the long, narrow hull and the raked-back mast that would come to typify the Bermudian sloop in the eighteenth century were

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<sup>69</sup>Ibid., p. 39. William Baker, in Sloops and Shallops (Barre, Mass.: Barre Publishing Co., 1966), informs us that sloops evolved from coastal Dutch "sloeps," which first appeared in the 1630s.

<sup>70</sup>Brian Lavery (ed.), Deane's Doctrine of Naval Architecture, 1670 (London: Conway Maritime Press, 1981), p. 29. Deane was the leading English shipbuilder of the late seventeenth century. The sloops were built for the Royal Navy.

<sup>71</sup>Baker, Sloops and Shallops, p. 54.

<sup>72</sup>Howard Chapelle, The Search For Speed Under Sail, 1700 - 1855 (New York: W. W. Norton and Co. 1967), p. 65.



already being incorporated by boat builders in miniature: "With triple corner'd sayls they always float about the island. In the world there are none in al pointes that may with them compare...They lie so near the wind that they will fetch the same place they look upon, close hal'd (hauled)."<sup>73</sup> The theory that the sloop might have evolved in part from these boats is supported by the fact that in the 1670s and 1680s many Bermudian sloops were not much larger than five-ton tobacco boats and increased in size only during the 1690s.

It is difficult to say much about the early Bermudian sloops with any degree of certainty. No plans were made of any Bermudian sloop before 1740, perhaps to keep the hull design secret.<sup>74</sup> Although the reef around the islands is a veritable ships' graveyard of English, French, Spanish, and American vessels, not one native Bermudian vessel has been found, let alone excavated, despite several decades of commercial treasure salvage diving and maritime archaeology.<sup>75</sup> While this is a tribute to the fine sailing integrity of the Bermudian sloop, it is also a source of frustration for researchers intent on studying the sloop's development. Although there are no surviving

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<sup>73</sup>Hardy, A Description of the Last Voyage..., p. 7.

<sup>74</sup>Swedish naval architect Fredrik Henrik ap Chapman obtained a draft of a one hundred thirty-ton Bermuda sloop in England some time in the 1740s. He printed this draft (#15) in his Architectura Navalis Mercatoria (Stockholm, 1768), plate LVII. The Chapman draft represented the Bermuda sloop in its mature form, which will be discussed below.

<sup>75</sup>During the summer of 1992 it has come to my attention that the wreck of one Bermuda sloop which sank off the Turks Islands in the Caribbean has been identified. An archaeological excavation of this vessel would yield valuable information about construction techniques, the types of woods used, hull design, and the material culture of the sloop's crew, to name but a few of the ways in which such a study would better inform the preliminary research presented here.

examples, it is still possible to identify the factors at work in shaping the evolution of the Bermuda sloop.

Sloops quickly became the dominant vessel type built in Bermuda when the industry experienced its first big boom. By 1700, just sixteen years after the dissolution of the Somers Island Company, Bermuda had a shipping fleet of some seventy cedar vessels, including "four ships of about 100 tons, six brigantines from about forty to sixty tons, and sixty sloops from thirty to above forty tons," as well as 300 - 400 of the small two-masted boats for fishing and loading vessels.<sup>76</sup> Edward Randolph, the Surveyor of British Colonies, informs us that the shipbuilding industry in Bermuda employed over 50 shipwrights and had 5 operating blacksmiths' forges for producing iron ship's parts. The islands also possessed a work force of 170 navigators, or masters, and 500 sailors to operate the Bermudian shipping fleet.<sup>77</sup>

The Bermuda sloop emerged as the preferred vessel because it was remarkably well adapted to the demands imposed by the island's geography and location. The small size of the sloops of this period (eight to forty-five tons) allowed drafts shallow enough to gain access to most of the bays and harbors of the islands by navigating the shallow channels that cut the reefs. The single fore-and-aft sail gave excellent maneuverability, especially sailing into the wind.<sup>78</sup> This allowed Bermudian mariners to reach Virginia, Carolina, and the West Indies although the destinations remained windward most of the year. Sloops could also be operated with crews of four to eight mariners. The small size of crews allowed masters more easily to assemble a sufficient work force to undertake a voyage; it was far easier and quicker for a

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<sup>76</sup>C.O. 37, v. 3, Edward Randolph to the Lords of Trade, Nov. 15, 1700.

<sup>77</sup>Ibid., p. 49.

<sup>78</sup>Howard Chapelle, The Search For Speed Under Sail, 1700 -1855, p. 66.

Bermudian master to find five men to man his sloop than for an English captain to recruit thirty for his ship.

The Bermuda sloop seems to have developed its reputation for speed during the first decades of the eighteenth century. Because the sloops were small and lacked the capacity to accommodate large cargoes, they had to make up with frequency of crossing what they lacked in size. Bermudian masters would make as many as five voyages a year in order to maintain a profitable volume of trade. Bermuda's shipping fleet was also expanding into the West Indies as pirates and privateers were running rampant throughout the Caribbean. Between 1690 and 1705, a number of Bermudian vessels were taken by these predators. In 1692, pirate John Lewis captured a fleet of nine Bermudian vessels off the Bay of Campeche and narrowly missed taking Captain George Tucker's sloop.<sup>79</sup> The famed Ferdinando captured the ships of captains Richard Jennings, John Trimmingham, Samuel Saltus, Joseph Dill, William Richardson, and Thomas Gibbs as well as eight other Bermudian vessels between 1698 and 1705.<sup>80</sup> William Joell was captured and lost the use of his arm in a fight with pirates in 1700.<sup>81</sup>

This threat to both purse and person prompted Bermudians to seek the fastest sloop they could produce. This was done by lengthening and narrowing the hull, creating finer lines, and adding a topsail for increased power. The next generation of ships produced by the shipbuilder-masters of Bermuda were much improved, so much so that Bermudians began to hunt the

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<sup>79</sup>Wilkinson, Bermuda in the Old Empire, pp. 70-71.

<sup>80</sup>C.O. 37, v. 3, p. 48; Wilkinson, Bermuda in the Old Empire, p. 71.

<sup>81</sup>Ibid., p. 72. The following spring, however, Thomas Frith captured and hanged these pirates in retaliation.

pirates who had previously preyed upon them, as well as French and Spanish vessels.

Between 1706 and 1714, many Bermudian masters took to privateering. John Trimmingham, Richard Jennings, one-armed William Joell, William Richardson, Samuel Stone, Francis Jones, and many others who had previously suffered economically took to the sea to avenge their losses and make fortunes for themselves. In 1709, Richardson captured a French vessel with 1,400 pieces of eight. Lewis Middleton, captain of the *Rose*, managed to restore Turks Island to Bermuda in 1710 by driving off a Spanish force, which had captured it the previous year. Captain Henry Jennings, by far the most successful privateer, took an incredible 60,000 pieces of eight from a single Spanish ship and took an additional 350,000 pieces of eight from salvaging wrecks. Fueled by these early successful ventures, over a dozen other shipbuilding families would enter into privateering ventures by 1720.<sup>82</sup>

Although Bermudians improved their sloops, a few still fell prey to pirates in the 1710s. In 1714, Charles Vane, using a captured Bermudian sloop, took vessels mastered by Daniel Stiles, James Basden, William Hall, Samuel Cooper and Edward North. Perhaps these families had not yet improved their hull designs; perhaps they merely suffered from bad luck.

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<sup>82</sup>Ibid., p. 71-75. Members of the Ball, Burrows, Cox, Durham, Gilbert, Jenour, Lea, Landey, Mallory, Newbold, North, Raynor, Seymour, Tynes, and Underwood families pursued privateering in either their own vessels or as masters in sloops owned by others. Tucker, *Bermuda*, p. 91.

The line between pirate and privateer often became blurred by the lure of gain and the heat of battle. Bermuda's own pirate, Bartholemew Tew, netted over L 15,000 for his Bermudian backers (Samuel Stone, Richard Gilbert, John Dickinson, Anthony White William Outerbridge, and Thomas Hall) and an estimated L 100,000 for the voyage in an expedition to the Indian Ocean in 1691. Wilkinson, *Bermuda in the Old Empire*, pp. 63-66.

Regardless, their misfortunes served to remind Bermudians of their need for speedy sloops to protect both life and cargo.<sup>83</sup>

Concerted efforts by the Royal Navy and the governors of the English West Indian and American colonies all but eliminated pirate activity after the 1720s. Although Bermudians still periodically engaged in privateering, their primary focus shifted to trade. They were dubbed "the Dutch of America" because they generally offered the lowest freight charges in the market. Since Bermudian vessels sailed into every port in search of markets, the masters of Bermuda were known for having "the best intelligence of any place in America."<sup>84</sup> The speed of their sloops was an asset for shipping produce and other commodities that could suffer from spoilage. Passage on a Bermuda sloop also insured that news, correspondence and passengers would arrive promptly.

The Bermuda sloop seems to have reached its mature form by 1715. It had an international reputation for its speed and ability to sail into the wind, perhaps better than any other vessel built before 1780.<sup>85</sup> One design of the mature Bermuda sloop was preserved on paper by an unknown English naval architect some time in the 1740s and later published in a book of drafts by a Swedish naval architect named Fredrik Henrik ap Chapman in 1768.<sup>86</sup> Howard Chapelle, a noted naval architect and historian, described the Bermuda sloop:

The Bermuda sloop was wide and deep; the entrance was short, convex, and full; the run line long and fine. She had moderate

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<sup>83</sup>Ibid., p. 73.

<sup>84</sup>Ibid., p. 20.

<sup>85</sup>Chapelle, Search for Speed, p. 65-66.

<sup>86</sup>Architectura Navalis Mercatoria, plate LVII, reproduced in Chapelle, Search for Speed, p. 65.

drag to the keel, much rake to the stern post, and a well-rounded rabbet. The sheer was marked with a high-crowned roof over a stern cabin. The midsection was formed with a straight sharply-rising floor, high well-rounded bilge, and upright or slightly flaring topside. The midsection form eased the sweep of the buttock-bow lines, reducing the average cambers sharply over what a flat-floored midsection with the same relative length and depth of hull would require. This sloop hull had good flow lines for her proportions, being without sudden change in overall form or excessive fullness anywhere under water. She would sail well on the wind as far as the cut and material of her sail would permit. However, the potential maximum speed, for her length, had been sacrificed in some degree to obtain an effective displacement in order to take on armament, cargo, and the necessary ballast to carry sail in a fresh breeze.<sup>87</sup>

The Chapman model (Figure 8) portrays a sloop measuring 60' 9" between perpendiculars. Its estimated draft was 12' 4" and the estimated displacement was 129.3 long tons, making this vessel a much larger but characteristically similar version of the sloops that comprised the bulk of Bermuda's shipping fleet.<sup>88</sup> The bowsprit and main boom were very long by contemporary standards. A variation of the rigging included adding a spread yard located just below the gaff jaws to which the foot of a square topsail could be secured. Chappelle has found pictorial evidence of this alternate rigging system as early as 1727.<sup>89</sup> Rigged, the Chapman sloop would have looked similar to Chappelle's reconstruction in Figure 9. Smaller and earlier versions of the Bermuda sloop, like the one pictured in Figure 5, lacked a square topsail.

Throughout the eighteenth century, the hull design of the Bermuda sloop remained fairly consistent. By mid-century, Bermudians would

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<sup>87</sup>Chappelle, Search for Speed, pp. 67-68.

<sup>88</sup>Ibid., p. 68.

<sup>89</sup>Ibid., pp. 69-70.

experiment with a variety of types of rigging, matching sailing characteristics to primary markets. The hull design remained the same, with only slight variation because the sloops were invariably built "by the eye" or without plans. The merits of the Bermuda hull design led to its adoption in both Virginia and New England by the mid-eighteenth century.<sup>90</sup> New England shipbuilders rigged these hulls like schooners for easier sail handling by a small crew in strong winds, while Virginians kept them rigged as sloops. The draft of a six-gun Virginian sloop of 42 tons is probably more representative of the average Bermuda trading sloop than the massive sloop preserved by Chapman (Figure 10).

The design of the Bermuda sloop, stressing a relatively long, narrow hull, served to underrepresent its tonnage as determined by the formula widely used by the Royal Navy and officials of the Crown. This formula was developed some time in the mid-seventeenth century and was designed primarily to assess the tonnage of ships-of-war, using oak as the assumed wood of construction. The formula was listed in William Sutherland's The Shipbuilder's Assistant<sup>91</sup> (1711), the first English shipwright's manual in wide circulation:

extreme length - extreme breadth = length of keel

length of keel x extreme breadth x 1/2 extreme breadth  
----- = tonnage

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By weighing the breadth of the vessel far more heavily in the formula than the length, ships that are proportionally longer and narrower, like the sloop, yield

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<sup>90</sup>Ibid., pp. 65, 86.

<sup>91</sup>London: Mount and David, 1711, 1726, pp. 69-70.

a tonnage quotient significantly lower than their actual weight. The **Hunter**, launched in Deane's shipyard in London in 1673, was measured as actually displacing 46 tons. Using the formula, however, its length of keel (60 feet) and its breadth (12 feet) would yield a tonnage figure of 35.9 tons, only 3/4 of the actual displacement! It was not until E. P. Kennedy published The Shipwright's Vade-Mecum in 1805 that a formula producing a more accurate assessment of tonnage was determined.<sup>92</sup>

One of the implications of this discovery is that tonnage should no longer be used to compare the volume of trade in the colonial period.<sup>93</sup> Bermuda's vessels were probably larger than vessels of comparably listed tonnages in ports in America and England. Not only was the material used in constructing Bermudian sloops lighter, displacing less water, but the Bermuda sloop's hull design proportions resulted in a tonnage measurement significantly lower than the actual burthen using Britain's standard tonnage formula. In practical terms, Bermudian shipbuilder-merchants benefited immediately from this underestimation, because the tax levied on their ships when launched was based on its measured tonnage. Tonnage duties levied at foreign ports would also be significantly lower.

The general trend in the Bermuda shipping fleet from 1716 until 1750 was to increase the sloop's size while maintaining its same proportions. Naval Office shipping returns have survived for this period, giving us valuable

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<sup>92</sup>E.P. Kennedy, The Shipwright's Vade-Mecum: A Clear and Familiar Introduction to the Principles and Practices of Shipbuilding (London: Steel, 1805), pp. 250-52.

<sup>93</sup>Another drawback of using tonnage as a means of comparison is that it merely measures the size of the vessels calling in at a particular port and does not reflect the volume of goods imported and exported, since these ships did not necessarily always take on or carry in cargoes.



information about the composition of Bermuda's shipping fleet (see Figure 11).<sup>94</sup> In many ways, these documents are superior to the ship registers that have previously been the main source of information for maritime historians. Registers usually provide the names of vessels, their tonnage, and the location and year in which they were built.<sup>95</sup> They give static pictures of a vessel as it enters into the world of shipping. Shipping returns, on the other hand, flesh out the vessel's life on the high seas, providing information about the master and crew, the number of guns and cargoes it carried, changes in the number and names of owners, and from whence it hailed and whither it was bound for each voyage in addition to the information listed in a ship's registry.

In 1716, 131 vessels entered or cleared St. George's, the capital and official port of entry for Bermuda. Of these 131 craft, 92 vessels were owned and registered on the islands and made up 70.2 % of the total trade (see Figure 12).

Bermuda's shipping fleet was composed entirely of sloops. In addition, all 92 sloops had been build on Bermuda. These sloops ranged in size from the 60-ton *Seaflower* to the 7-ton *Mayflower*. When one examines when these

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<sup>94</sup>C.O. 41, v. 6-7, Bermuda Naval Office Shipping Returns, 1715 - 1751. All information for three years (1716, 1734, and 1750) was entered into a database (Paradox 3.5) in order to compose a statistical picture of the Bermuda shipping fleet roughly corresponding to three generations of mariners on the islands. Modern calendrical notation was used, beginning each year with January 1. In addition to shipbuilding, a wealth of information was obtained relating to the provisioning of the islands, and volume and variety of exports and imports broken down by source or destination. Patterns in ship ownership and mastery of vessels remain to be covered in future research.

<sup>95</sup>For a good example of the uses of shipping registers, see Bernard and Lotte Bailyn, Massachusetts Shipping 1697 - 1714: A Statistical Study (Cambridge: Bellknap Press, 1959).

sloops were built, it becomes apparent that most of them were quite new (see Figure 13).

It was common practice for Bermudians to build a vessel, sail it from three to five years, and then sell it to a merchant in an overseas port.<sup>96</sup> When the old vessel was sold, it was immediately replaced with a new sloop which the owners had been building concurrently. This system ensured that the owners' crew and cargo were sailing on a relatively new, low-maintenance vessel operating at peak performance. Profits made from trading in a single year more than paid for the initial costs of building the vessel. After using the sloop for several years, its Bermudian owners could still sell it for a tidy profit. Its purchaser could happily expect another ten years of life from the sleek sailer.

In 1715, thirty two sloops were built on the islands.<sup>97</sup> These sloops ranged from 10 tons (**Advice**, **Content**, and **Samuel**) to 30 tons (**Eagle** and **Mary**), averaging 19.5 tons in size. The number of vessels launched each month reflected a distinct seasonal cycle of production on Bermuda (see Figure 15). Most of the vessels launched in 1715 were built during the winter, when storms kept much of Bermuda's male population on the island. The smaller sloops were launched in February and March (9 vessels averaging 17.7 tons), while slightly larger vessels were launched in May and June (10 sloops averaging 19 tons). The largest vessels were built during the summer and launched in the fall (5 in October, averaging 23.4 tons). At this rate, many of

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<sup>96</sup>Wilkinson, Bermuda in the Old Empire, p. 19. C.O. 37, v. 13, p. 42.

<sup>97</sup>1715, the year prior to the returns year sampled, best represents the shipbuilding activities on Bermuda, since many of the vessels built in 1716 would not be launched until early in 1717. It is probable that a few more than 32 vessels were built in 1715; some might have been lost at sea or intended for direct sale to other colonial merchants.

the fifteen-to-twenty shipyards on the island and in operation at this time were producing two vessels per year. Since each sloop was worth approximately L 200 to L 450, and averaged L 6 - L 8 per ton,<sup>98</sup> the shipbuilding industry in Bermuda was worth over L 4,300 annually in the 1710s.

By 1734, there was a substantial shift in the composition of vessels calling in at Bermuda (see Figure 15). Ships registered in Bermuda made up 83% of the total, an increase of more than 12% since 1716. While the same proportion of vessels from New England, Virginia, the Carolinas, and the West Indies continued to trade in the islands, ships from Great Britain or the Middle Atlantic colonies virtually disappeared.<sup>99</sup>

Despite this increased share of trade, the number of ships involved in trading fell from 131 in 1716 to 109 in 1734. Bermuda was still recovering from a depression that had begun in the late 1720s and had forced over one thousand Bermudians to emigrate to the Carolinas, Georgia, or the West

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<sup>98</sup>Wilkinson, *Bermuda in the Old Empire*, p. 22. Using several probate inventories from Bermuda's *Book of Wills*, vols. 4-5, it has been possible to determine the assessed values for several vessels listed in the shipping returns. Joseph Forster's 1/8 share of the 40-ton **Content** was worth L 53 when the vessel was launched in 1711. 1/8 of the 30-ton **Advice**, launched in 1710, was valued at L 58.10. William Cox' 1/3 share of the **Lily** a 28-ton sloop, was worth L 133. William Pitt, owner of 1/6 of the **Industry**, had his share of the 45-ton sloop assessed at L 80.

<sup>99</sup>Preliminary research on economic trends in Bermuda suggests that between 1716 and 1734 there was a shift on the islands from using goods of English manufacture to importing similar wares from New York, Philadelphia and New England. Furthermore, Bermudian merchants expanded into this market, replacing traders from the Middle Colonies. A quantitative treatment of Bermudian imports and exports and a study addressing the strategies of provisioning the islands are planned for the future.

Indies.<sup>100</sup> Only 21 sloops had been built in 1733, eleven fewer than in 1715 (see Figure 16). Although ship production fell, the number of Bermudian vessels involved with trading remained constant. The Bermuda shipping fleet was composed of 86 sloops, 1 schooner, and 3 snows.

The sloops ranged in size from 10 tons (**Adventure, Charles and Edward, Content, Elizabeth, Little Peter, and Resolution**) to 50 tons (**Pembroke, Don Carlos, and Ann**). The three snows, all built early in 1734 for American merchants, were significantly larger: the **Hope of Philadelphia** weighed 50 tons, the **Walpole** 70 tons, and the **Nassau** 80 tons. The single schooner, the **James and Ann**, weighed only 10 tons, placing it among the smallest vessels in the fleet.

During the 1730s, the Bermuda Naval Shipping Returns format changed, adding information on the number of guns carried and the size of each vessel's crew. In 1734, at least 565 sailors and masters operated Bermuda's shipping fleet. The average size of a sloop's crew was 6.2 men; small ten-ton sloops could get by with a minimum of four, while forty- to fifty-ton sloops demanded a crew of nine. Crews for the snows averaged 9.33 men, due to their larger size. Schooners needed only four men to operate; more manageable sails allowed for a smaller crew.

Of the twenty-one vessels built in 1733, nineteen were launched between January and May (90.5% of the total; see Figure 17). All of these had presumably been built over the winter. The average vessel built in 1733 was 23.33 tons burthen. Lighter vessels continued to be launched earlier in the spring; the five vessels launched in February averaged 22.4 tons, while the nine vessels launched in March and April weighed an average of 26.1 tons.

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<sup>100</sup>Wilkinson, Bermuda in the Old Empire, p. 84.

By 1750, Bermuda had recovered from the depressions of the 1720s and 1730s and was riding a wave of prosperity following the conclusion of King George's War. At least 140 ships entered and/or cleared St. George's that year. The Bermudian shipping fleet now numbered 115 vessels, a 25-ship increase since 1734. Bermudians maintained a hold on 81% of the trade (see Figure 18). The composition of the shipping fleet, however, was no longer dominated by the sloop. By mid-century, Bermudian shipbuilders were diversifying by constructing specific ships for specific markets. The Bermudian shipping fleet was composed of 18 brigantines, 14 schooners, 1 ship, and 1 snow in addition to the 81 sloops that made up the majority of vessels (see Figure 19). This fleet employed over 785 men, roughly one-third of the entire male population of the colony; The ship and snow each had a crew of 12. Brigantines averaged 9.05 men per crew. Each sloop needed 6.3 men on the average. Schooners, the smallest vessel-type in the fleet, still needed an average of 6.36 men per crew.

One significant change which had occurred by 1750 was that Bermuda shipbuilders had begun to construct a variety of vessel types. Of the 32 vessels built in 1749, 22 were sloops, 3 were brigs, and 7 were schooners (see Figure 20). Sloops were now being regularly produced at the rate of two-to-three per month from March through September and averaged 32.2 tons each. The larger brigantines, averaging 50 tons each were built during the fall and winter, as were the schooners (30 tons on average).

Over the course of the first half of the eighteenth century, the Bermuda sloop had significantly increased in size. One can easily see the magnitude of increase in the size of Bermudian vessels when one compares the tonnage of the comparable number of ships built in the 1710s and 1740s (Figures 21 and 22). Shipbuilding continued to increase in volume after 1750. During the Seven

Years War, Bermudian shipyards would turn out nearly sixty ships each year. On the eve of the American Revolution, this rate would increase to one hundred vessels per year worth over L 12,000 annually.<sup>101</sup> Ships were vital to Bermuda both as an export commodity and as a means to carry on trade. The carrying trade employed over 750 men annually by mid-century. An additional 300 - 400 men were employed building and servicing the fleet. These craftsmen and mechanics on the islands were just as crucial to Bermuda as the mariners who manned the sloops. We turn next to this vital group, comprised mostly of slaves, to examine the actual construction of vessels and the organization of labor and ownership within Bermuda's shipbuilding industry.

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<sup>101</sup>Wilkinson, Bermuda in the Old Empire, p. 8.

### Bermudian Slavery

It is a little known fact that Bermuda was the first English colony to import slaves. In 1616, the Somers Island Company under Governor Daniel Tucker authorized Captain George Bargrave to acquire "an Indian and a Negar" in the West Indies to dive for pearls off Bermuda's shores. The importation of these slaves anticipated a similar trend in Virginia by two years.<sup>102</sup>

In the 1620s and 1630s, a number of other black and Indian slaves were brought to Bermuda from the West Indies to teach the settlers how to cultivate tobacco. Some were bought or commandeered from wrecked Spanish ships by the Company and served as a civil work force, planting and clearing the common land and maintaining the roads, bridges, and forts of the colony. Others were purchased by private landowners such as Sir Robert Rich to work the 25-acre shares of land which had been laid out by Richard Norwood for the Company's investors. Although there was a sufficient number of black slaves and ancillary laborers to warrant "an Act to restrayne the insolencies of the Negroes" in 1623, it seems that they made up a very small portion of Bermuda's population before the 1640s, due to the large number of English indentured servants arriving annually.<sup>103</sup>

By the 1640s, English participation in the African slave trade had been sufficiently established to guarantee a steady stream of slaves into the West

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<sup>102</sup>Packwood, Chained on the Rock, p. 2, Smith, Slavery in Bermuda, p. 15.

<sup>103</sup>Packwood, Chained, pp. 3-9; Smith, Slavery, pp. 17-19. It is notable that the earliest black were imported for their special skills, such as diving and tobacco cultivation, rather than as unskilled laborers.

Indies and Virginia. Most of the slaves imported into Bermuda came via West Indian ports; very few were brought directly from Africa. As tobacco monoculture became more firmly rooted in the Bermudian economy and as the number of Englishmen willing to migrate to Bermuda diminished, black slaves came to compose a larger portion of the agricultural work force. In the 1650s and 1660s, Irish and Scottish political exiles and enslaved American Indians supplemented the labor pool in Bermuda.<sup>104</sup>

This influx of unfree labor, coupled with the natural increase of settlers, led to an overpopulation of the islands by the 1660s which initiated an out-migration among white Bermudians to Eleutheria, New Providence, Barbados, Jamaica, and St. Lucia. Internal pressures within Bermudian society caused by this overpopulation led to three slave revolts, all of which were nipped in the bud. By 1675, the number of slaves relative to the white population of the islands had risen so much that Governor Sir John Heydon enacted a ban on the future importation of blacks, Indians and mulattos. Bermuda's favorable climatic conditions, combined with generally benevolent treatment of slaves by masters, allowed slaves to make up nearly one-third of Bermuda's population on the eve of the dissolution of the Somers Island Company in 1684, although fewer than a thousand slaves were imported during the first seventy years of colonization.<sup>105</sup>

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<sup>104</sup>Bermudian tobacco was grown on small (25 to 100 acre) farms, the majority of which were individually owned and worked by a handful of slaves or tenant farmers. The lack of substantial tracts of land precluded the development of gang-labor slavery with all of the brutality it entailed. The Irish and Scottish exiles, deported during and after the English Civil War, served a seven-year indenture. Smith, *Slavery*, pp. 20-26, 50-52; Packwood, *Chained*, pp. 60-61.

<sup>105</sup>James Smith's research has revealed that fewer than ninety slaves during the seventeenth century can be positively identified as having come direct from



With the collapse of Bermuda's tobacco monoculture in the 1670s and 1680s came a necessary diversification of the island's economy; as the shift was made toward maritime industries, both free and unfree workers had to adapt to new labor demands. Agricultural pursuits expanded to include cultivation of potatoes, cabbage, onions and a wide variety of fruits which became saleable commodities in the West Indies. To help Bermuda's expanding shipbuilding industry, slaves were taught skills by their masters or apprenticed to carpenters, caulkers, sawyers, and boatmen. This last profession, devoted to the construction and sailing of small sailboats, had been practiced by slaves since the early seventeenth century. Masters would regularly send their bondsmen out to the reefs to reap the sea's bountiful harvests. During much of the seventeenth century, slaves also ferried tobacco from local wharves to the Company's magazine ships anchored in Castle Harbor. Coastal boats represented the most rapid form of local transportation for shipping goods and conveying passengers around the islands, since overland travel was slow and limited to three meandering trails which ran the length of the main island.<sup>106</sup>

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Africa; one-half of a cargo of 125 slaves from the "coast of Guiny" were disposed of on Bermuda around 1672, and a handful of a cargo of 90 slaves bound for Virginia and Carolina were sold to Bermudians in 1683. Smith, Slavery, pp. 20, 53-56. The first reliable demographic information, taken from a report issued by Governor Robertson in 1691, listed 4,331 white settlers and 1,917 slaves living on Bermuda in that year. By 1699, the population balance had shifted to 3,615 whites and 2,247 blacks. Packwood, Chained, pp. 73-75.

<sup>106</sup>Packwood, Chained, pp. 30-33. Smith 62-63. For overland transportation routes in the seventeenth century, see Richard Norwood's second survey and map (1663) in Lefroy Memorials, vol. 2. References to tobacco transportation in John Hardy, A Description of the Last Voyage to Bermudas..., pp. 6-8. In Bermuda, to this day, the West End is called "up country" and St. Georges is called "down country" because of the prevailing

Slaves who were already experienced boatmen easily adapted to sailing larger ocean-going sloops. By 1700, Edward Randolph estimated that one hundred of the five hundred Bermudian sailors employed each year in the carrying trade were slaves. Under Governor Benjamin Bennett's tenure (1701 - 1713, 1718 - 1722), the ratio of two white sailors (master and mate) to four black sailors was legally fixed, increasing the number of slaves employed on the open seas.<sup>107</sup>

Once the carrying trade was established, slaves served as sailors on their masters' vessels and as pilots guiding foreign ships through Bermuda's treacherous reef system. A large number of slaves were brought down to the Turks Islands by their Bermudian masters and employed in raking salt which was traded with the American colonies. During the summer months, when not actively raking the salt, masters would employ their slaves in "wrecking," or salvaging goods from vessels wrecked on the reefs surrounding the Bahamas and Turks Islands, as well as harvesting tropical wood or hunting sea turtles. The salt industry, which was established in 1678, employed many former Bermudian planters after tobacco declined as a viable commercial crop. By the middle of the eighteenth century, over 1,200 Bermudians and their slaves were annually employed in gathering and transporting salt.<sup>108</sup>

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winds which facilitated sailing eastward (windward), but hindered progress to the west.

<sup>107</sup>C.O. 37, vol. 3:46-50; Report of Capt. George Tucker (Provost Marshall) to Whitehall, July 19, 1725 in C.O. 37, vol. 7.

<sup>108</sup>Salt was in much demand in an age without refrigeration, since it was the only means of preserving meat and fish for extended periods. Bermudians traded salt to the Carolinas and Virginia, where it was used to preserve beef and pork. To a lesser extent, salt was also exported to New England for salting fish. The salt trade was incredibly lucrative. The average Bermudian vessel gathered between 2000 and 3000 bushels annually and received between 18 d. and 1s. 4 d. per bushel, depending on the season; salt sold in

Slaves on Bermuda were also used to support the shipping industry by building warehouses and working on the docks at St. George and at private wharves scattered throughout the islands. Bermudian architecture shifted from building in wood to stone construction because the price of native cedar rose dramatically with the demand of the shipbuilding industry in the late seventeenth and early eighteenth centuries. Teams of skilled slaves trained in masonry and house construction were responsible for erecting most of the stone houses built since the late seventeenth century. Other slaves labored to quarry the stone used in these buildings, usually from bedrock located near the shore.<sup>109</sup>

The biggest contribution that slaves made to Bermuda's shipbuilding industry was in assembling the vessels themselves. Slave labor was used in every stage of construction, from harvesting the timber to launching and outfitting the vessel for sea. A number of slaves, each with different skills, worked on various aspects of the sloop under direction of a white shipwright to transform a forest of cedars into a Bermuda sloop. The actual construction of these vessels, along with the organization of the necessary labor and capital, deserves closer attention.

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October and November fetched the highest price since the demand peaked during the time when animals were traditionally slaughtered. C.O. 41, vol 6-7 (1716, 1734, 1750),; Smith Slavery, pp. 59-62. For wrecking, see Wilkinson, Bermuda in the Old Empire, p. 19. In 1716, 24 Bermudian masters returned from the Bahamas with over 12,346 pieces-of-eight salvaged from wrecks, in addition to wood, sails, rigging, anchors, brass, iron, cannons, lead and other material recovered. C.O. 41, vol. 6.

<sup>109</sup>Packwood, Chained, pp. 11, 19-20. Smith, Slavery, pp. 50-52. Building stone was preferentially quarried from areas close to the sea because this stone had already developed a rigid exterior surface which made it stronger than inland limestone. Since slaves could not testify in court, some unscrupulous masters would employ their slaves in smuggling goods onto the island with little fear of the legal repercussions if caught.

### Sloop Construction

A cursory glance at Bermuda's shipping registry for the eighteenth century immediately reveals that the ownership of the islands' merchant fleet was shown by a large number of individuals. Very few Bermudians commanded the capital and physical resources to build and own a ship outright. In most cases it took the combined labors, resources, and funding of several individuals to produce a finished sloop. Partnerships to this end were structured along both kinship and commercial lines. A closer examination of ownership patterns revealed how the Bermuda shipping fleet was organized and operated by a handful of old elite Bermudian families.<sup>110</sup>

In 1716, the Bermudian shipping fleet was composed of 84 ships. The ownership of these vessels was divided into 245 shares, which were held by 179 individual owners. The average vessel was apportioned into 2.92 shares, each held by a different owner. This dispersal of ownership was not only a product of a lack of consolidated wealth which would allow individuals to own ships outright, but represented a primitive form of insurance; if the ship was lost at sea, no one member of the community would suffer a disastrous financial loss<sup>111</sup>.

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<sup>110</sup>It is important to note that the same family names which dominate the rolls of ship owners were also among the leading planters of the seventeenth century.

<sup>111</sup>The Bermuda shipping fleet was defined here as vessels built and registered in Bermuda for that year. The division of ships into shares presents a problem in quantification; although a ship might have several owners, the portion of the ship that each of them owned might vary considerably. Some owners, like William Pitt (died 1710) might own as little as 1/16 of a vessel. Others, like Benjamin Hinson, owned more than an equal allotment; his will mentions that he owned 3/4 of the **Benjamin** (with Edward Archer) and 1/2 of the **Mary**, leaving the other half to Josias

At least thirty-five of the eighty-four ships in the merchant fleet were "family owned." Of the 73 ships which had two or more owners, 35 vessels (47.9%) had two or more owners with the same last name. In some cases the owners were father-son combinations, like the 20-ton **Elizabeth and Ann**, owned by William Outerbridge Sr. and his two sons, William, Jr. and John. Other vessels were owned by brothers or brothers and sisters; the **Spy of Bermuda** was owned by two sets of brothers: Christopher, Daniel, and John Lusher and George and John Wells, in addition to Charles Conyers, Edward Hinson, and Nathaniel White. The **Samuel** was jointly owned by Daniel, Jr. and John and Mary Stiles, the sons and daughter of Daniel Stiles of Southampton.<sup>112</sup> Still other vessels were owned by brothers and their wives; George and Jehoadan Tucker owned the **St. George** with Daniel and Jemima Tucker, their brother Florentius Tucker, and outsiders Jehoadan Davis and John Darrell.<sup>113</sup>

Ten of the ships in Bermuda's merchant fleet (12%) had one or more female owners. In six cases, women owned shares in vessels with relatives, including brothers, fathers or husbands. Other women were independent operators; Elizabeth Walker and Elizabeth Woolrich both owned part of the aptly named **Elizabeth**, with John Peniston and Joseph Williams. Sarah White inherited her late husband's share in the **Katherine** in 1709 and

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Forster and John Fowle. Book of Wills, vol. 4, pp. 76-77; vol. 5, pp. 178-81.

<sup>112</sup>Hallett, Early Bermuda Records, 1619 - 1826, p. 14.

<sup>113</sup>The number of "family-owned" vessels would increase dramatically if the definition was expanded to include owners related by marriage and first cousins, but without an exhaustive genealogical study of the leading Bermudian families, which is beyond the scope of this work, it would be impossible to clearly establish the number of related owners. B.P.R.O./C.O. 41, vol. 6.

remained an active owner with Thomas Jones and Thomas Lea until at least 1716.<sup>114</sup> Although more research needs to be done in the area of gender studies in colonial society, it seems that Bermudian women had a relatively high degree of legal, social and economic autonomy when compared to their counterparts in the Caribbean and North American colonies.

In terms of organizing the operation of the Bermudian shipping fleet, there is a relatively high correlation between individuals owning the ship and its cargo and mastering the ship on its various ventures. Forty-one of the 84 vessels (49%) were mastered by one of the owners or a direct relative (brother or son). The *Elizabeth and Ann*, which has already been mentioned, was mastered by Thomas Outerbridge, yet another son of William Outerbridge Sr. The *Recovery*, owned by William Bascome and Daniel Keele, was commanded by Daniel's brother John. Thirty-three ships in the fleet (39%) were mastered by one or more of the owners. The *Samuel*, which made three voyages in 1716, was mastered by two of its owners, Abram Aderly and John Sherlock. The *Spy's* two masters were brothers Israel and Daniel Lusher. Of the 179 individuals who owned shares in Bermuda's shipping fleet, 50 served as masters; seventeen served as masters on ships in which they had no financial stake.<sup>115</sup>

The dual role of owner and master was advantageous when one considers that the master had both to manage the crew and maximize profits from disposing of the vessel's cargo. Frequently, a master would also have to take on another cargo at a foreign port and carry it back to Bermuda or to

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<sup>114</sup>Book of Wills, vol. 4, pp. 48-50. The other two independent female shipowners were Deborah Jones and Elizabeth Dickinson.

<sup>115</sup>Like "family" ownership, the frequency of "family" mastery would doubtless increase if it were possible to include cousins and in-laws within the definition.

another colonial English port. As one who had a financial stake in the outcome of a venture, the master-owner decided which commodities to carry and which ports to visit in order to maximize profits. Also, by commanding one's own vessel, operating expenses were minimized. The vessel's owners did not have to hire a master and pay him weekly or monthly wages. If the master-owner brought his own slaves along to serve as crew, operating costs were further reduced.

Ownership patterns of the 1734 shipping fleet closely resembled that of the 1716 fleet. The merchant fleet was composed of 86 ships divided into 253 shares (average 2.94 shares per ship), with 175 individual owners. Thirty-four of these ships (39.5%) had two or more owners with the same last name. "Family" mastery of vessels increased; 50 ships (58.1%) were mastered by owners or their close relatives, with 41 vessels (47.7%) commanded directly by one or more owners. But female participation in the shipping industry markedly decreased; only 5 vessels (5.8%) in 1734 had a woman among its owners.

By 1750, the Bermuda merchant fleet had changed in a number of ways. As previously mentioned, the tonnage of the average ship increased markedly. There was also a growing degree of diversity in terms of the vessel types (sloops, snows, schooners, brigantines, etc.) that made up the fleet. The very size of the fleet also increased to 110 craft built and registered in Bermuda. These ships were divided into 321 shares, maintaining the previous ratio of 2.9 shares per vessel. The number of "family" owned vessels remained numerically constant at 36, but proportionally declined to comprise only 32.7% of the fleet. "Family" mastered vessels increased to 59 ships, making up 53.6% of the merchant fleet, with 49 vessels (45%) commanded directly by one or more owners. The number of female owners continued to decline;

only four vessels (3.6%) included women among their owners. As the century progressed, it seems that kinship bonds as an organizing force within the Bermuda shipbuilding industry lost ground to commercial ties, particularly with individuals who lived in ports where Bermudian traders called frequently.

Different members of the individual partnerships which owned each ship brought different skills and assets to the construction and successful operation of the vessel. Some owners supplied labor toward operating the vessel once built either directly, by mastering the sloop and managing the vessel's crew and cargo, or indirectly, by providing slaves to serve as crews or sons to serve as masters. Other owners, particularly those with large land holdings, provided the cedar from which the sloops were built and often the slaves who built the sloops. From the late seventeenth century on, cedar trees were explicitly mentioned in wills independent of land acreage. With the growth of Bermuda's shipbuilding industry, the value of cedars often exceeded the value of the land upon which they grew. For this reason, clauses began to appear in wills regulating the cutting of trees after the owner's death. John Dickinson, for instance, gave his land and house to his wife after his death, but forbade her to cut down or sell any of the cedar trees growing on the property with the exception of those needed periodically to repair the house. He also gave his son James "one hundred good cedar trees" to be cut from his lands.<sup>116</sup> John Argent specified in his will that no timber was to be cut from his land until seven years after his death.<sup>117</sup> Daniel Hinson grew wood specifically to build a sloop: "It is my will that my executors doth

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<sup>116</sup>Book of Wills, vol. 4, pp. 61-64.

<sup>117</sup>Book of Wills, vol. 4, pp. 101-103.



build the hull of a vessel of ye trees that is now uppon my lands and to be sould(,) the money to be devided" among his wife and children.<sup>118</sup>

Other shipowners contributed the skilled and unskilled labor which transformed a forest of cedar into suitable construction materials. The inventory of William Cox of Devonshire, boat- and shipbuilder, includes two sets of carpenter's tools, a pit saw, 927 feet of 1" cedar plank, 405 feet of 3/4" cedar plank,<sup>119</sup> 36 small boat timbers, 86 large boat timbers, 3 pieces of boat stems, 87 sloop timbers, 1 stern post and 2 "after bends" for a sloop, 9 trees "not yet squared," 1 frame of a boat (16 feet long), and 20 pounds of tallow.<sup>120</sup> Doubtless his four male slaves were employed in converting cedar trees into the planks, timbers and framing pieces to be incorporated into sloops and sailboats.<sup>121</sup>

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<sup>118</sup>Book of Wills, vol. 5, p. 1-3.

<sup>119</sup>In contemporary shipwright manuals, planking is usually defined as being at least 1 1/4 inches thick. Cox's inventory reveals that Bermudian shipbuilders were using much thinner wood as planking, probably due to the relatively small size of the vessels they were building and the difficulty in warping thicker pieces of cedar prior to attaching them to the ship's frame, especially below the water line.

<sup>120</sup>In The Search for Speed Under Sail, Howard Chapelle mentions that melted tallow mixed with whitewash (powdered limestone) served as a cheap substitute for paint. The whitewash-tallow coating was applied to the exterior of the hull below the water-line to extend the life of a vessel (p. 14). Cox's will (Book of Wills, vol. 4, pp. 128-34) mentions a lime kiln on his property. Given the large amount of tallow which was imported into Bermuda and the abundance of native limestone which was regularly converted into lime for land construction, the application of tallow-whitewash coatings on vessels built on the islands was probably widespread and might have been an important factor in the longevity of Bermudian sloops.

<sup>121</sup>The values of Cox's man "Harry" and his boy "Sam," at L 40 and L 25 respectively, would indicate that they were skilled labor. Cox owned 1/3 of the Lilly, worth L 133, which was at sea at the time of his death. Debts due

Other shipowners provided the land on which the ship was constructed and the timber, but hired Bermudian shipwrights to construct the vessels for them. Captain John Harford's will, dated 1711, revealed that he was "one third owner of the sloop now in building at my landing place" in Smiths Tribe.<sup>122</sup> John Morris, a shipwright living in Devonshire, worked for a number of prominent shipowners, including George Hubbard, William Williams, and Samuel Sherlock. His inventory listed four axes, 9 new adzes, 39 boards, 6 planks, assorted lumber and chalk, 125 timbers and 5 adult male slaves: Dick (L 25), Bacti (L 30), Young Dick (L 30), Will, a carpenter (L 45) and Prupo, a mulatto (L 40). His assets, not including his house and land, amounted to L 643.18.8.<sup>123</sup>

Although most of the Bermuda shipbuilding industry could be supported by the island's physical resources and labor, there still remained a number of vital ingredients which had to be purchased abroad. While cedar served admirably for hull planking and framing materials, it was too soft for decking and was too brittle and grew too short to make for good masts, booms, bowsprits, or spars. As the industry grew during the first half of the eighteenth century, the islands' ability to provide enough cedar for all of the vessels built was pushed to the limit, forcing shipbuilders to import

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to his estate by a Mr. Tatem of Bermuda and a Colonel Browne of Barbados reveal some of Cox's commercial connections.

<sup>122</sup>Book of Wills, vol. 4, pp. 127. He willed his share to his wife Sarah.

<sup>123</sup>Book of Wills, vol. 4, pp. 3-8. Morris did not own shares in any vessels at the time of his death. His connections with Hubbard, Williams and Sherlock are mentioned in the bequests in his will. He seems to have earned a suitable living as a professional shipwright, with his team of skilled slaves, and did not speculate on shipping ventures.

increasing amounts of board, planking, and timber from the Caribbean, the Carolinas and New England.<sup>124</sup>

In addition to wood, the shipbuilding industry also demanded pitch, tar, tallow, and turpentine for treating the planking both above and below the water-line. Iron, lead, brass, and coal had to be imported to produce the hardware necessary to build the framing and operate the ships. Sails, cordage, rigging, and cable were also in demand for operating the vessel and securing it when not in use. Finally, because native cedar was so valuable, firewood had to be imported to maintain domestic households on the islands. The appendix shows Bermuda's net maritime imports in the years 1716, 1734, and 1750, figures which clearly illustrate the growing demands of the shipbuilding industry.

The construction, operation, and ownership of the Bermuda shipping fleet was organized by small corporate partnerships shaped by kinship ties and common economic interests and greatly aided by slave labor. Because slaves could not demand the high wages paid to skilled shipwrights and

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<sup>124</sup>Bermuda's increasing demand for shipbuilding wood, most notably pine, oak, and mahogany, occurred at approximately the same time as the development of timber exploitation in northern New England (New Hampshire and Maine) and in the Carolinas. Bermudian masters found processed board and planking waiting for them at many Southern and New England ports, saving them the trouble of converting wood into boards and planks and thus maximizing cargo space aboard their vessels. For more information on the development of colonial timber exploitation, see Charles Carroll, The Timber Economy of Puritan New England (Providence: Brown University Press, 1973), Thomas Cox et. al., This Well-Wooded Land: Americans and their Forests from Colonial Times to the Present (Lincoln: University of Nebraska Press, 1985), and Timothy Silver, A New Face on the Countryside (New York: Cambridge University Press, 1990).

carpenters in other colonies, construction costs were minimized. Similarly, shipowners and masters employing their own slaves as crew for their vessels saved considerably on operating expenses once the sloop was employed in the carrying trade. Family ties, considerable personal freedom, and the comparatively mild treatment of slaves on Bermuda kept slave-sailors from escaping in foreign ports. Master-owners, who commanded approximately one-half the ships in the Bermuda merchant fleet in any given year, not only served to further minimize operating costs but also acted as financial managers while their vessels were trading. They were in charge of disposing the sloop's cargo to the best advantage and determining where the vessel would then proceed, and with which commodity in its hold. Bermudian masters, who called at large number of colonial ports, maintained their own financial information network which established the purchase and selling price of a variety of commodities in all the colonial ports. The fact that owners also served as masters further supports the notion that Bermuda sloops were of extremely high-quality construction; the fortunes and even the life of the builder and/or owner depended on the ship's ability to perform in all types of weather.

The construction of the Bermuda sloop was the product of the business partnership which eventually owned the vessel. The financial support underlying the ship's construction took many forms. In some cases, owners donated cedar trees toward the building of the sloop. Others donated labor, either in the form of their own experience as shipwrights or indirectly through the labor of their slaves. Still others provided capital to hire an independent Bermudian shipwright or to purchase material which were not available locally. Although the organization of Bermuda's commercial network, both within the islands and inter-colonially, deserves much greater attention, this

cursory investigation has revealed a high level of complexity and sophistication which might rival any of London's trade syndicates.

### Conclusion

Beginning in the closing decades of the seventeenth century and continuing through the early nineteenth century, Bermuda was a substantial shipbuilding center. An earlier emphasis on tobacco agriculture and legal barriers place by the Somers Island Company had hindered the development of a shipbuilding industry and a shipping fleet before the 1680s. When tobacco ceased to be a profitable commodity, many of the islands' elites adeptly made the transition from an agricultural to a maritime economy by training their slaves to build and sail ships, growing cedar trees or West Indian provisions on their land, and becoming masters on their own vessels in order to supervise their ventures directly. Bermudian trade connections were probably largely based along kinship lines, since two major out-migrations in the 1650s and 1730s resulted in friends and relatives establishing themselves in many Caribbean and American ports.

Bermuda benefited greatly from its geography, both in terms of its physical location in relation to the American and Caribbean commercial community and its climate and local environment. Bermuda was centrally located; sloops could reach any port in America or the Sugar Islands in a matter of days. In times of war, foreign vessels had to pass within forty miles of Bermuda while enroute to Europe because of prevailing winds and currents, making it an ideal location for privateering. Bermuda's many reefs and natural harbors served to protect the islands from foreign invasion and to shelter its merchant fleet. Warm weather allowed shipbuilding to continue year-round, with many yards producing two or more ships a year. The Bermuda cedar was a unique part of the local environment; its wood helped to

make the Bermuda sloop a superior vessel. Cedar's light weight allowed Bermudian shipwrights to build larger, faster vessels than those being built on the American continent. Both design and construction produced official listings which underestimated tonnage, which helped the Bermudian shipowner by minimizing duties and taxes. Since cedar suffered very little shrinkage, shipbuilding wood did not have to be seasoned for six months, a factor which hamstrung shipbuilding elsewhere. Most importantly, cedar's resistance to decay and parasites resulted in a vessel which had a life span at least double that of vessels made in England or America.

Once firmly established, the shipbuilding industry remained remarkably consistent. Two trends identified in this study were a steady increase in the size of the vessels built and a slow but steady rise in the number of vessels built each year, peaking in the 1770s. Although sloops were by far the dominant type of vessel built, the industry exhibited a growing degree of diversity by the middle of the eighteenth century, with a growing number of schooners being built. The ships that composed Bermuda's merchant fleet were all relatively new, within five years of construction. Shipowners sold their old sloops as soon as they completed a new one. Even used, these vessels fetched double the price of a English or American craft of comparable size.

The institution of slavery contributed greatly to the development and operation of the shipbuilding industry.<sup>125</sup> Bermuda's early agricultural

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<sup>125</sup>Conversely, the organization and demands of the shipbuilding industry shaped Bermudian slavery in a number of important ways. The works of James Smith and Cyril Outerbridge Packwood, while providing a useful starting point for the study of Bermudian slavery, do not begin to do justice to the complexities of Anglo-slave relations on the islands in the seventeenth and eighteenth century. The skills and mobility which male slaves possessed and the constant interdependence that characterized master-slave relations aboard ship created an institutional slavery which was very

economy had brought a substantial number of slaves to the islands. A healthy climate and mild treatment had further increased the slave population. With the decline of farming, owners shifted the labors of their slaves to maritime activities which included building and sailing sloops. They saved considerable expenses by not having to pay the wages that skilled craftsmen in other colonies commanded. Slaves were also available to work year-round and participated in a wide range of activities related to ship construction. Those slaves who served as crew on their owners' ships were highly valued by their masters, well treated, and tied to Bermuda through wives and children, all factors which prevented their flight in foreign ports.

This study has barely scratched the surface of the rich maritime history of Bermuda. Many avenues of research remain open to scholars. These include the privateering activities of Bermudian masters, provisioning the islands' populace, defining the commercial network in which Bermudian merchant-shipowners functioned, particularly the relationships between Bermudians and their agents in foreign ports, and a more thorough exploration of the decline of the shipbuilding industry. The shipbuilding "revolution" of

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different from practices in urban port cities (see Gary Nash, The Urban Crucible), the Southern colonies, and the Caribbean. The experience of female slaves more closely parallels the lives and labors of white Bermudian women; a larger social history devoted to the separate spheres of maritime men and local ladies would not only reveal the vastly different lives each experienced, but would also help to define work-roles and inter-relationships within the slave community. The slave narratives of Mary Prince, who was born in Bermuda, and Olaudah Equiano, who spent several years as a sailor, offer us a glimpse into the experiences undoubtedly shared by many Bermudian slaves (see Henry Louis Gates (ed.), Classic Slave Narratives (New York: Mentor Books, 1987)). Future research on Bermudian slavery has rich potential, given the wealth of documents lodged in the Bermuda National Archives and the volume of recent scholarship devoted to contemporaneous slavery in other British colonies.



the 1680s and 1690s undoubtedly had widespread effects on the social institutions and older economic organization of Bermuda which had developed around an agricultural economy. Determining the impact this transition to a maritime economy had upon Bermudian society is the next logical step in pursuing a more complete understanding of Bermudian colonial history. Bermuda, the neglected child of the British Atlantic colonial community, is finally receiving some of the attention its rich history deserves.

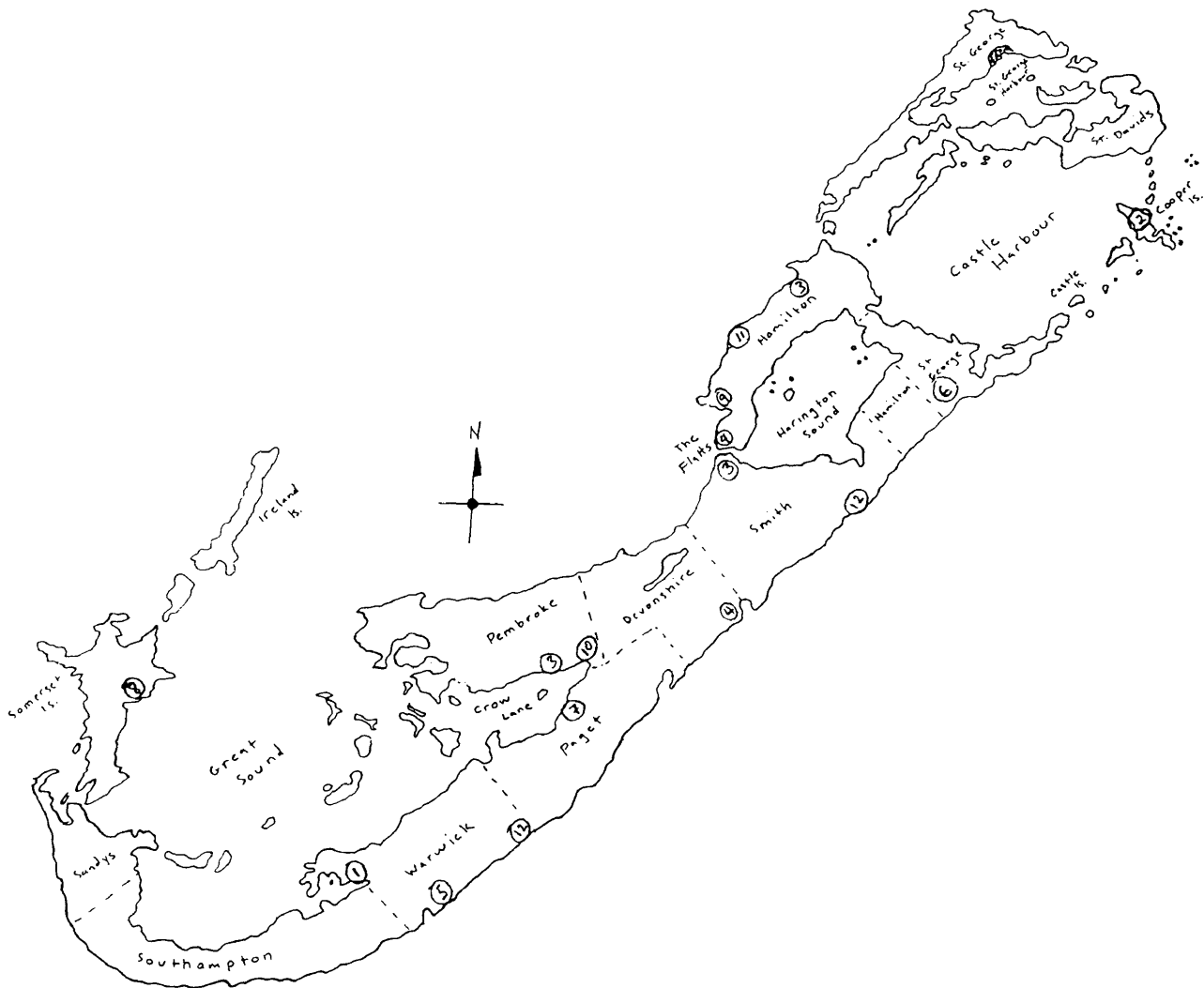


Figure 1. Bermuda in the late seventeenth century, showing the land holdings and possible origins of vessels built by 1) John Darrell, 2) David Ming, 3) Perient Trott, 4) John Stowe, 5) John Wentworth, 6) George Tucker, 7) Phillip Lea, 8) John Perinchief, 9) Edward Atwood, 10) Anthony Peniston, 11) Samuel Stone, and 12) Hugh Wentworth. (Source: Richard Norwood's 1663 Survey of Bermuda in LeFroy's Memorials, pp. 645-717).

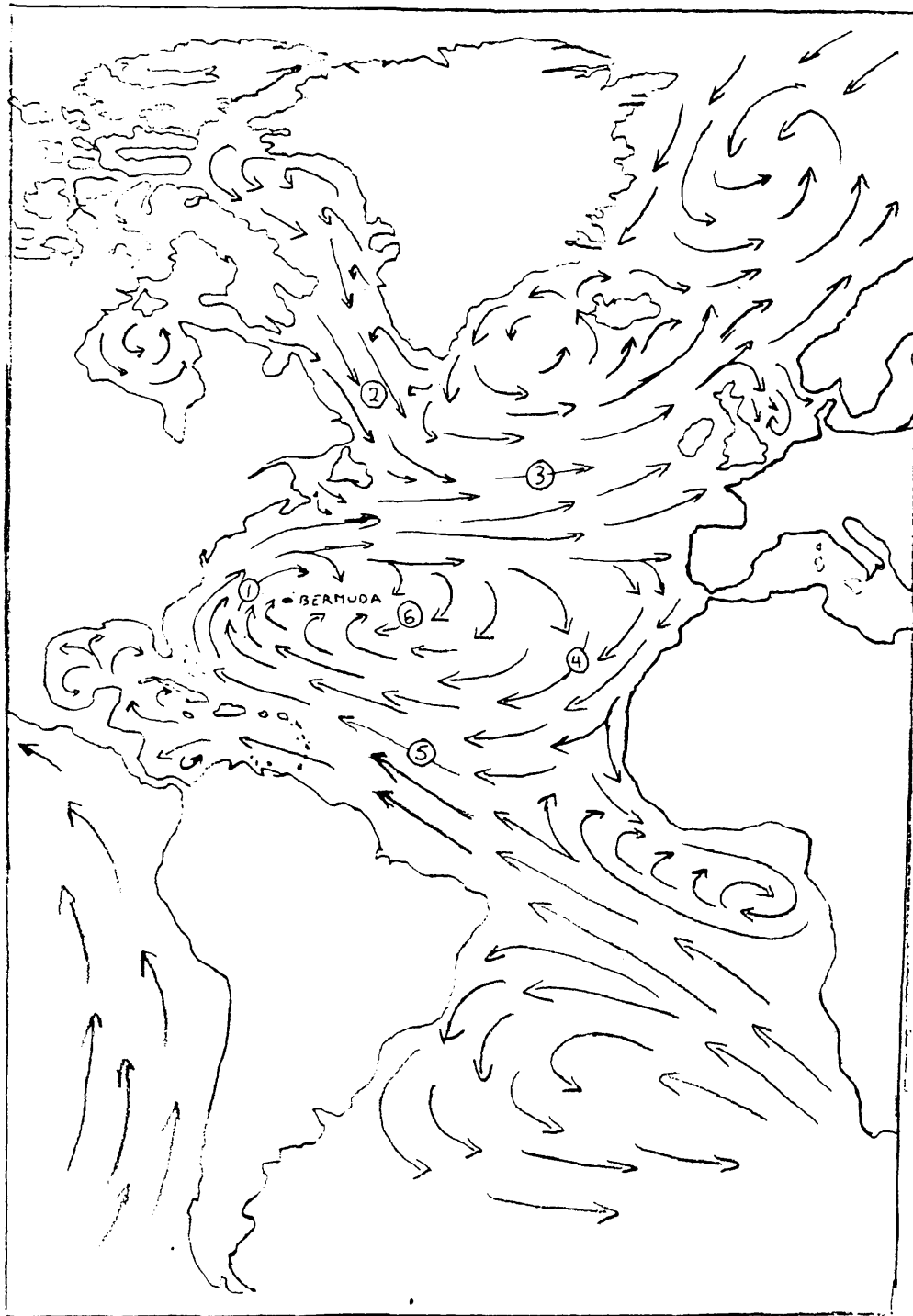


Figure 2. Bermuda in relation to the Americas, Europe, and Africa, showing the prevailing North Atlantic ocean currents: 1) Gulf Stream current, 2) Labrador current, 3) North Atlantic current, 4) Canaries current, 5) North Equatorial current, and 6) the Sargasso Sea. (Source: The World Book Atlas, plate 72).

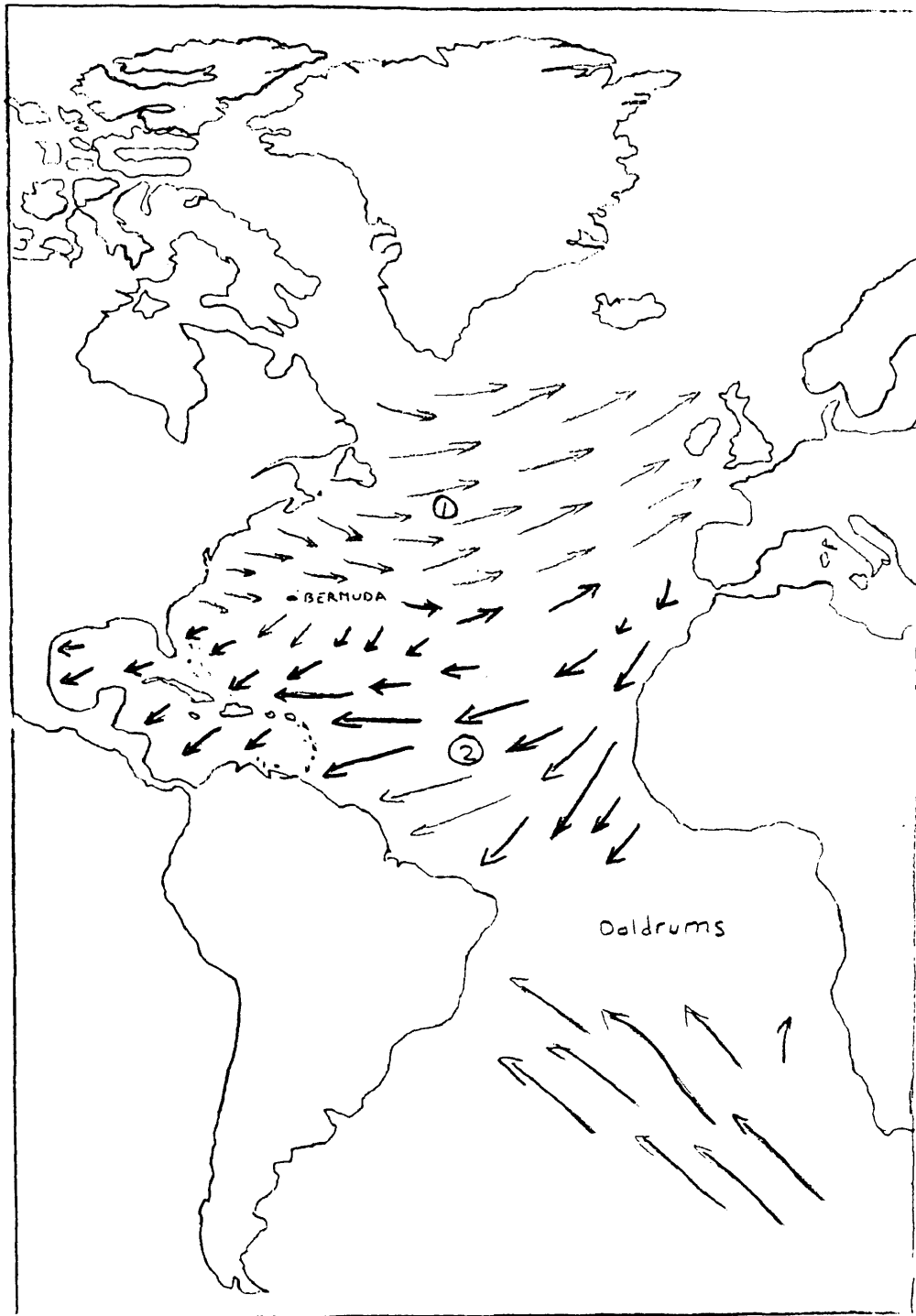


Figure 3. Predominant wind patterns in January: 1) Westerlies, 2) Northeast Trade Winds. Note that at this time of the year it is easiest to access the West Indies from Bermuda, but difficult to reach the mainland colonies. (Source: *The World Book Atlas*, plate 72).

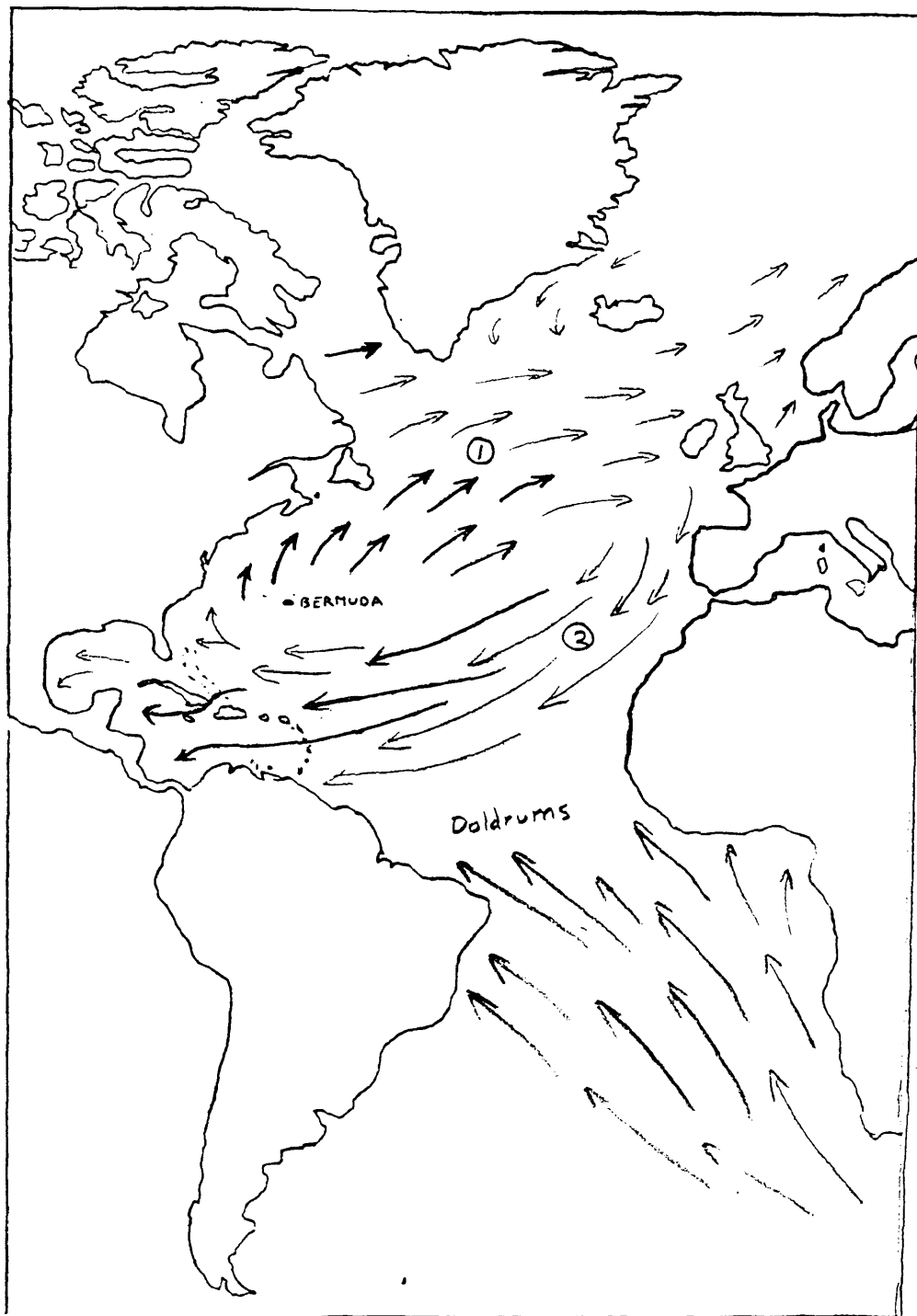


Figure 4. Predominant wind patterns in July: 1) Westerlies, 2) Northeast Trade Winds. Bermudians must now sail across the prevailing winds to reach the Leewards and the Southern colonies. (Source: The World Book Atlas, plate 72).

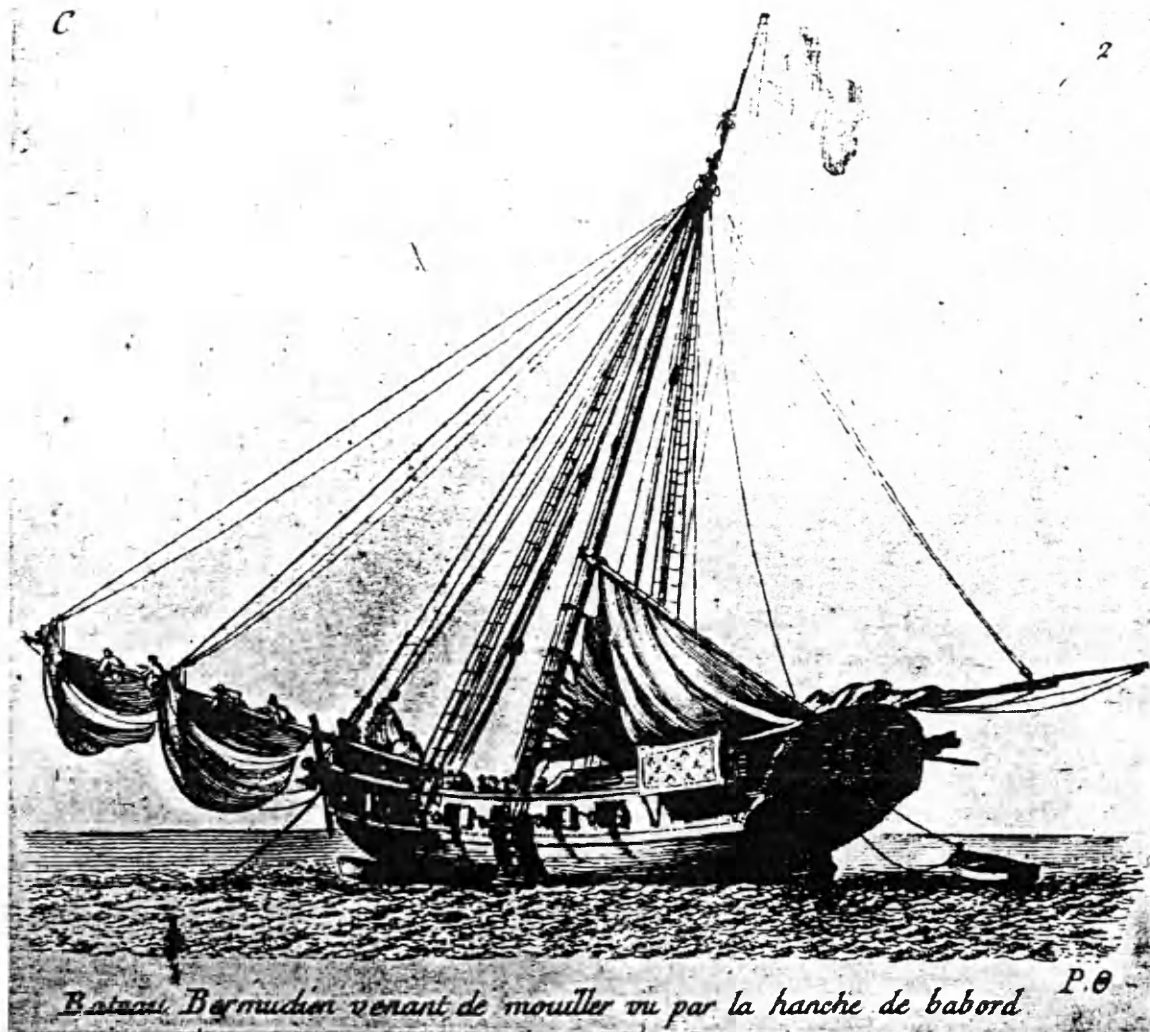
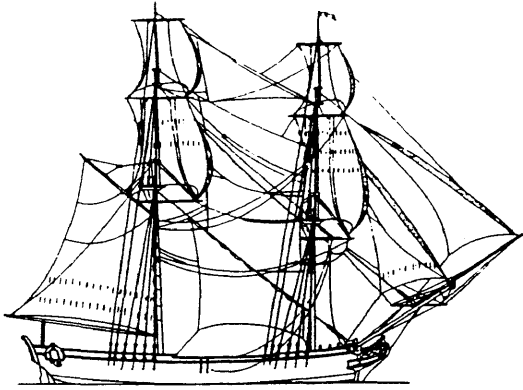
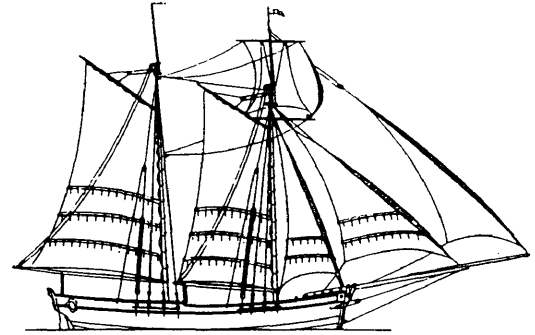


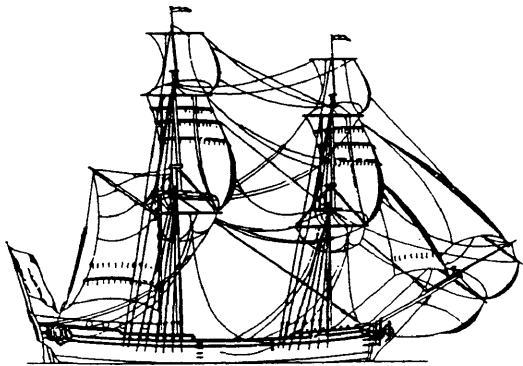
Figure 5. A Bermuda sloop of the early eighteenth century. (Source: Wilkinson, Bermuda in the Old Empire).



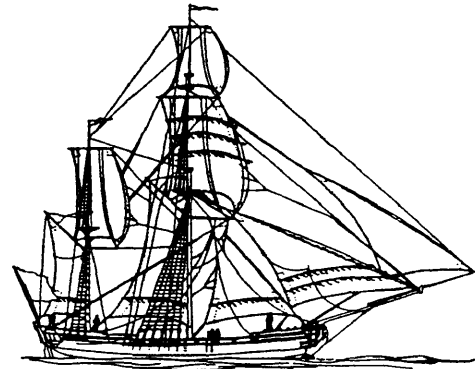
Brig: two masts (fore and main) with square sails on both masts. A brig is basically a shortened ship without a mizzenmast. A brigantine was a variation of a brig in that it had square sails only on the foremast.



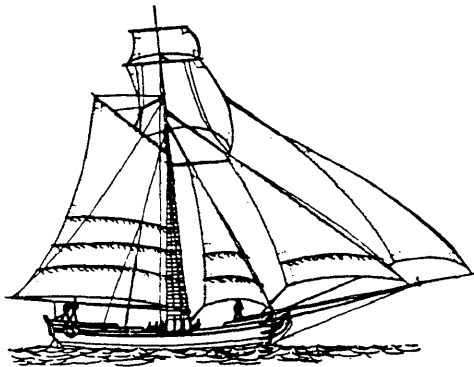
Schooner: two-masted vessel with fore and aft sails. Some carried additional small square sails on the foremast and were called "topsail schooners." At first glance, a topsail schooner would appear similar to a brig or brigantine, but, on closer examination, the sharper rake or slant of the schooner's masts and the narrower flush-decked hull would be apparent.



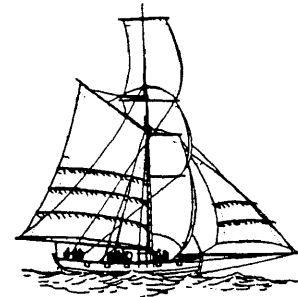
Snow: same as a brig but with a small pole mounted about a foot behind, or abaft, the mizzenmast for carrying the spanker, or gaff-rigged sail, on that mast.



Ketch: similar to a ship, but without a foremast. A ketch is similar to a brig, except it has a main and mizzenmast instead of a fore and mainmast, but the masts are placed further aft on the hull. Ketches were usually employed as warships with mortars in place of the foremast, and until about 1700 as ocean fishing boats.



Sloop: single-masted vessel with either square or fore and aft sails including a large-gaff-rigged spanker and often a jibboom on the fixed bowsprit; this inclined upward at a sharper angle than the cutter's, which did not have a jibboom.



Cutter: similar to a sloop, but with a running bowsprit, and no quarterdeck.

Figure 6. Sailing vessels of the seventeenth and eighteenth centuries. Note that the sloop pictured represents the New England design, without the raked mast typical of Bermudian sloops. (Source: P.C. Coker III, Charleston's Maritime Heritage, 1670 - 1865, pp. xiii-xvi).

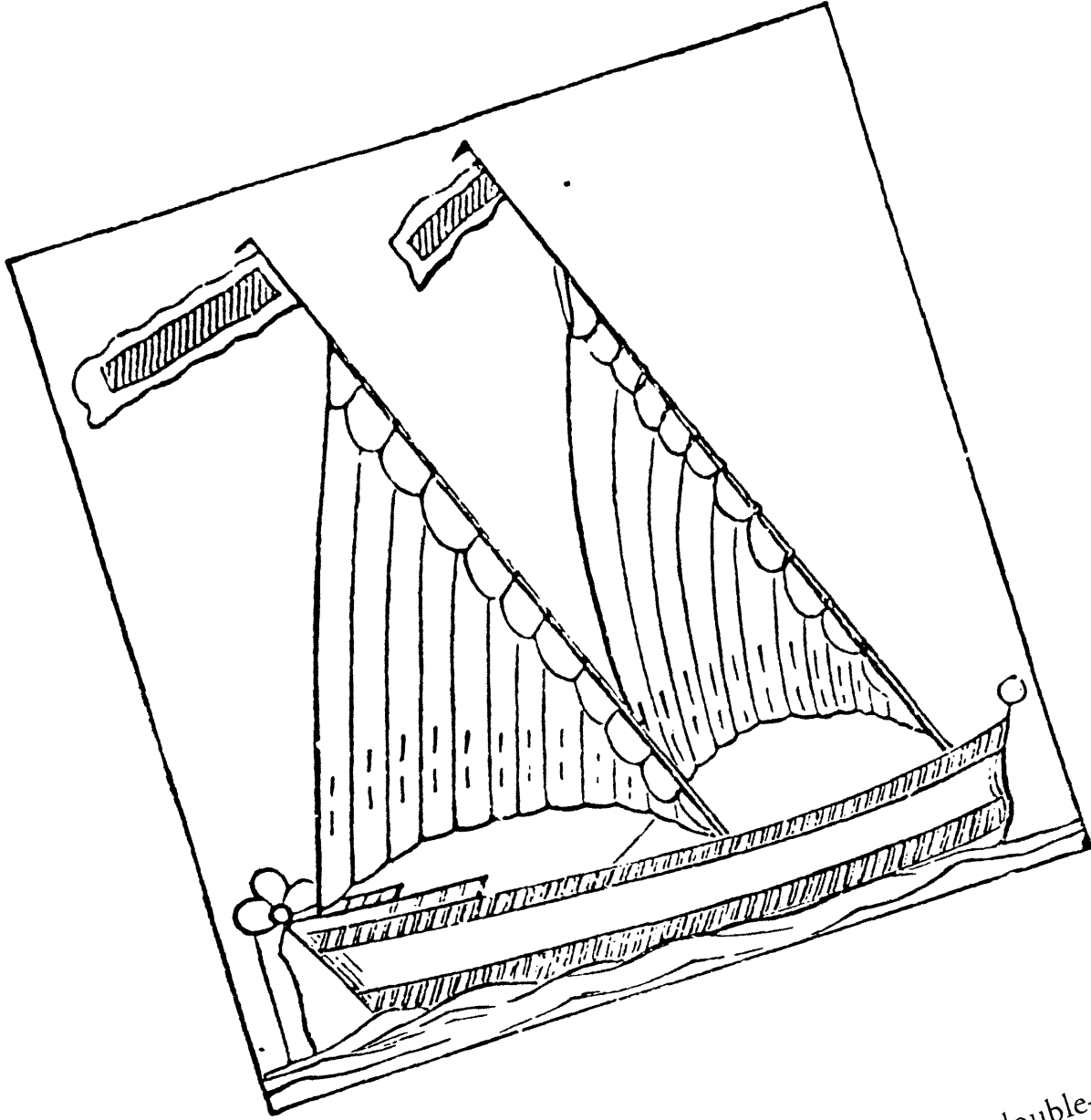


Figure 7. A sketch of a seventeenth-century Bermudian double-masted fishing or tobacco boat. Note the sharp rake of the masts. (Source: John Hardy, A Description of the Last Voyage to Bermudas in the Ship Marigold, S. P. Commander).



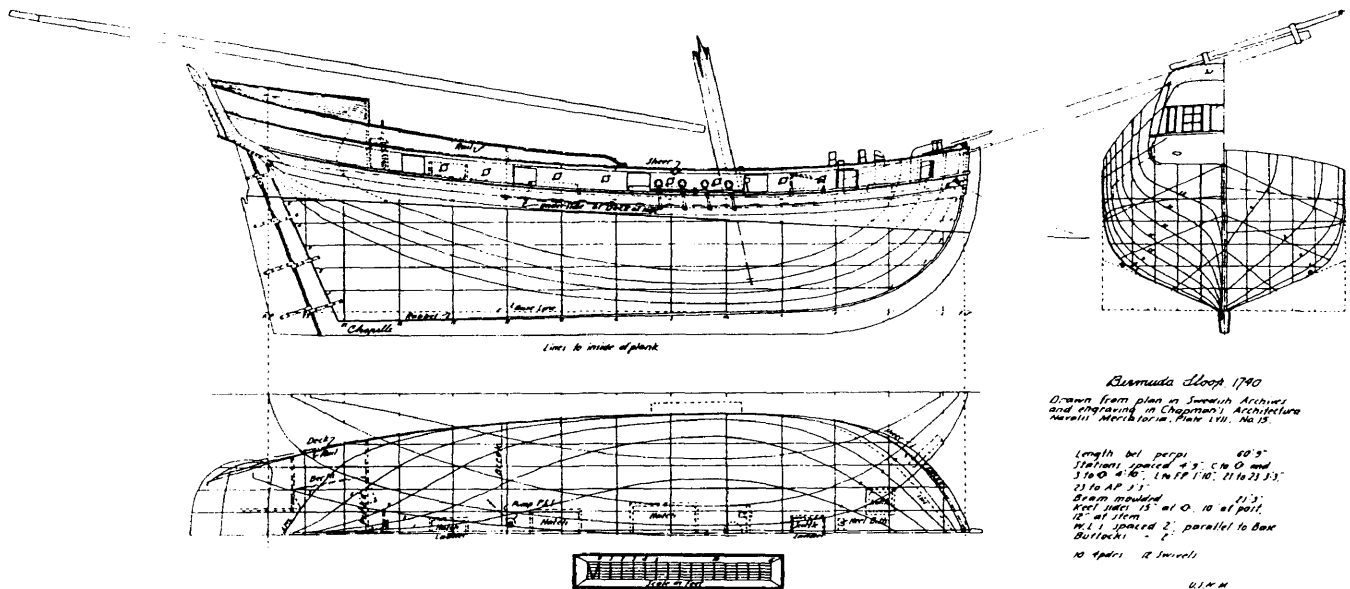


Figure 8. Swedish naval architect Fredrik Henrik ap Chapman's draft of a 1740s Bermuda sloop. (Source: Howard Chapelle, The Search for Speed Under Sail, plate 8).

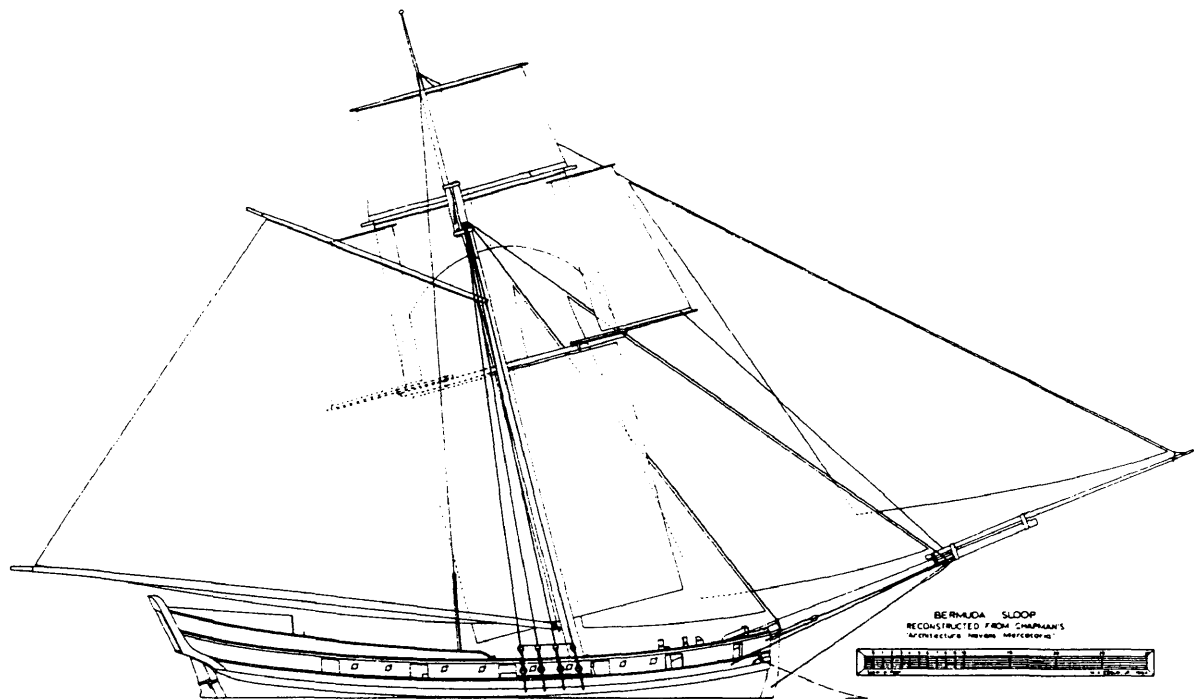


Figure 9. Rigging for the Chapman model sloop, as reconstructed by Howard Chapelle. (Source: Chapelle, The Search for Speed Under Sail, plate 9).

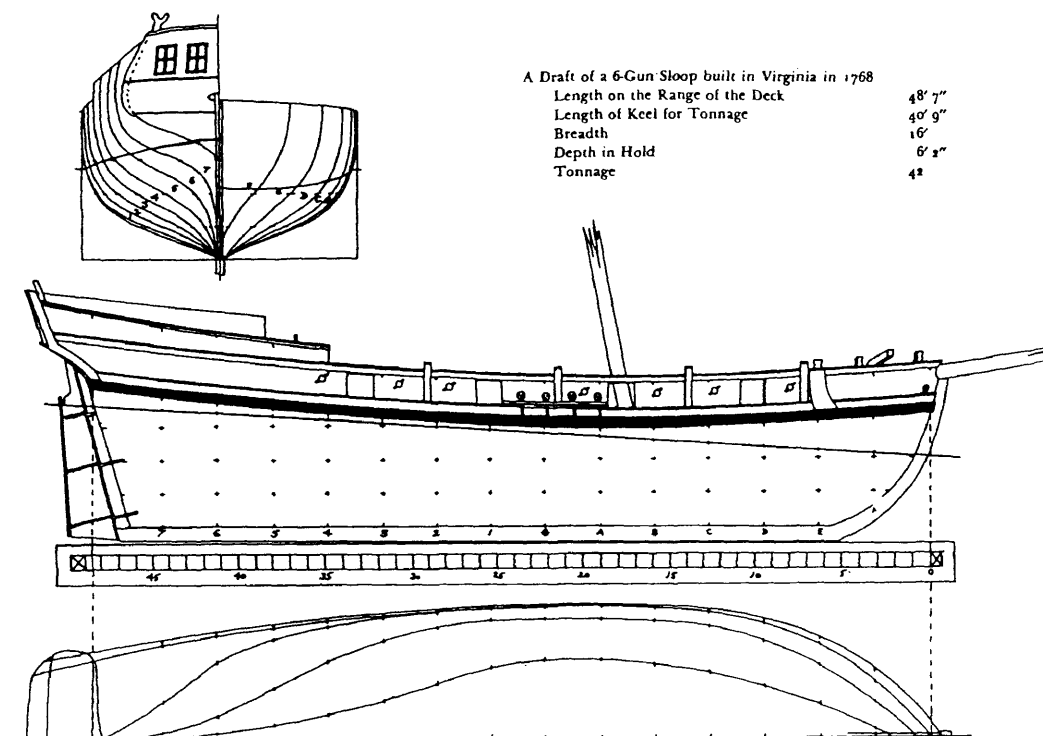


Figure 10. Draft of a Virginia sloop built in 1768. This vessel, although wider in breadth, bears a striking resemblance to the mature Bermuda sloop. American shipbuilders adopted many aspects of the Bermuda hull design in the 1750s and 1760s. (Source: John Fitzhugh Millar, American Ships of the Colonial and Revolutionary Periods, p. 343).



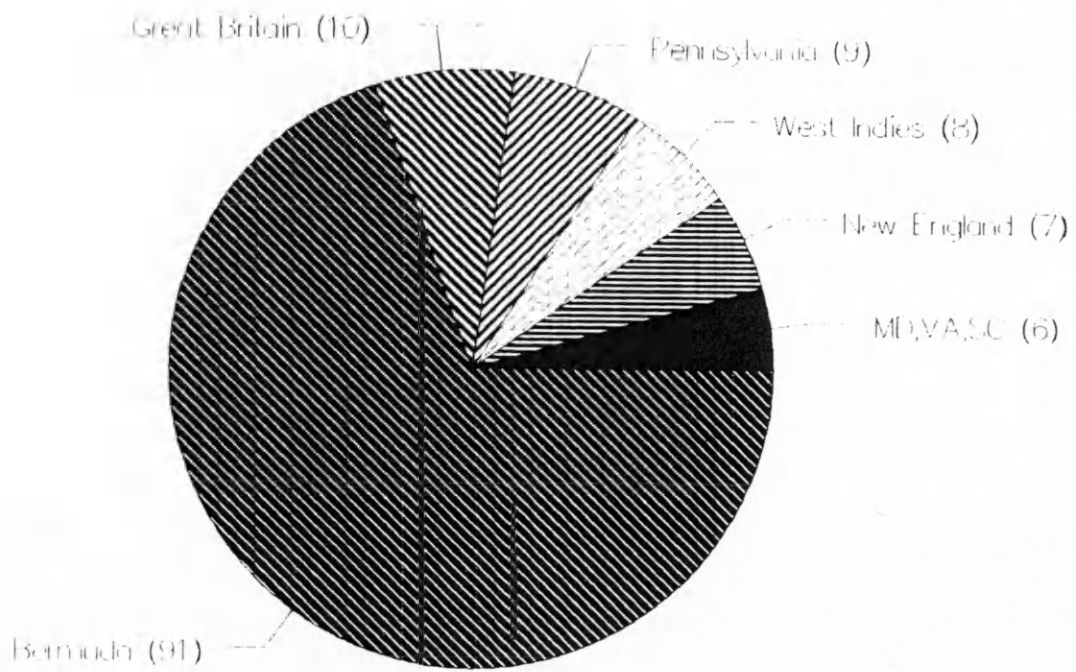


Figure 12. Registry of vessels calling in St. George's in 1716.

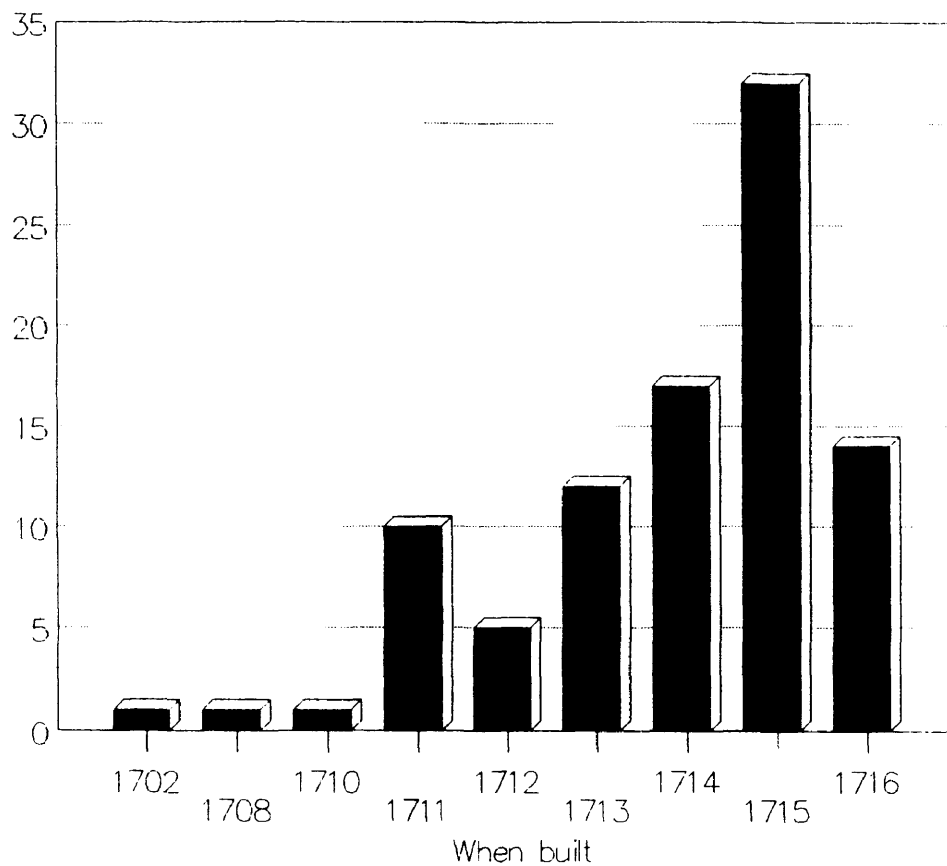


Figure 13. Ships built in Bermuda actively trading in 1716, by year. Note that in 1712, at least 12 Bermuda vessels had been captured by pirates and privateers in the West Indies.

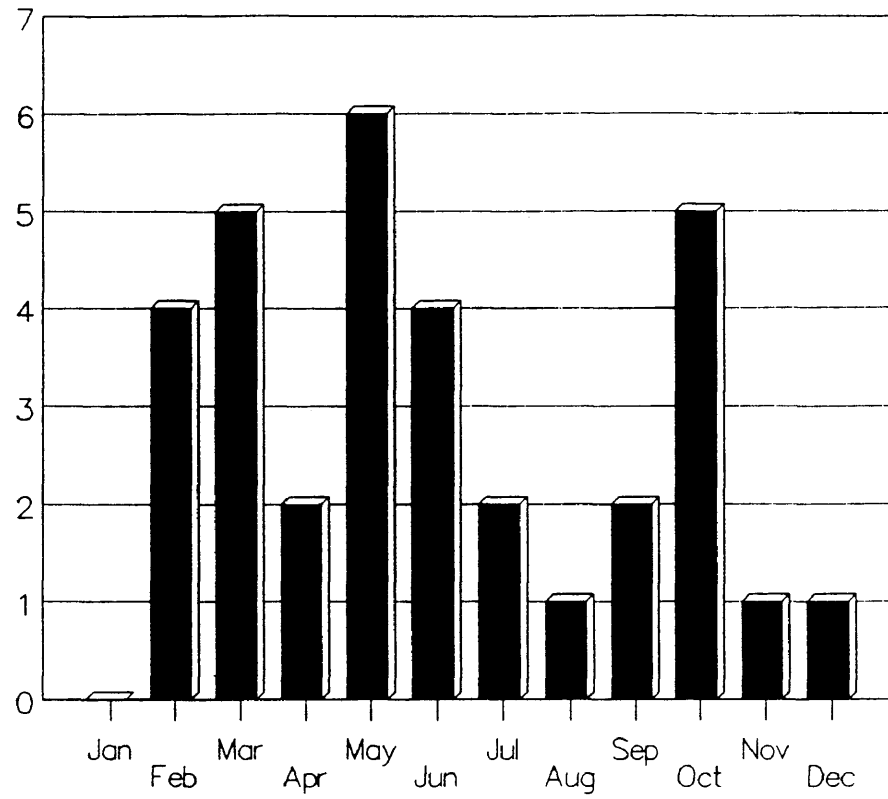


Figure 14. Ships built in Bermuda in 1715, listed by month launched.

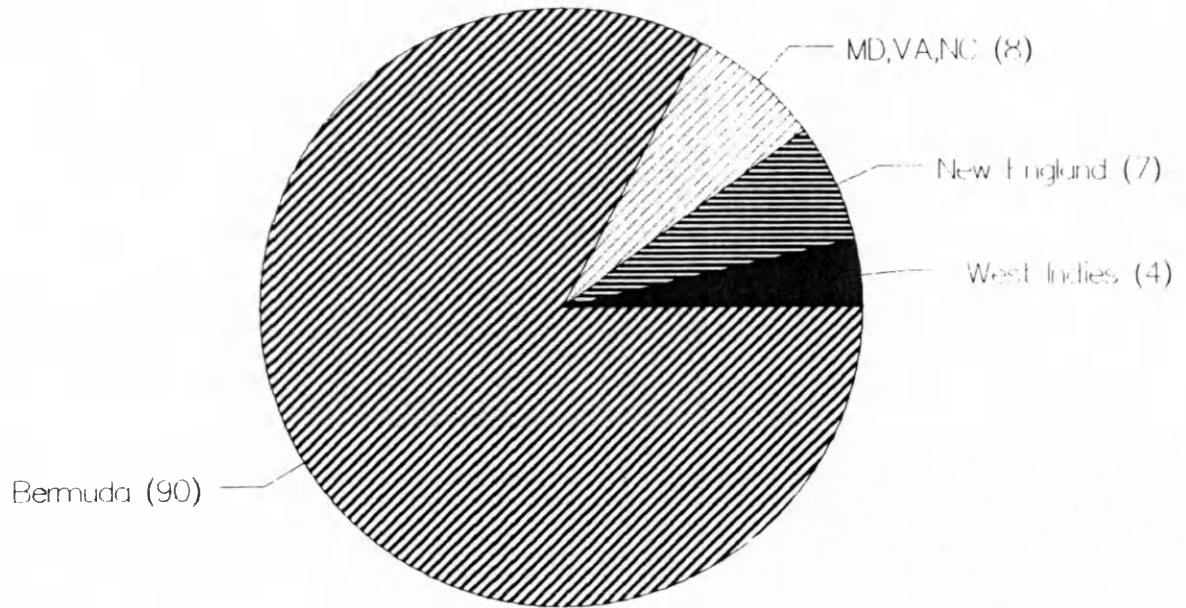


Figure 15. Registry of ships entering and/or clearing St. George's in 1734. Note the decline of vessels from the Middle colonies and Great Britain since 1716.



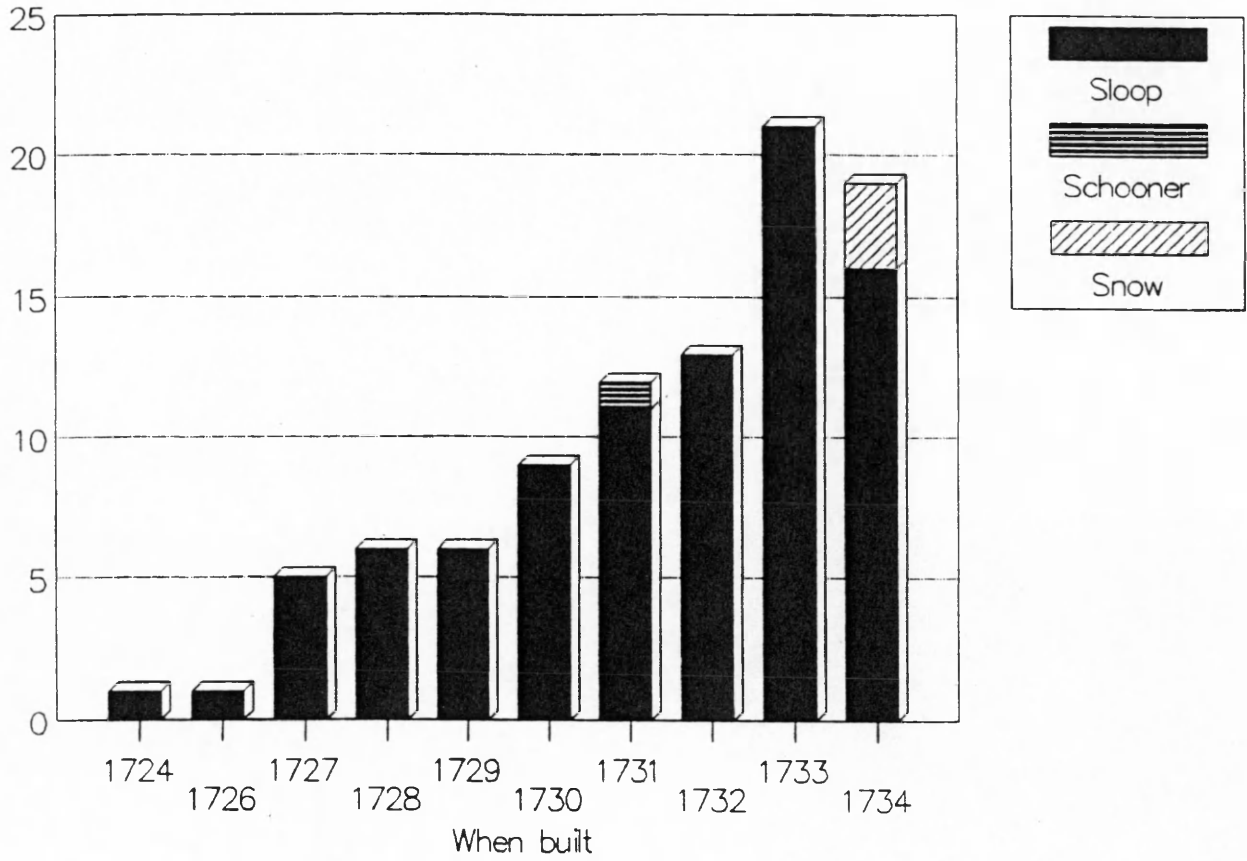


Figure 16. Ships built in Bermuda actively trading in 1734, by year built.

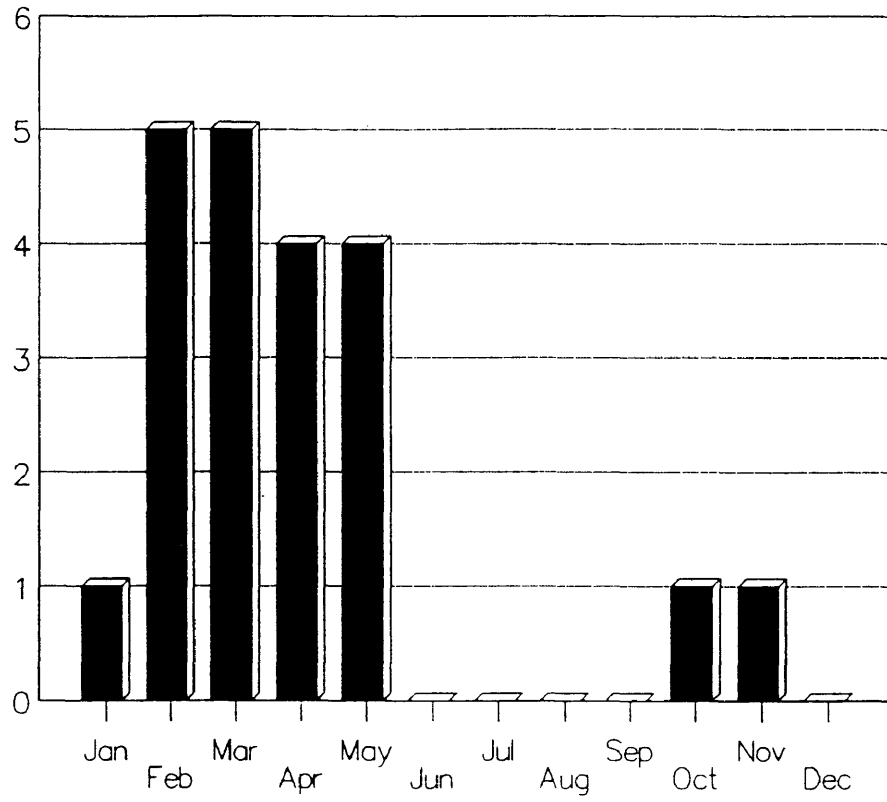


Figure 17. Sloops built in 1733, by month launched.

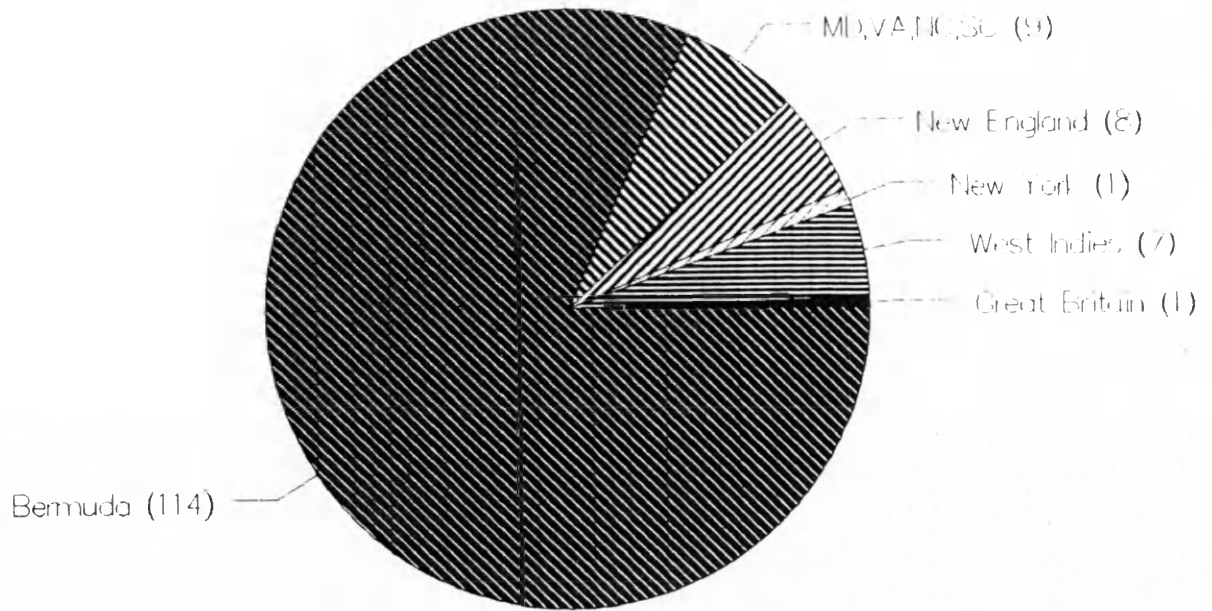


Figure 18. Registry of vessels entering and/or clearing St. George's in 1750.

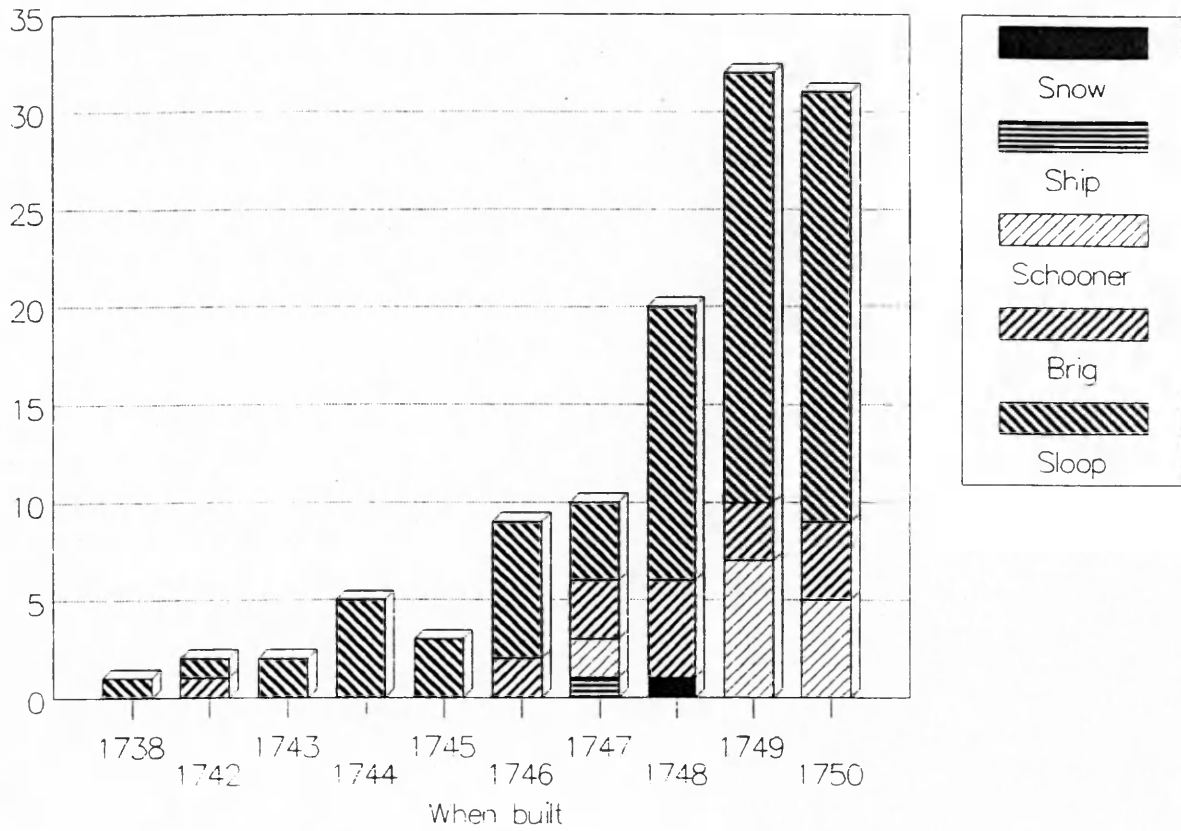


Figure 19. Bermuda-built vessels actively trading in 1750, by year. Note the diversity of vessel types.

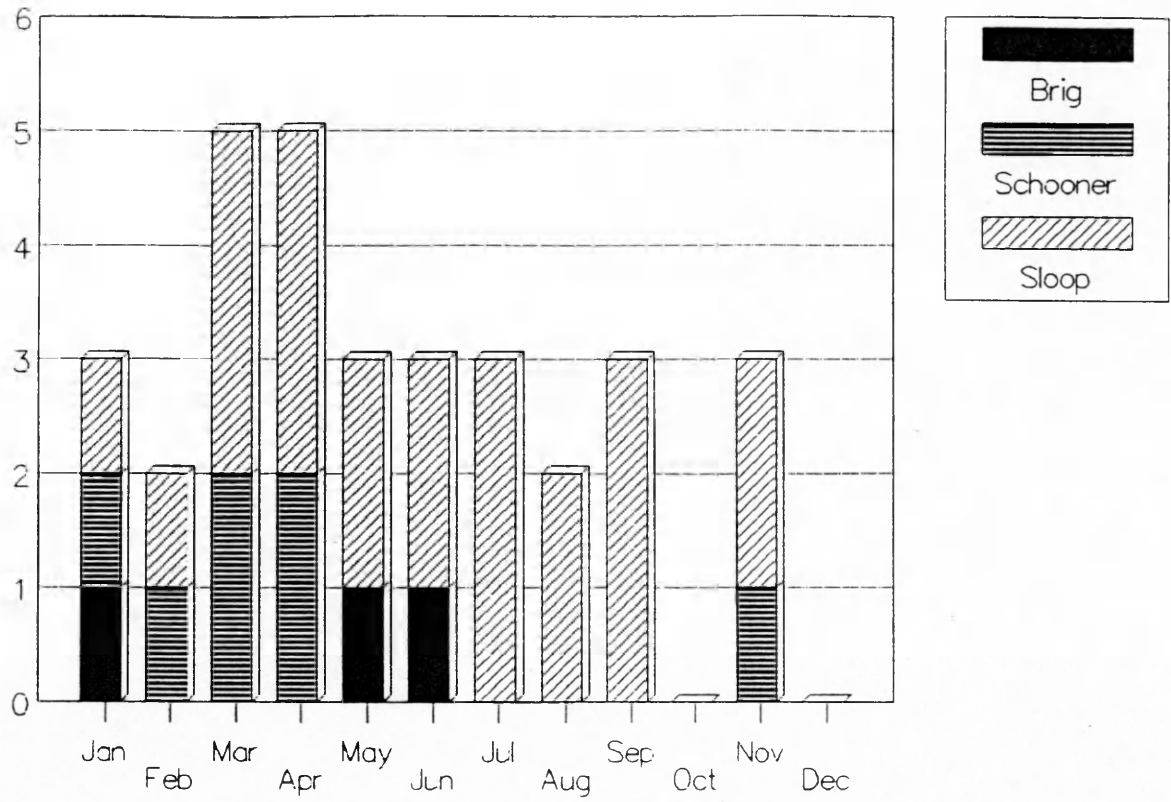


Figure 20. Vessels built in Bermuda in 1749, by month launched.

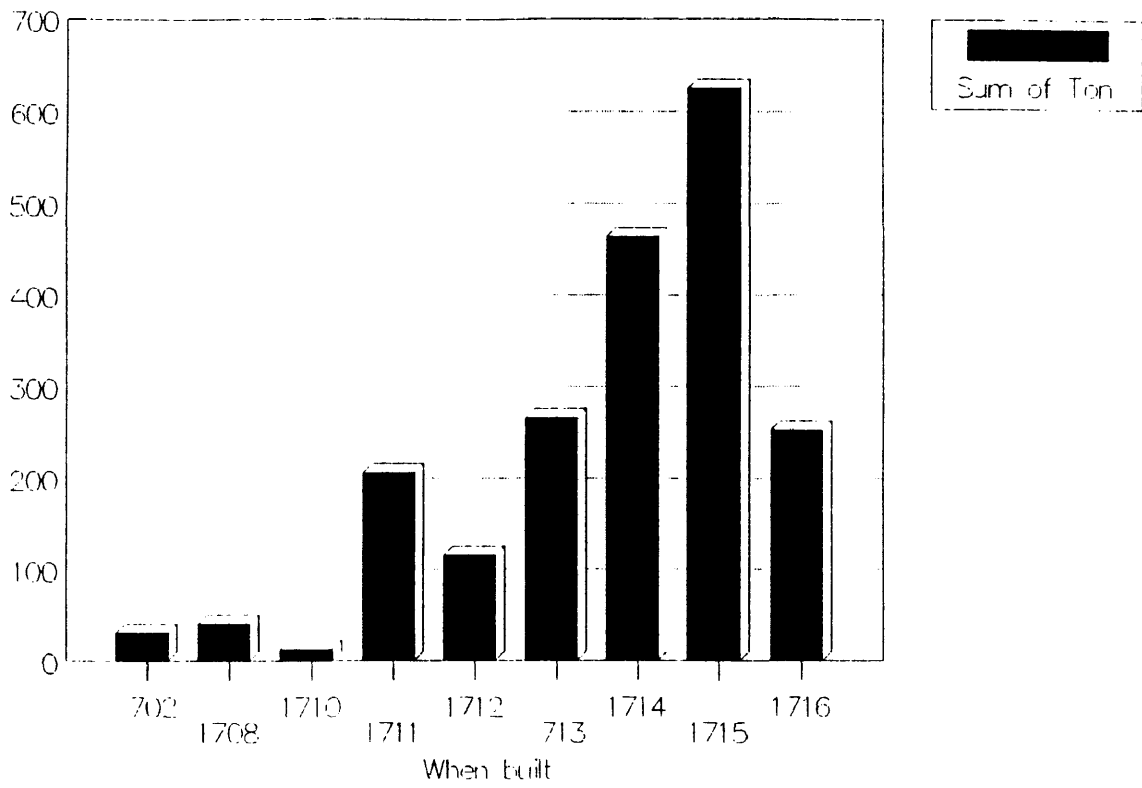


Figure 21. Tonnage of Bermuda-built vessels of the 1716 Bermuda shipping fleet, by year built.

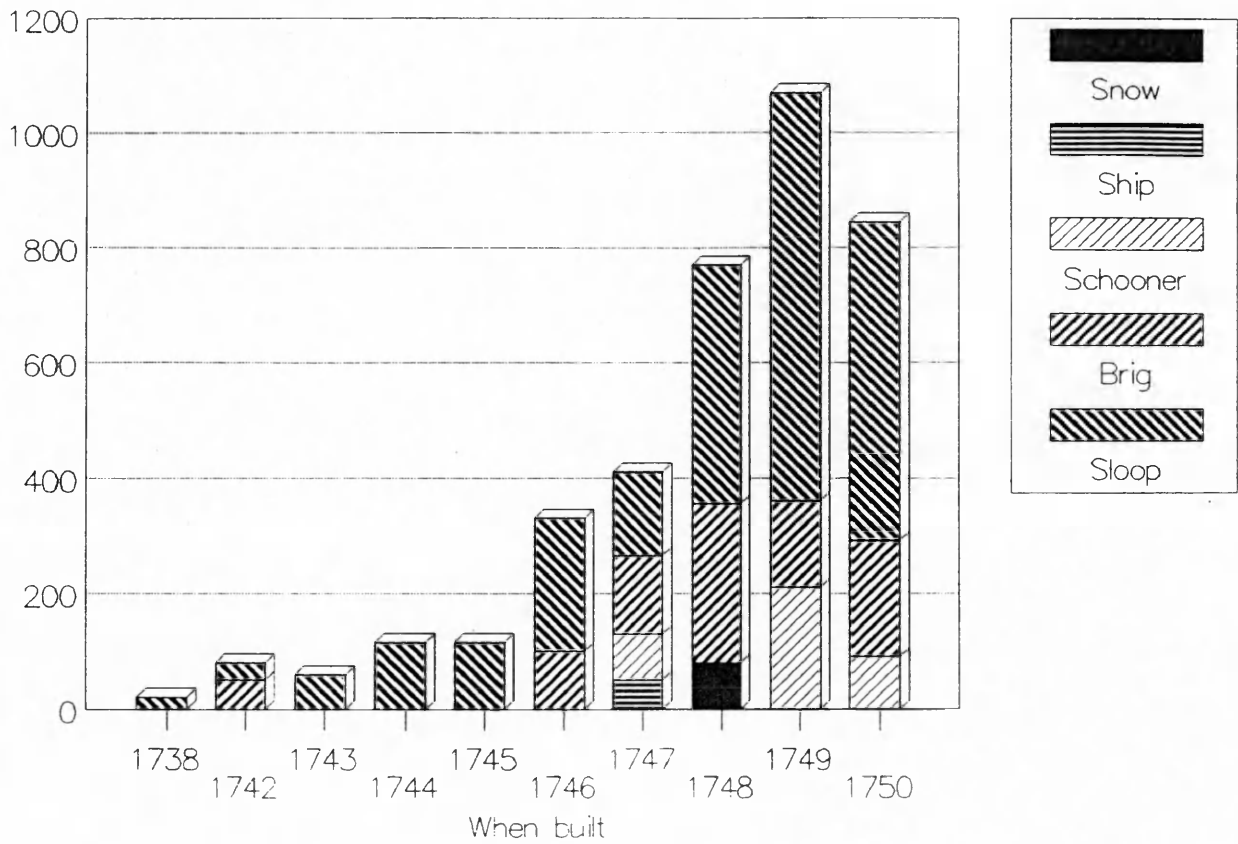


Figure 22. Tonnage of Bermuda-built vessels of the 1750 Bermuda shipping fleet, by year built.

## Appendix

Bermuda's Net Maritime Imports <sup>126</sup>

<u>Item</u>	<u>1716</u>	<u>1734</u>	<u>1750</u>
anchors	3	3	12 (6 Large)
boards, total	52,250 ft.	73,800 ft.	132,726 ft.
pine		61,800 ft.	65,750 ft.
cedar			202 ft.
mahogany			7,080 ft.
oak			4,000 ft.
booms	33	24	32
bowsprits	33	24	28
blocks shipbuilding <sup>127</sup>			552 + 200 ft
deadeyes		8 sets	310 + 2 sets
cable		4 sets	5 sets
cordage	5 coils	150 + coils	23 coils + 7214 ft.
coal	15 hogsheads	21.5 chalders	17 chalders
iron	2.5 tons	7.25 tons	17 tons
lumber (total)	35 tons	118,600 ft.+ 50 tons	51,300 ft.+ 90 tons
Braziletto/ firewood	13 tons	50 tons	78 tons
Madeiras			3 parcels <sup>128</sup>

<sup>126</sup>This chart represents the total quantity of goods which were imported for use on Bermuda. Items which arrived and were re-exported to other colonies have been deducted. The total amount of wood products and iron most likely exceeded the demand of the shipbuilding industry; some of the wood undoubtedly went toward supporting the construction of furniture and buildings on the islands. Iron was used in tools as well as in architectural hardware. Source: C.O. 41, vol. 6-7.

<sup>127</sup>Shipbuilding blocks refers to the timber used to support the frame of the vessel as it is constructed. Deadeye/blocks refer to the system of pulleys which control the vessel's rigging.

<sup>128</sup>A parcel was a seventeenth-century measure of wood similar to a cord, measured in a commercially established number of feet of wood which



<u>Item</u>	<u>1716</u>	<u>1734</u>	<u>1750</u>
cedar			22 tons
masts	38	38	70 + 4 sets
mast-hoops		32	48
pitch	199 barrels	112 barrels	39 barrels
plank (total)	3000 ft.	53,570 ft.	35,236 ft. + 3 tons
ash		1,900 ft.	
Madeiras	500 ft.	34,270 ft.	8,476 ft.
mahogany			17,070 ft
oak			970 ft.
pine			4,300 ft.
pumps		19	22 + 2 sets
sails		2 sets + 8 bolts duck	24 bolts duck
spars	22+	173	33 (spruce) + 6 sets
tar	63 barrels	380 barrels	133 barrels
tallow	4 casks + 1,900 lbs.	7 barrels + 17,085 lbs.	51 barrels + 3,200 lbs.
turpentine		29 barrels	29 barrels
timber (total)	2 parcels	43 parcels	193 parcels
		704 pieces	1,518 ft.
		88 tons	
oak	2 parcels	43 parcels	7 parcels
lignum vitae		12 tons	
miscellaneous	rigging	rigging	rigging (2sets)
	powder	6 cutlasses	7 lg.guns
	17 small arms	30 "sloop poles"	3 4-pound cannon
		6 brls. lignum oil	2 gun carriges

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varied according to the wood's thickness. See William Sutherland, The Shipbuilder's Assistant, or Marine Architecture (London: Mount and Davidson, 1726), pp. 17-19.

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