

**THE RIGGING MATERIAL FROM *BOSCAWEN*:
SETTING THE SAILS OF A MID-EIGHTEENTH-CENTURY
WARSHIP DURING THE FRENCH AND INDIAN WAR**

A Thesis

by

ALAN THOMAS FLANIGAN

Submitted to the Office of Graduate Studies of
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Major Subject: Anthropology


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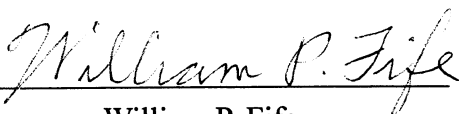
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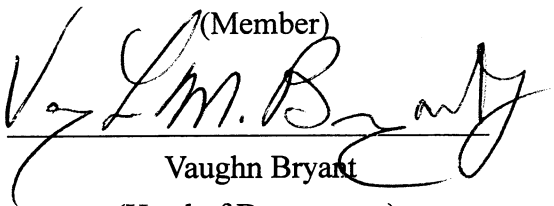
MASTER OF ARTS

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ABSTRACT

The Rigging Material from *Boscawen*:
Setting the Sails of a Mid-Eighteenth-Century
Warship during the French and Indian War. (May 1999)
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To secure English control of Lake Champlain in the final years of the French and Indian War, General Jeffrey Amherst ordered the construction of the brig *Duke of Cumberland* and the sloop *Boscawen*. Within days of setting sail in 1759 these vessels established British naval superiority upon the lake. At the conclusion of the war in 1763, the vessels were removed from service and moored at the King's Shipyard below Fort Ticonderoga. Stripped of their rigging and armament they settled into the muddy bottom of Lake Champlain.

In 1983 the accidental discovery of the sloop *Boscawen* led to its excavation during the next two summers and a multidisciplinary study of the naval architecture, maritime history, and archaeology related to the vessel. The excavation produced over 5,000 artifacts of which the 90 items related to *Boscawen*'s rigging are presented in this thesis. The study of these artifacts has contributed to our knowledge of the rigging of one of the earliest colonial freshwater warships.

ACKNOWLEDGMENTS

Completion of this thesis would not have been possible without the unyielding support and encouragement of my parents and sister. Additionally, I am indebted to my committee members for their assistance, especially my committee chair, Dr. Kevin J. Crisman, for his guidance and patience. Finally, I would like to thank the many professors, colleagues, and friends in the Nautical Archaeology Program for the knowledge and experiences they have shared with me.

TABLE OF CONTENTS

		Page
ABSTRACT		iii
ACKNOWLEDGMENTS		iv
TABLE OF CONTENTS		v
LIST OF FIGURES		vii
CHAPTER		
I	INTRODUCTION	1
II	THE COLONIAL WARS	5
	THE EARLY WARS	5
	THE FRENCH AND INDIAN WAR	9
	1760 AND SERVICE AFTER THE WAR	16
III	EXCAVATING THE SLOOP <i>BOSCAWEN</i>	19
	DISCOVERY OF <i>BOSCAWEN</i>	19
	FORT TICONDEROGA SHIPYARD EXCAVATION	21
IV	THE RIGGING MATERIAL	26
	SPARS	28
	STANDING RIGGING	33
	RUNNING RIGGING	37
	MISCELLANEOUS WOOD ARTIFACTS	52
	SUMMARY OF ARTIFACTS	53
V	THE DEVELOPMENT OF THE SLOOP	55
	TERMINOLOGY	55
	MAINSAILS	61
	HEADSAILS	64
	SQUARE SAILS	65
	SLOOP-RIG	65
VI	RECONSTRUCTING THE RIGGING OF <i>BOSCAWEN</i>	67
	TREATISES ON THE RIGGING OF SLOOPS	67
	SETTLING ON A SLOOP	69
	SPARS	71
	STANDING RIGGING	72

	Page
CHAPTER	
RUNNING RIGGING	72
RIGGING <i>BOSCAWEN</i>	72
VII CONCLUSION	75
REFERENCES	77
APPENDIX A	82
APPENDIX B	83
VITA	139

LIST OF FIGURES

FIGURE		Page
3-1	The <i>Boscawen</i> excavation grid plan	22
3-2	The <i>Boscawen</i> excavation site plan	24
4-1	A concentration of rigging material recovered from the stern	27
4-2	<i>Boscawen</i> 's Mast Step	29
4-3	<i>Boscawen</i> 's Mast Cap	30
4-4	<i>Boscawen</i> 's parrel trucks	31
4-5	Deadeyes	34
4-6	Shroud trucks 02-102, 02-118 and 02-236	36
4-7	A selection of <i>Boscawen</i> 's blocks	38
4-8	The components of a single sheave block	39
4-9	A selection of <i>Boscawen</i> 's sheaves	42
4-10	A diagram of the treatment of a length of rope	49
5-1	Basic and full sloop rigs	56
5-2	Fore-and-aft rigs	62
6-1	<i>Boscawen</i> and <i>Duke of Cumberland</i> at anchor in Lake Champlain	73
6-2	A reconstruction of the rigging plan of the sloop <i>Boscawen</i>	74
B-1	Parrel Trucks 02-032, 02-096, and 02-097	84
B-2	Parrel Trucks 02-106, 02-237, and 02-250	85
B-3	Parrel Truck 02-071	86
B-4	Deadeye fragments 02-010 and 02-061	87
B-5	Deadeye 02-121	88
B-6	Deadeye 02-211	89
B-7	Shroud Truck 02-102	90

FIGURE		Page
B-8	Shroud Truck 02-118	91
B-9	Shroud Truck 02-236	92
B-10	Single Sheave Block 02-043	93
B-11	Single Sheave Block 02-046	94
B-12	Single Sheave Block 02-048	95
B-13	Single Sheave Block 02-119	96
B-14	Single Sheave Block 02-125	97
B-15	Single Sheave Block 02-126	98
B-16	Single Sheave Block 02-131	99
B-17	Single Sheave Block 02-206	100
B-18	Single Sheave Block 02-209	101
B-19	Single Sheave Block 02-298	102
B-20	Sheave with Pin 02-034	103
B-21	Sheave 02-042	104
B-22	Sheave 02-044	105
B-23	Sheave 02-059	106
B-24	Sheave 02-065	107
B-25	Sheave 02-079	108
B-26	Sheave 02-082	109
B-27	Sheave 02-095	110
B-28	Sheave 02-100	111
B-29	Sheave 02-124	112
B-30	Sheave 02-339	113
B-31	Hook 03-005	114
B-32	Hook 03-006	115

FIGURE		Page
B-33	Hook and Thimble 03-039	116
B-34	Hook and Thimble 03-049	117
B-35	Hook 03-058	118
B-36	Thimble 03-008 and Hook 03-121	119
B-37	Hook and Thimble 03-129	120
B-38	Hook and Thimble 03-443	121
B-39	Hook and Thimble 03-471	122
B-40	Hook 03-510	123
B-41	Strap Hook 03-009	124
B-42	Parcelling 04-014 and 04-018	125
B-43	Rope Fragments 06-009	126
B-44	Rope Fragments 06-016, 06-017, and 06-019	127
B-45	Rope Fragments 06-037	128
B-46	Rope Fragments 06-039 and 06-041	129
B-47	Rope Fragments 06-067	130
B-48	Rope Fragments 06-066 and 06-068	131
B-49	Rope Fragments 06-069	132
B-50	Rope Fragments 06-098	133
B-51	Rope Fragments 06-106 and 06-123	134
B-52	Wooden Ring Fragment 02-056, Sheave Pin 02-062, and Toggle or Block Pin 02-063	135
B-53	Wood Toggles or Block Pins 02-063, 02-099, and 02-182	136
B-54	Wooden Ring 02-163	137
B-55	Wooden Spindle 02-173 and Sheave Pin 02-322	138

CHAPTER I

INTRODUCTION

More than two hundred years after the French and Indian War, the discovery of three vessels buried beneath the muddy bottom of Lake Champlain has yielded much information about the British vessels that participated in the conflict. In the summer of 1983, during a survey sponsored by the Champlain Maritime Society (CMS) to find the remains of the "Great Bridge" that had joined the Revolutionary War fortifications of Mount Independence, Vermont and Fort Ticonderoga, New York, a team of divers serendipitously located the remains of three ships. Based on historical information, the dimensions of the archaeological remains of the hull, and test excavations these vessels were identified as part of the first naval units built on the lake during the French and Indian War. All evidence suggested that the largest of the vessels was the 115-ton British sloop *Boscawen* (Cohn 1985:337-355).

During the next year, the newly discovered vessels remained undisturbed while the "Fort Ticonderoga Shipwreck Project" was planned. The institutions involved in the project included the CMS, the Fort Ticonderoga Association, and the State of New York. After formal agreements regarding excavation, conservation, and preservation of the remains were signed on June 19, 1984, excavation began on the only vessel that could be tentatively identified, the sloop *Boscawen*. For a total of fourteen weeks during the summers of 1984 and 1985, mud was removed from the hull, artifacts were recovered, and the dimensions of the vessel were meticulously recorded. In the following years the artifacts were conserved, drawn, photographed, and studied while the hull

The journal used as a model for style and format is *Historical Archaeology*.

measurements were used to produce a very preliminary reconstruction of the vessel (Crisman 1985a:357-371).

This thesis briefly examines the role of *Boscawen* during the naval campaign of the French and Indian War on Lake Champlain. A summary of the excavation and conservation of the artifacts is followed by a descriptive catalogue of the rigging material. Finally, after reviewing of the evolution of the sloop rig and the classification of the sloop warship, examining of accounts of those involved in the construction and outfitting of *Boscawen*, and analyzing relevant historical and archaeological material, this thesis proposes a hypothetical reconstruction of the rigging of one of the earliest freshwater warships built in colonial North America.

By the seventeenth century, military strategists in France and England realized that control of the Champlain Valley would be determined by control of the lake itself. Between 1689 and 1763 contest for hegemony in Europe, echoed in North America by the struggle between the French colonies of Canada and the British colonies to the south, escalated into four wars. Already threatened by the construction of two French forts at the southern end of the lake, St. Frédéric (Crown Point) and Carillon (Ticonderoga), the British began the final war in 1755 in response to the construction of a third fort, Fort Duquesne, in the Ohio Valley.

The first campaign in 1756 against St. Frédéric and Carillon fizzled after a battle at the southern end of Lake George. A second campaign to oust the French in 1758 ended in disastrous failure for the British. In July, 1759, the British army under the command of General Jeffrey Amherst marched north again to seize the French forts. This time, the French offered little resistance and abandoned the southern forts, retreating under the protection of their fleet on Lake Champlain. Realizing that his ultimate success depended upon control of the lake, Amherst ordered Captain Joshua Loring to construct two warships, the 155-ton brig *Duke of Cumberland* and the 115-

ton sloop *Boscawen*.

Upon completion, the two ships were immediately pressed into service. Within days they had captured most of the French fleet and secured control of the lake. Although the lake now belonged to Amherst, the onset of winter forced him to order the warships back to Ticonderoga to be laid up for winter at the King's Shipyard. The following year *Boscawen* returned to service to transport troops and supplies during the successful 1760 campaign against the New France. With the French defeated, the fleet lost its strategic significance. The vessels returned to Ticonderoga where they were tied to the docks of the King's Shipyard, stripped of armament and rigging, and left to settle into the muddy bottom of Lake Champlain.

The discovery of these vessels and their subsequent excavation is significant because they were the first colonial warships built on Lake Champlain and among the earliest freshwater warships built in North America. A two-year project sponsored by the Champlain Maritime Society and the Fort Ticonderoga Association excavated and recorded the hull of the sloop *Boscawen*. As the vessel was uncovered artifacts were recovered, conserved, and preserved for future analysis. The scatter of these artifacts and the vessel's construction features were meticulously recorded. From the measurements a detailed map has been produced revealing clusters of associated artifacts such as rigging material that was concentrated in the aftermost part of the vessel.

Of the 5,000 artifacts recovered from *Boscawen*, only a few—approximately 90 items—are associated with the rigging, but this is a sizable archaeological collection with few parallels. The artifacts include deadeyes, blocks, sheaves, parrel trucks, seizing trucks, iron hooks, rope, and leather parcelling. Related objects include a mast step and mast cap. The details of each artifact are recorded in the catalogue and an accompanying illustration or photograph can be found in Appendix B. Additionally, the function of each type of artifact is discussed to explain its role as a component of

the sloop rig. Finally, a comparison of the rigging material found on *Boscawen* and archaeological finds of contemporary wrecks such as *Machault*, the Cornwallis Cave Shipwreck, and Yorktown Project Shipwreck provides a better understanding of the material found in the rig of this mid-eighteenth-century warship.

The sixteenth- and seventeenth-century European development of the sloop rig—one mast fitted with a fore-and-aft sail—gave sailors better control of their craft. By the seventeenth century, the term “sloop of war” was also used to classify a warship by the number of guns with which it was armed. The historical record contains much information about the development of the sloop rig and the standards by which a sloop-of-war was constructed and rigged in Europe during this period. However, there is little information about such vessels in the New World. The archaeological remains of *Boscawen* reveal several deviations from the well-defined standards of Royal Naval vessels built in England and recorded in treatises on rigging written in the latter part of the eighteenth century. Additionally, review of records in the state archives of New York, the Public Archives of Canada, and the Public Records Office of London, England has yielded correspondence among those responsible for the construction and outfitting of *Boscawen*. With this information a hypothetical reconstruction of the rigging of the sloop *Boscawen* is presented.

Thus, two centuries after *Boscawen* was stripped of its rigging and left to settle into the mud, the excavation and analysis of the sloop has shed new light on the maritime and military history of colonial America. The recovered artifacts have produced a wealth of information about the construction and outfitting of this mid-eighteenth-century vessel that was instrumental in establishing British naval supremacy on Lake Champlain. Analysis of the rigging material has provided insight into the abilities and limitations of shipbuilders struggling to create a navy in the North American frontier of the Champlain Valley.

CHAPTER II

THE COLONIAL WARS

For the greater part of the seventeenth century, English and French colonization of the New World proceeded without conflict. Separated by forests, mountains, rivers, and lakes the colonists coexisted peacefully while attempting to reap the benefits of the newly found resources of North America. When war broke out in Europe between the France of Louis XIV and England of William and Mary in the year 1689, their colonies would follow suit. Three wars were waged over the next half-century, but it was not until the fourth, the French and Indian War, that the British secured political and cultural dominance in North America.

THE EARLY WARS

English and French colonization of North America differed greatly (Crisman 1988:129). The French colonies began with the establishment of Quebec in 1608, and remained concentrated around the St. Lawrence Valley. New settlements, including Montreal in 1642, relied on fishing, farming, and lumbering, but the primary French colonial industry was the fur trade. New France was excellently situated to exploit this resource, as the St. Lawrence River provided direct access from the Atlantic Ocean to the Great Lakes and interior of the continent. Although ideally placed for trade with the interior, the location of New France and its dependence on furs had significant drawbacks. The mercantile economic nature of the colony left it heavily dependent upon supplies, both of food and trade goods, from Europe. These shipments were interrupted, however, during the winter months when the St. Lawrence froze and during wartime when the river was vulnerable to blockades.

Because of the natural barrier created by the Appalachian Mountains, the

English colonies in North America did not expand westward but rather spread out along the coastal plain and piedmont from New England to Georgia. In contrast to their French counterparts, the English settlers developed a multidimensional economy based on fishing, farming, and commerce. Without significant waterway access to the hinterland of North America, the English colonists instead developed the fishing industry of the North Atlantic and the trade of rum and foodstuffs with Europe and the West Indies.

With England's acquisition of Dutch colonies on the Hudson and Delaware Rivers in the 1660s, French and English colonies grew nearer to one another and were linked by two navigable waterways. The least direct and more difficult was between the upper Hudson River and Lake Ontario via the Mohawk and Oswego Rivers. The most direct and most important was the Champlain waterway from the upper Hudson River to the St. Lawrence Rivers through Lake Champlain and Lake George. This was the route chosen by French ministers in a plan to conquer New York that marked the beginning of 'King William's War' in North America in 1689 (Bellico 1992:15)

King William's War (1689 - 1697)

Excluding conflicts with local Indian populations, peace had been maintained during the early period of North American colonization while Europe was embroiled in the Thirty Years War (1618 - 1648) and a number of smaller conflicts. The outbreak of 'The War of the League of Augsburg' (King William's War in the New World) between England and France in 1689 arrived in New France with a plan from ministers in Paris to march 1,600 troops and militia down Lake Champlain and the Hudson River to New York. There they would join two French warships to lay siege to the city. Realizing the impracticality of this plan, the governor of New France instead instituted a series of attacks on isolated English outposts (Bellico 1992:15).

During the fall of 1689, the New England colonists readied to invade New France via the Champlain Valley and the St. Lawrence River, but upon reaching the southern end of Lake Champlain the troops were unable to continue, as they had brought no boats to sail down the lake. Soon after, the English attacked by sea with a small fleet from New England that sailed up the St. Lawrence River and laid siege to Quebec. Demands to surrender the city were ignored and the amateurish siege did little to persuade the French defenders to give up. In November, as winter settled in, the invading fleet was forced to return to New England (Crisman 1988:139).

So ended the final major offensive of King William's War. For seven years sporadic raids continued until the Peace of Ryswick in 1697. Although much needed, this peace was short lived.

Queen Anne's War (1702 - 1713)

The outbreak of 'The War of Spanish Succession' (Queen Anne's War in the New World) in 1702 once more pitted England and France against each other in the Old World. Although the ministers in Paris again instructed the governor of New France to attack New York and Boston, the means to do so was not provided. The French returned to their strategy of raiding enemy outposts. English attempts at retaliation through invasion of New France by way of the Champlain Valley and St. Lawrence River were again frustrated by poor planning, incompetence, and disease. The single significant victory of the war was the capture of Port Royal, Acadia in 1710, giving the British¹ nominal control over this Atlantic province of New France and the Gulf of St. Lawrence (Bellico 1992:16).

Britain maintained control of Acadia after the Peace of Utrecht in 1713, and

¹ With the unification of England and Scotland in 1708 the rubrics Britain and British replace England and English as generalized terms of reference.

while England and France remained at peace for the next thirty years in the Old World, the French strengthened the approaches to New France by constructing forts at the head of Lake Ontario in 1726 (Fort Niagara) and near the southern end of Lake Champlain in 1734 (Fort St. Frédéric). Furthermore, in 1720, to make up for the loss of Acadia they began construction of a combination port and citadel on Cape Breton Island. This massive fortification, called Louisbourg, was designed to protect the mouth of the St. Lawrence River and provide a base from which the French navy and privateers could harass British merchant and fishing vessels (Bellico 1992:16).

King George's War (1744 - 1748)

The threat of Louisbourg was quickly recognized by the New England colonies. With the outbreak of 'The War of Austrian Succession' (King George's War in the New World) in Europe in 1744, the British colonists decided to protect their maritime trade by attacking the fortress. In March of 1745, more than 4,000 militiamen in a fleet of merchant and fishing vessels sailed from Boston. They landed in April and commenced a siege Louisbourg, effectively isolating the defenders by blockading French supply vessels. The British colonists forced the surrender of the fortress in six weeks (Bellico 1992:20).

Two attempts were made by the French to recapture Louisbourg. Both naval expeditions failed, but the fortification was returned to the French under the treaty of Aix la Chapelle that ended the war in 1748. Peace was again short lived as the continued expansion of the English and French colonies inevitably renewed territorial disputes.

THE FRENCH AND INDIAN WAR

In 1753, the French constructed a series of forts at the northern end of the Ohio River to establish their claim to the region. The following year, Virginia militia Major George Washington was sent by the British to remove the French, but his troops were surrounded and defeated in a day-long skirmish. Throughout the year the French and British both sent troops and warships to North America while publicly calling for peace. This peace was broken on June 8, 1755 when a British naval squadron under Admiral Edward Boscawen captured two French troopships off Newfoundland. So began 'The French and Indian War' in North America, but it was not until 1756 that Britain and France formally declared 'The Seven Years War.'

On September 6, 1755, while devising the following year's strategy, Robert Napier penned a memorandum to William August, Duke of Cumberland, highlighting the military importance of control of Lake Champlain:

The unfortunate Miscarriage of His Majesty's Forces in the designed Attack upon Fort du *Quesne*, in *North America*, & the Death of Major Gen *Braddock*, make it necessary to alter the *Scheme* proposed for the next year's Campaign in that Country; which, if the attempts upon *Niagara* and *Crown-Point* Succeed, as those have already done upon Fort *Beau Sejour* & *S' John's*, will still put us in a condition to attack *Montreal* and *Quebec*, & afterwards to go up the River, & attack Fort du *Quesne*. . .

If the Attacks upon *Niagara* and *Crown-Point* have met with the Success which 'tis hoped they will, the obvious Business of next Campaign is the Reduction of *Montreal* and *Quebec* with the Forts which lie between those Places: in order to which we must be masters of Lake *Champlain* by having a proper Number of armed Vessels upon it: and, as this Lake empties itself into the River *S' Lawrence*, by the River *Sorrell*, between *Quebec* & *Montreal*, it will naturally occur to the General that he must make himself Master of the last mentioned River; by which Means he will have the Advantage of Water Carriage from *Crown Point* to the *S' Lawrence*, & have it in his Power to keep either *Quebec* or *Montreal* in check, whilst he carries on his attack upon either of those Places. And it is not to be doubted with the Force he will have,

the Benefit before mentioned of water Carriage behind him, & the assistance of such a Number of His Majesty's ships of war, as shall be thought sufficient to block up the mouth of the River *S' Lawrence* he will soon be able to reduce those Places, & by that means, make himself master of all *Canada* (Pargellis 1969:133-135).

The 1758 campaign to oust the French from the Champlain Valley ended in disaster for the British. Defeated by a smaller French army at Fort Carillon, the British withdrew to the south. This gave the French time to further strengthen control of the lake by building a naval squadron of four 65-ton sloops and a 70-ton schooner.

The following year, command of the British army was given to General Jeffrey Amherst. Soon after defeating the French forces at Louisburg in 1758 he began preparing for another campaign down the Champlain Valley into Canada. On May 14, 1759, a French deserter from Crown Point provided the first solid information about the French fleet on Lake Champlain. In June, Amherst forwarded this information to William Pitt, the British secretary of state, remarking "there are two Vessels on Lake Champlayn of small Force and two more were to be finished the later end of last month" (Knox 1968:23). In the same letter Amherst also informed Pitt that Captain Joshua Loring had gone to New York to "prepare materials for four Vessells, two on Lake Champlayn and two on Lake Ontario" (Knox 1968:28). Amherst's instructions to Captain Joshua Loring at New York ordered him to prepare to build at Ticonderoga two vessels of sufficient strength to engage the new French warships.

Believing he would "have occasion for two Brigs for the Navigation of Lake Champlain" Amherst wrote to Loring while in New York on May 13, 1759, ordering him to secure the rigging for a vessel of 120 to 130 tons. As Amherst believed a second set was stored at Albany, Loring was further ordered to secure this one set of rigging material for as cheap a price as possible and with the condition that the material could be returned if unused (WOR 34/64.196). The following week Amherst wrote

Loring again ordering him to find masters for the two vessels and rigging for a brig of 120 to 130 tons (WOR 34/64.197). On May 22, 1759, these orders were amended further to include the hiring of seventy ships carpenters and two overseers for the construction and rigging of two Snows of 18 guns each. Amherst wrote:

Besides the Two Briggs which I mentioned to You in Mine of the 13th. I intended Building for the Navigation of Lake Champlain, I am Come to a Resolution of Building Two Snows, capable of Mounting Eighteen Six Pounders for Other Uses

You will also take Care to purchase at as Cheap a Rate as possible what Rigging and Other Materials You think necessary for Rigging out and Equipping both the said Snows, which Necessaries You will Order to be forwarded to this place [Albany] without loss of time, & Come up Yourself so soon as these Orders are Executed, which must not meet with any Delay (WOR 34/64.198).

Building a Fleet

In June 1759, Amherst marched north to take control of Lake George. In July, he continued north and seized the French Forts Carillon and St. Frédéric at the southern end of Lake Champlain. As the army advanced from Lake George to Lake Champlain a reference within "Commissary Wilson's Orderly Book" records an order on July 25, 1759, stating "The following carpenters *** James Frazer, George McDougall, James Frazer [sic], John McColme, John Robinson, James Cumming, and James McDonald of the Royal Highlanders to be at the sawmills tomorrow at 5 o'clock and if Capt. Loreing should not be there they will receive their directions from Brigadier Ruggles" (Richards 1981:77). The French offered little resistance and abandoned the southern forts, retreating under the protection of their fleet. Realizing success depended upon control of the lake, Amherst stressed the urgency of completing the brig in his correspondence to Captain Loring.

As the French fled, they set fire to Fort Carillon and blew up her magazine. On

the morning of July 27, while the fort continued to burn, a British sergeant entered the ruins to strike the French flag and hoist the Union Jack. Amherst began rebuilding the damaged fort, ordered all French boats to be raised and repaired, and instructed that “the Brig: and the boats [he] had ordered to be built for carrying Guns to be finished in all haste that [he] may be superior to the Enemy’s Sloops on the Lake” (Knox 1968:46).

On August 1, a scouting party reported that the French had abandoned Crown Point to the north. Amherst’s army moved on to Crown Point on August 4th joining an advanced party of Rangers. Loring remained behind at Ticonderoga to complete the construction of the brig. As Amherst set out for Crown Point he wrote to Loring:

I proceed tomorrow to Crown Point, where you will please to send me reports of anything material that may happen, As the success and advantages that may be gained this campaign greatly depend on your making the utmost Expedition in forwarding everything in Your Department, I must most earnestly recommend it to you, that you will make all the dispatch possible in building the Vessel and boats for the Guns according to the intended plan (WOR 34/64.202).

However, the construction of the vessels over the next two months was hampered by foul weather, illness among the carpenters, mechanical difficulties at the saw mill, and quarreling among the officers over limited timber supplies for a number of construction projects (WOR 34/64.149-151).

On August 16, a French deserter from the vessels anchored off the Four Brothers Islands arrived at Crown Point. He provided a detailed description of the French fleet, identifying the four vessels as the schooner *La Vigilante* with ten guns, the sloops *Musquelonge*, *La Brochette*, and *L’Esturgeon* with eight guns each. Upon receipt of this information, Amherst immediately sent for Loring. The following day, the two met to discuss the strength of the enemy. They concluded that the brig would not be sufficient strength against such a force and decided to build a radeau to carry guns on

the lake (Knox 1968:52). Although Loring estimated only three days were needed to cut the planks for the radeau, rain delays continued. Two more days of heavy rain followed and on August 22, Loring wrote that the planks were not yet cut and three more days were needed (WOR 34/64.151). On August 30, Amherst wrote "the Radeau building, and I am promised the Brigantine shall soon be ready, I then shall be able either to take or force away the Enemy's Vessels on the Lake & to proceed to the other end" (Knox 1968:56). The following day Loring wrote Amherst informing him the brig was in the water with only the quarterdeck and rigging needing completion (WOR 34/64.157). However, on September 1, three prisoners were brought to Crown Point who told of a new 16-gun French vessel being launched. Again Amherst contacted Loring to stress the urgency of completing a second vessel. He also ordered Major Ord to prepare combustibles to attempt to burn the newly launched French vessel (Knox 1968:57). Two days later, Captain Loring responded to the General's message with a visit to Crown Point. There the two officers decided that the second vessel would be a 16-gun sloop; however, the rain delays, limited supply of man power, high demand for wood, and repeated failure of the saw mill caused concern over the speed at which this vessel could be built (Knox 1968:57).

Two weeks later, Loring wrote Amherst, informing him that he would lay the keel of the sloop the following Sunday if the weather held (WOR 34/64.159). On September 16, Loring again wrote, noting that the keel was laid and that the sloop would be ready in fifteen days. He added that the brig was only two days from completion and could be completed eight days before the completion of the sloop; he believed, however, that Amherst did not want the brig to sail before the sloop was ready and so ordered many of the brig's carpenters to work on the sloop. He also noted that many of the carpenters had fallen ill due to their hard labor, bad water, and lack of spruce beer (WOR 34/64.160).

The next day, September 17, rain again halted construction, and two days later the saw mill crank broke for a second time. Repairs were ordered, rain continued to delay the work, but Loring promised the vessels would be ready by September 31 (Knox 1968:61). On September 27, Amherst sent men and provisions for the brig and sloop. The six gun radeau *Ligonier* was launched September 29 and Loring promised the brig and sloop by the following week, but again the saw mill crank broke (Knox 1968:62).

On October 1, Amherst sent word to Loring that Lieutenant Alexander Grant would be commissioned as commander of the sloop (WOR 34/64.20). On October 6, Amherst informed Loring that the sloop would be named *Boscawen* and that she and the brig would sail the day after they arrived in Crown Point (WOR 34/64.222). As construction continued, the vessel was fitted out with provisions, guns, and men from Crown Point. Orders in "Commissary Wilson's Orderly Book" instructed "The Regiments are to give the following numbers for the Brig and Sloop and will send seamen if they have them: For the Brig, [illegible] Royal Highlanders 14 men." (Richards 1981:82). On October 8, the sloop was ready to sail but was waiting for the last of her guns. Two days later, Amherst issued the following orders to Loring:

Whereas my intentions are not only to Destroy the Enemy as far as [illegible] but also to Endeavor to obtain the free and uninterrupted Navigation of Lake Champlain, for which purposed it is Necessary to take or Destroy the Enemies Vessells now upon it, Which I think Cannot be better Effected than by cutting them off from their Port at Isle aux Nois.

I would therefore have You immediately upon Receipt of Your Sailing orders proceed with the above Brig and Sloop down the Lake and use all Your endeavor to get passed the Enemies Sloops if possible unperceived, if not, You will at all Events do Your utmost to Come up with and Attack them, and that without any Regard to the army You [illegible]—as I think them sufficiently covered by the Artillery Boats When You are advanced.

If You can cutt off the Enemies Communication between the Port at the Isle aux Nois and their Vessells You may then be certain of the Vessells as they must then fall in between You and the army and Cannot avoid Coming to Action.

But if You Cannot get passed them and You find them Endeavoring to make their Escape You must pursue them as close under the Cannon of the Isle aux Nois, as You can possible go without Endangering the Loss of His Majesty's Ships by Stranding or Running ashore and During the Whole time of the chase You will annoy & Distress them to the utmost of Your powers (WOR 34/64.225).

The Naval Conquest of Lake Champlain

On October 10, 1759 the 155-ton brig *Duke of Cumberland* arrived at Crown Point armed with twenty 4-pounder and 6-pounder cannon and twenty swivel cannon, commanded by Captain Loring, and manned by 70 seamen and 60 marines. The following day, under the command of Lieutenant Grant, the 115-ton sloop *Boscawen* arrived at Crown Point. Mounting sixteen 4-pounders, 6-pounders and twenty-two swivel guns, the sloop carried a crew of 60 seamen and 50 marines (Knox 1968:64).

Finally complete, the new warships were immediately hurried into service and set sail down the lake at 4 o'clock on the afternoon of October 11, ahead of a flotilla including *Ligonier*, two other radeau, three row galleys and four columns of bateaux. Amherst sailed aboard the radeau *Ligonier* from which a light was hung at night for the bateaux to follow. As the sun set and the brig and sloop ranged ahead of the fleet, Major Reid of the Highlander Regiment mistakenly followed the light of the brig. During the night *Duke of Cumberland* and *Boscawen* sailed past the French sloops south of Four Brothers Islands, but Reid was not so lucky. At sunrise he found his regiment among the enemy warships; a short skirmish ensued with the sloops firing upon the bateaux, sinking one, and taking twenty-one men prisoner. Before the British fleet could assist, Amherst watched the French sloops "make all the sail they could"

fleeing down the lake (Knox 1968:65).

Forty-five miles to the north of the Four Brothers Islands, *Duke of Cumberland* and *Boscawen* encountered the French schooner *La Vigilante*. Loring ordered the two ships after the schooner but sailed into shallow waters and ran both ships aground. By the time the crews were able to free the vessels, *La Vigilante* was long gone. Later that day, Captain Loring spotted the three French sloops and gave chase. As night fell, the French sailed into Cumberland Bay. The following day, October 13, Loring discovered that the French had sunk two of their vessels, run the other aground, and fled overland. Leaving Grant to salvage the French vessels, stores, guns and rigging, Loring set out for Isle-aux-Noix to intercept the French schooner (Knox 1968:65).

The weather turned bad and the wind began to blow hard from the north. The fleet of bateaux was unable to continue sailing against the wind. On October 18, a brief respite in the weather gave Amherst the opportunity to sail to Cumberland Bay to inspect the salvage of the French vessels. He found one of the sloops was already repaired and sailing with *Duke of Cumberland* and *Boscawen*. As he ordered 200 men in whaleboats to assist Loring in his search for the schooner *La Vigilante* a messenger arrived with news that Quebec had surrendered on September 18. October 19, the weather again turned bad and Amherst reluctantly gave up the campaign and returned to Crown Point to complete the repairs to the fort before winter (Knox 1968:66). With the French flotilla devastated the British had unquestioned control of the lake, but the onset of winter forced Amherst to order the warships back to Ticonderoga to be laid up for the season at the King's Shipyard (Bellico 1992:103).

1760 AND SERVICE AFTER THE WAR

The following year *Boscawen* returned to service to transport troops and supplies during the 1760 campaign. On May 25, Amherst ordered Major Robert Rogers to

attack the town of St. Jean on the Sorel River (modern Richelieu River). In preparation for a three-pronged offensive against New France that would ultimately converge on Montreal, the British brig and four sloops, under the command of Captain Alexander Grant, were to facilitate an amphibious assault by Rogers' raiders on St. Jean to destroy French provisions and the vessels supplying Isle-aux-Noix. The raid was well coordinated but ultimately unsuccessful as none of the French vessels were destroyed.

Preparations continued through June and July for the final offensive against New France. Finally, at ten o'clock in the morning of August 11, 1760, a fleet set sail from Crown Point including the brig *Duke of Cumberland*, the sloop *Boscawen*, the three captured French sloops, the radeau *Ligonier* and two other small radeau, three row galleys, two long boats, 263 bateaux, 12 canoes, and 41 whaleboats (Bellico 1992:104). Slowed by foul weather, the armada finally reached on Isle-aux-Noix on 14 August. The troops landed under the protection of the fleet and immediately laid siege to the fortress. The French held out for two weeks before abandoning the fortress and withdrawing to Montreal.

From the south, east, and west the British successfully forced the French army back to Montreal. On September 6, the 2,200 French troops that had retreated to Montreal were surrounded by 17,000 British troops. That night the French drafted a proposal for surrender that was presented to Amherst the following day. Amherst rejected the French proposal, demanding that the French surrender completely and that they agree not to serve again during the course of the war. The French considered these to be humiliating demands, but they were beaten and had no choice but to sign the 55 articles of surrender on September 8, 1760.

Victorious, Amherst returned to New York by way of Lake Champlain and Lake George. Meanwhile, the fleet returned to Ticonderoga where the vessels remained under the direction of Lieutenant Grant until 1763. While settling his accounts

during the winter of 1763, Grant recorded that he was short sailors to attend to the vessels “to put the rigging in any tolerable order for nixt spring.” (Gage 1775:vol. 9). On December 1, 1763 he wrote that “all the sloops on Lake Chample are Lay’d up for the season” and that he had been provided “Six Soldiers during the wenter to Assist the Sailors in overhauling the rigging &c &c” (Gage 1775:vol. 10). As he departed from Ticonderoga he recorded the war fleet as “laid up here, consisting of a large Brigantine which mounted 20 guns, two Schooners, two sloops, and some smaller craft; also a sloop constantly employed in the summer season between this place and St. John’s.”

Two years later, in a letter to Major General Gage, Brigadier General R. Burton reported that the craft upon Lake Champlain were in very bad condition including the *Maskinouge*—presumably the captured French sloop *Musquelonge*—which “may make two, or three Trips without repairs.”(Gage 1775:vol. 35). This letter was followed by a detailed report of the condition of the vessels on the lake written on March 25, 1765. In this report two sloops, *Maskinonge* and *La Chigan*, were in service on the lake but both were reported to be in very bad condition (Gage 1775:vol. 35). Responding to the question of whether any other vessels may be fitted up for carrying troops, the same report stated, “The English Sloop Called the Boscawen Seems the Most probable, & may Want the least Repair, but She has been Sunk these Three Years, and it’s difficult to Say What Time it may take to raise her up” (Gage 1775:vol. 35).

The salvage was never undertaken and no other references regarding *Boscawen* appear until July 30, 1778. In a final account of the veteran vessels of the French and Indian War, the brig *Duke of Cumberland* and sloop *Boscawen* are described as “Lay’d up And Decay’d” (Bellico 1992:109). Rotting, sunken, and settling into the mud at the King’s Shipyard, *Boscawen* was forgotten for the next two hundred years.

CHAPTER III

EXCAVATING THE SLOOP *BOSCAWEN*

DISCOVERY OF *BOSCAWEN*

In 1983 an archaeological survey was undertaken to locate the remains of the "Great Bridge." The bridge had connected Fort Ticonderoga, New York to the fortifications of Mount Independence, Vermont during the Revolutionary War. It had in fact been a floating bridge and the archaeologists were in search of the wooden and stone caissons that had once held it in place. The survey was under the direction of Arthur B. Cohn and Kevin J. Crisman and sponsored by the Fort Ticonderoga Association, the Champlain Maritime Society and the Vermont Division for Historic Preservation.

Preliminary historical research identified an area immediately below Fort Ticonderoga as the point where the western end of the bridge reached the shore. Additionally, this area was identified as the location of the King's Shipyard. The shallow depth, mud bottom, and aquatic weeds of this part of the lake made sonar surveys impractical. Instead, teams of divers swam tight search patterns along the bottom in search of the archaeological remains. Within hours the western-most caissons were located, but the divers also discovered the remains of two submerged ships. The following day, during a more thorough investigation of the vessels, a third was discovered.

Although the hulls of these vessels were buried in the mud, protruding timbers revealed the length of two of the hulls. The first was 65 feet (19.9 m) in length and the second over 70 feet (21.3 m) long. The length of the third hull could not be ascertained, but it appeared to have a flat bottom. Test pits were dug in each of the hulls

revealing construction features and artifacts that further aided in the identification of the vessels. Hull dimensions, iron bolts fastening the timbers of the first and third vessel, and relatively modest timber dimensions together suggested a French origin. The second hull had overall dimensions, large scantlings, and a combination of iron and treenails fastenings that were suggestive of English military vessels of the eighteenth century. Recovered artifacts also appeared to date to the eighteenth century. They included iron hooks and spikes, a stone axe-head, and a spoon, which were removed, drawn, photographed and reburied.

The construction features and the artifacts provided enough information to make a preliminary identification of the vessels as warships built during the latter part of the French and Indian War. More specifically, the first and third vessels were believed to be French vessels, a sloop and a gunboat or radeau, captured by the British. The second vessel was tentatively identified as the British sloop *Boscawen* (Cohn 1985:342).

These vessels represented some of the earliest military vessels built on Lake Champlain. They were hastily built during the final years of the war and little information about their construction could be found in contemporary archival records. Another vessel built at the same time as *Boscawen*, the brig *Duke of Cumberland*, had been pulled from the lake in 1909 and displayed at Ticonderoga. However, she was never thoroughly studied and after years of neglect and extreme deterioration much of the information about her was all but lost. The new discoveries represented a significant archaeological find that promised to answer many questions about the construction and service of vessels on Lake Champlain during the French and Indian War.

FORT TICONDEROGA SHIPYARD EXCAVATION

From the preliminary information gathered in 1983, a plan was developed to complete a thorough excavation of one of the vessels found in the dockyard. After removing the mud, the hull would be meticulously recorded and associated artifacts were to be recovered, conserved and recorded for future analysis and display at the Fort Ticonderoga Museum. After considerable thought and discussion, the size of the hulls, their position in the dockyard, and historical data enabled the tentative identification of only one vessel, the 115-ton sloop *Boscawen*. Since she was identifiable she was chosen to excavate as historical research would be easier with a named vessel. Further archival and archaeological study may help to identify the other vessels.

The excavation was planned to take six weeks during the summer of 1984 and four weeks during the summer of 1985. A team of divers, archaeologists, artists, and conservators was assembled while equipment and facilities were acquired. Two buildings were selected to serve as crew quarters, a conservation laboratory, drafting headquarters, and photographic laboratory. The museum's boathouse, ideally located only 100 feet (30.48 m) from the bow of *Boscawen*, was selected for a diving headquarters. After a staircase and work dock were built, and power for the compressors was added, the excavation began.

Boscawen lay in only eight feet (2.44 m) of water, but the water was murky and visibility was usually zero. Additionally, three feet (0.91 m) of soft mud and dense weeds buried the majority of the hull. To keep the divers off the mud and prevent disturbing the wreck during the course of the excavation, 25-foot (7.62 m) square grids were suspended over the bow, midships, and stern sections of the vessel (Figure 3-1). These grids were subdivided into five-foot (1.52 m) square units that provided a means of systematic archaeological excavation and analysis of the vessel.

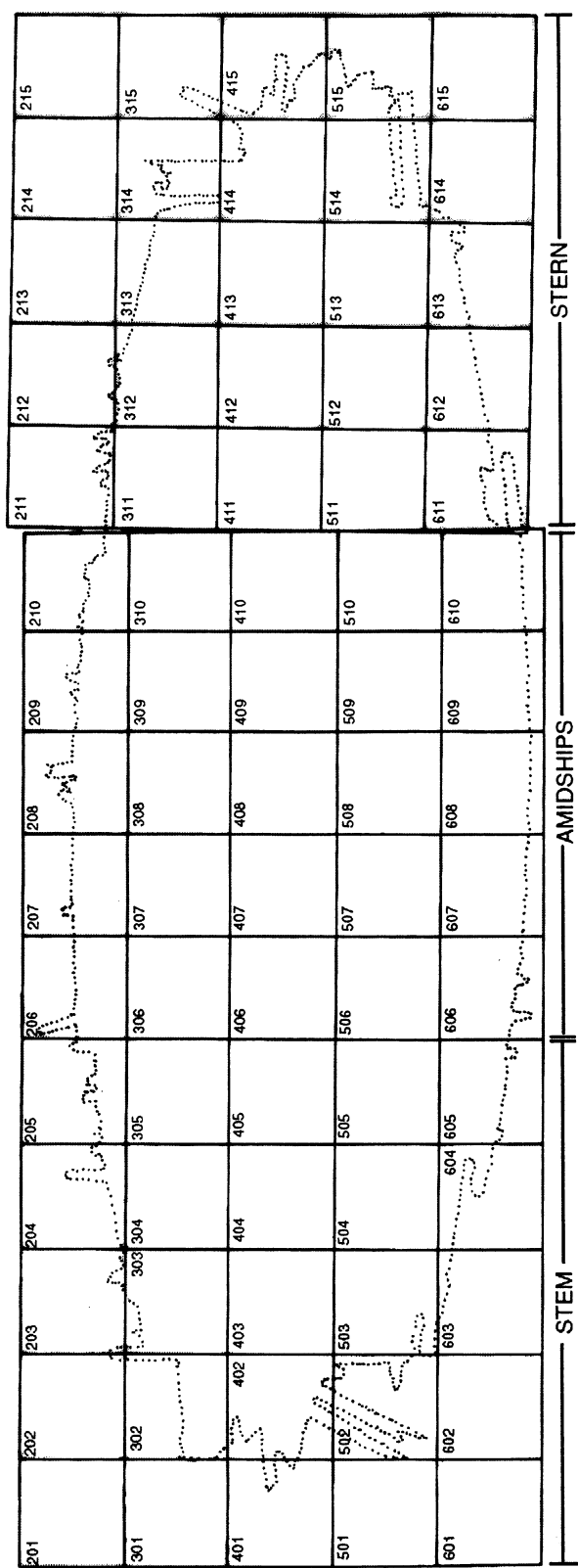


Figure 3-1. The Boscawen excavation grid plan (By Kevin J. Crisman).

Each of the twenty-five units within the grid was identified by number. Excavators were assigned a unit and were responsible for its excavation. The mud covering the hull was removed by two water dredges and redeposited fifty feet (15.24 m) away. During each ninety minute dive, excavators removed the mud uniformly in 4-inch (10.16 cm) levels which were given a letter designation—the surface designated as ‘A’, the next ‘B’, and so on. As artifacts were uncovered, their position was recorded, and they were removed for cataloguing and conservation. Each unit was completely excavated down to the interior of the hull. Then the excavator was responsible for recording the construction features of the hull within the unit. After this was completed the excavator was assigned a new unit to excavate and record. These measurements were used to study the hull of *Boscawen* and to draw the excavation site plan (Figure 3-2).

As the mud was blown out the exhaust of the dredge it passed through quarter-inch (0.64 cm) mesh ‘dredge bags’ to catch small artifacts accidentally vacuumed up by the dredges. Ten minutes before a dive ended the dredge pump was shut off to signal to the diver. The diver would then obtain a new dredge bag and exchange it for the one attached to the exhaust. The used bag was taken to conservators to sift and collect artifacts that had been taken up by the dredge. Artifacts that were discovered in the dredge spoil were given the same reference number of the unit and level in which the diver had just been working.

Over 5,000 artifacts were recovered during the excavation including collections of tools, weapons, personal possession of the crew, and rigging material. The majority of these artifacts were brought up by divers in plastic bags or plastic containers. Fragile material, such as rope, was raised on screens or trays (Miksch 1985:371). Initially, artifacts were cleaned of mud and catalogued. In the catalogue artifacts were divided into six major material classes identified by a number: general inorganic (01-), wood

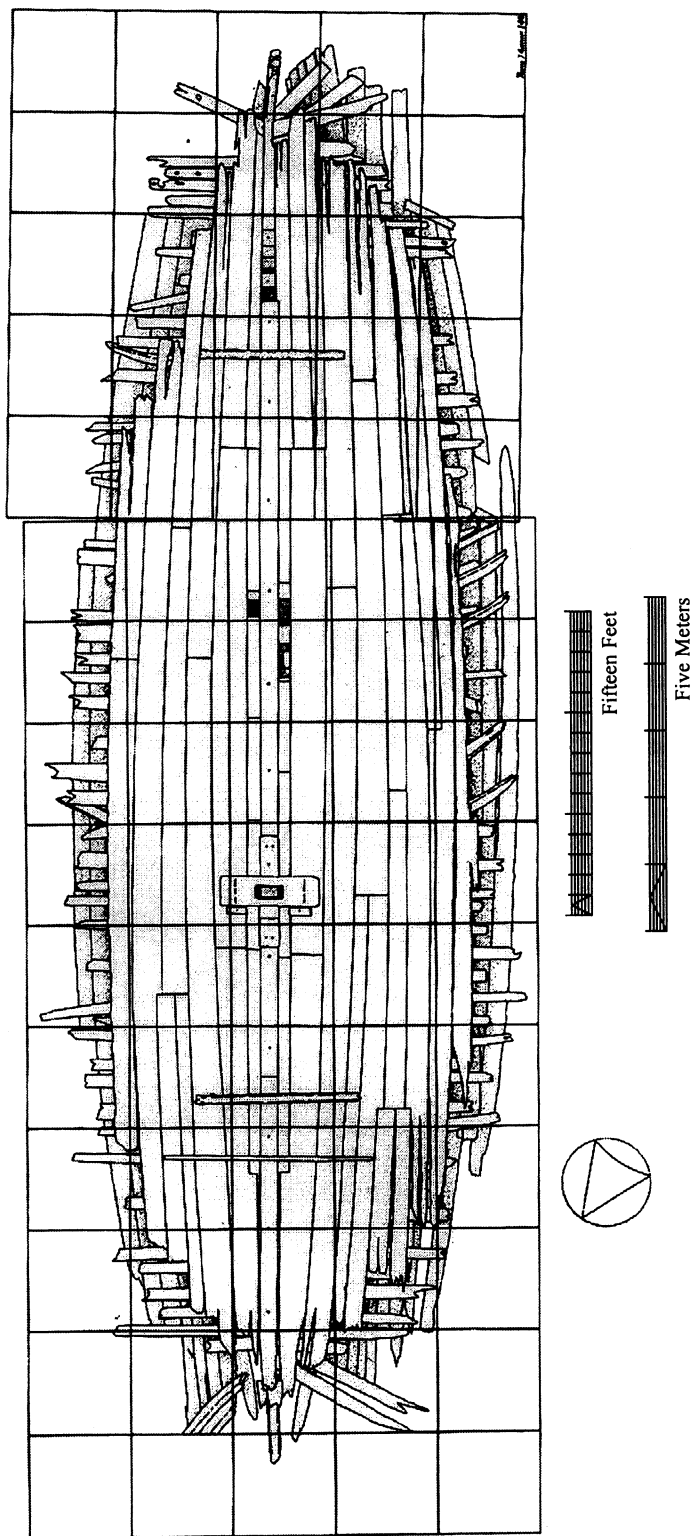


Figure 3-2. The Boscawen excavation site plan (By Kevin J. Crisman).

(02-), metal (03-), leather (04-), glass (05-), and general organic (06-). As artifacts were recovered and catalogued numbers were assigned sequentially within each class. The artifacts were kept wet while they were measured, sketched, and photographed. Finally, due to the nature of the environment from which they were recovered, many of the artifacts underwent extensive conservation to preserve them for future analysis and display. Alcohol and acetone resin dehydration, freeze drying and polyethylene glycol impregnation, and electrolytic reduction were a few of the techniques used to conserve the assemblage of artifacts from the wreck, an assemblage that included rigging material such as wooden blocks and sheaves, metal hooks, leather parcelling, and fragments of rope.

The following general format was used to catalogue the rigging material. Artifacts were sorted by type with an introductory statement and a description of function for each category. When applicable, comparable archaeological finds are discussed; however, studied alone these artifacts reveal much about their function and the rigging of this armed colonial sloop.

The hostilities between the French and British New World colonists which culminated in the French and Indian Wars were often constrained by logistical and material limitations. When ministers in Paris ordered the conquest of New York the governor of New France, hampered by these limitations, chose instead to raid English outposts. When in retaliation, the British attempted to raid Montreal by way of Lake Champlain, they were stopped by the need for vessels to sail the lake. As the years passed and England and France sent more men, weapons, and tools to the New World, constraints began to ease. But when the British Army was called upon to hastily build a fleet in the hinterland of North America, wartime limitations again applied, as will be seen in the rigging material of the sloop *Boscawen*.

CHAPTER IV

THE RIGGING MATERIAL

The excavation produced a large amount of rigging material; however, despite this large number, little can be determined about the actual rig of *Boscawen*. As no record of the dimensions of the rig exists and the mast and spars were not recovered, little more can be determined from the artifacts than the probable function of each piece in the rigging of *Boscawen*.

The items recovered and discussed below include the mast step, mast cap, deadeyes, single-sheaved wooden blocks, spare or worn-out sheaves, parrel trucks, seizing trucks, iron hooks, iron thimbles, leather parcelling, and many fragments of rope. The presence of such a large quantity of material is intriguing considering at the end of the war *Boscawen* was recorded to have been stripped of her armament and rigging. Although the material was found throughout the hull, a large concentration was recovered from the aftermost end of the vessel suggesting the presence of a boatswain's locker where spare rigging material was stored (Figure 4-1).

The basic rigging of a sailing vessel can be divided into four types of components: the spars, standing rigging, running rigging, and sails. The spars include the masts, the yards, the gaff, and the boom. The standing rigging is the combination of stays, shrouds, deadeyes, and chain-wales that hold the spars in place. The running rigging includes the lines, blocks, and hooks that hoist and trim the final rigging component, the sails. Without question, the deadeyes, parrel trucks, and seizing trucks were part of the vessel's rigging, however, many of the small blocks, iron hooks, and rope remains could have served as tackle for either the sails or *Boscawen*'s armament.

The artifacts are presented below in the order of the aforementioned groups.

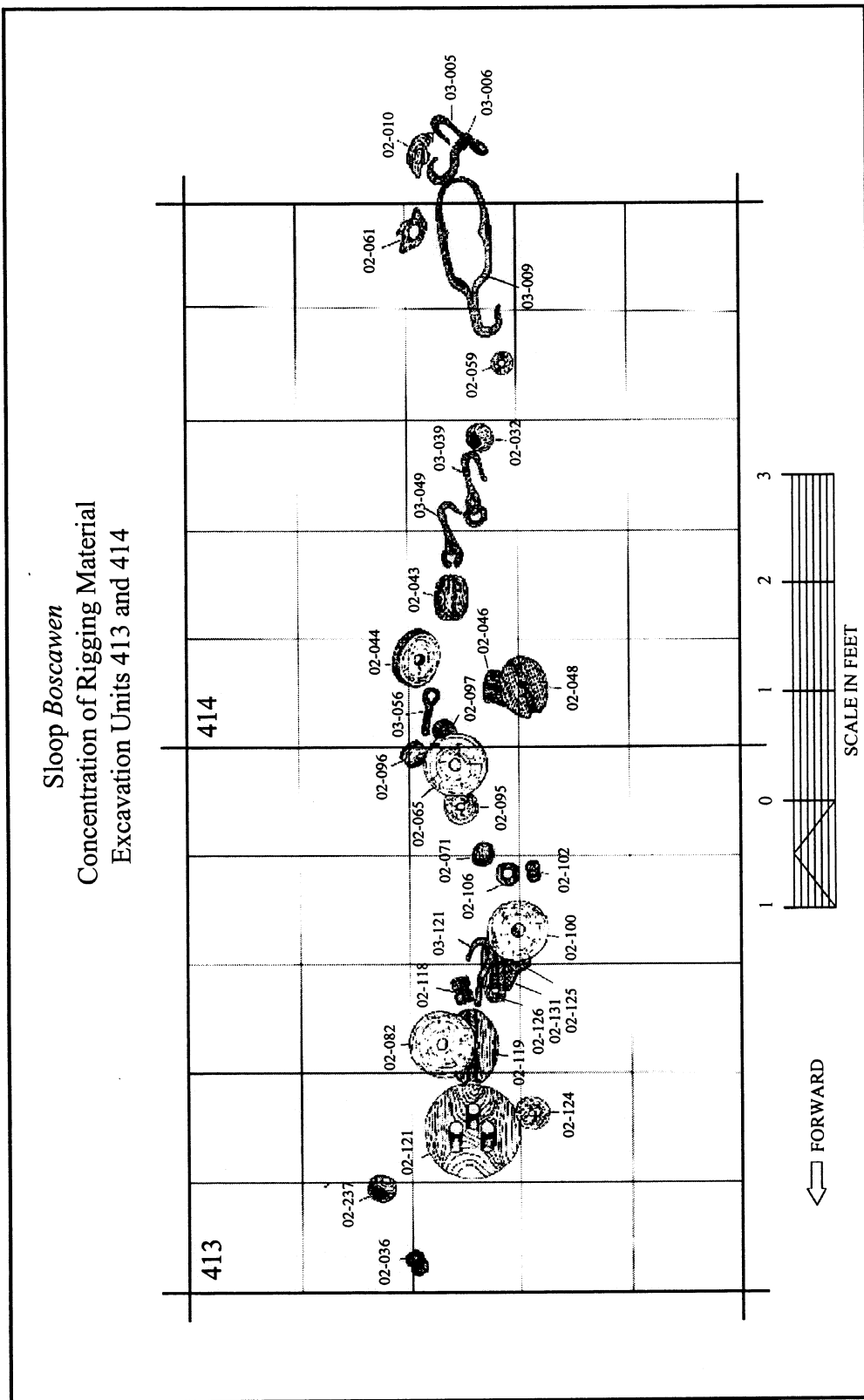


Figure 4-1. A concentration of rigging material recovered from the stern (After Crisman 1985b:383).

For each group of items a definition is provided from David Steel's two-volume treatise written in 1794, *The Elements and Practice of Rigging and Seamanship* or George Biddlecombe's *The Art of Rigging* first published in 1848. An Admiralty agent, Steel's compilation was so widely accepted it was edited and republished in four volumes within a few years. Half a century later the importance of the document was demonstrated by the fact that Captain George Biddlecombe, a Master in the Royal Navy and former merchant seaman, used it as the nucleus for *The Art of Rigging* that he wrote for students at the Royal Naval Academy. Each definition is followed by a list of the items of the group with a brief description of each artifact and references to the illustrations or photographs of the artifacts found in Appendix B.

SPARS

No remains of the mast, boom, or yards were found during the excavation; however, two closely associated artifacts were recovered. The first was the mast step that held the heel of *Boscawen's* mast. The other was the mast cap that fastened the topmast to the mast.

Mast Step

The mast step was constructed from a block of white oak, 4 feet, 3 inches (1.29 m) long, 16 inches (40.64 cm) high and 18 inches (45.72 cm) wide (Figure 4-2). Placed laterally across the keelson at a point slightly more than one third the vessel's length aft of the stem, the step was notched to fit over the keelson. To hold it in place, two two-foot-long (60.96 cm) wooden wedges were spiked into the keelson forward and aft of the step. The two small blocks of wood were fastened to the ceiling on the forward side of the step, with one on each side of the keelson; each was secured in

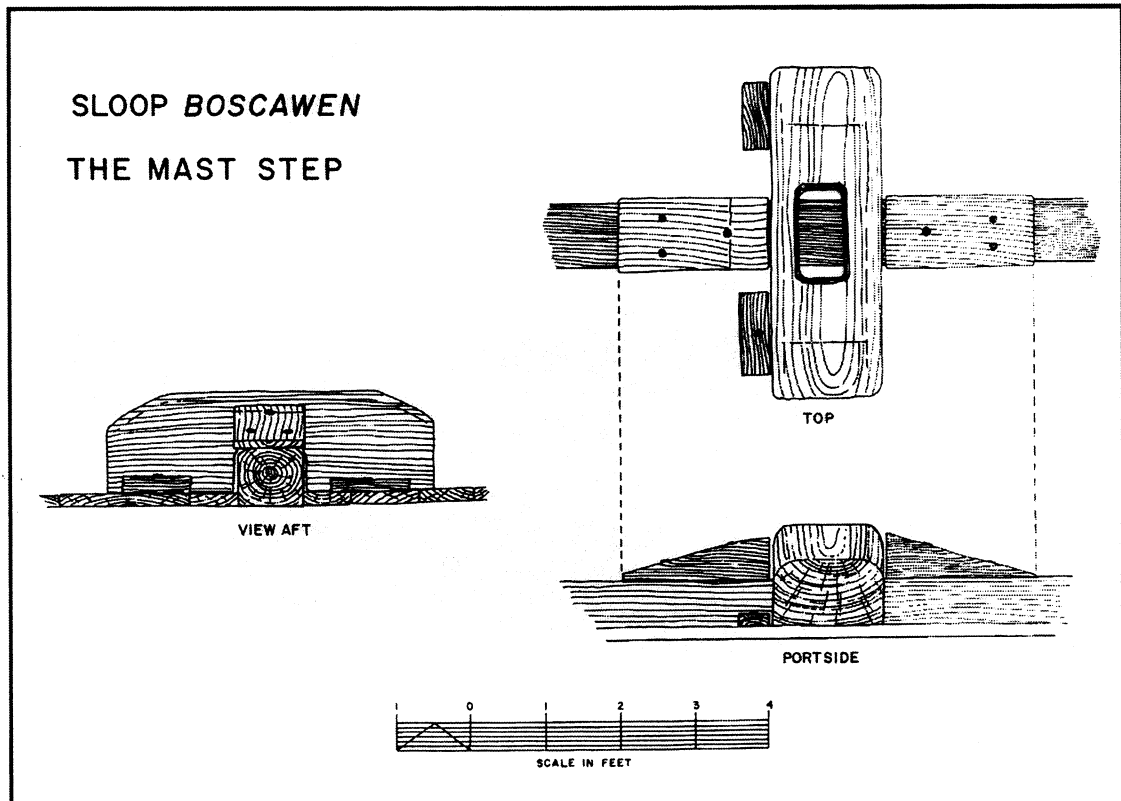


Figure 4-2. Boscawen's Mast Step (Reproduced with permission, Crisman 1985b:366).

place with a single iron spike. The purpose of these blocks was to prevent the step from twisting out of place. The step itself was not spiked or bolted to the ceiling or the keelson, presumably to allow the mast to be shifted forward or aft if necessary (Kevin J. Crisman 1998, pers. comm.).

The heel of the mast was fit into a 1 foot, 4 inch (40.64 cm) long and 8-1/2 inch (21.59 cm) wide slot cut through the mast step. This slot held the mast firmly in place while allowing the weight of the mast and rigging to rest directly on *Boscawen's* keelson.

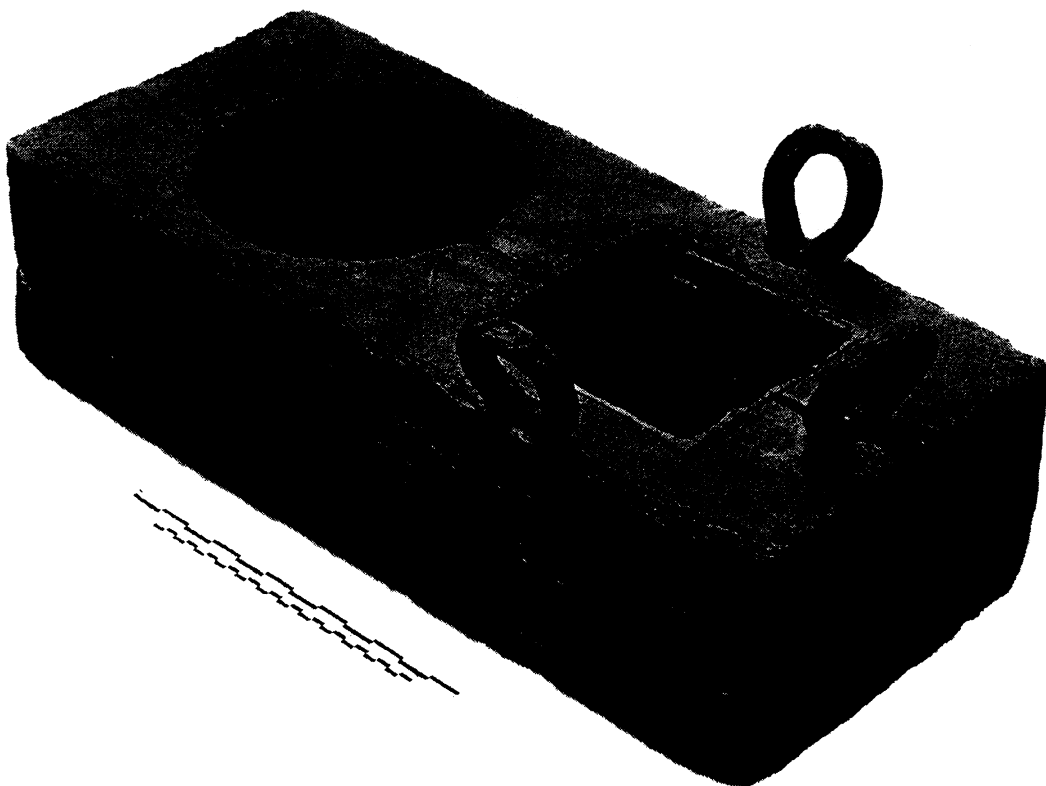


Figure 4-3. Boscawen's Mast Cap.

Mast Cap

The mast cap was originally placed over the top of the lower mast to secure the lower end of the topmast at a part of the masts called the "doubling." Fashioned from a single piece of wood and reinforced laterally with three iron bolts, the cap is 27-1/4 inches (69.22 cm) long, 12-7/8 inches (32.70 cm) wide and 7-1/2 inches (19.05 cm) thick (Figure 4-3). The cap has a 9-inch (22.86 cm) hole carved into the forward half through which the topmast passed. Into the other half a 7-inch (17.78 cm) square notch was cut 5 inches (12.70 cm) deep into the wood. The notch was placed over the squared upper end of the masthead and a 1/4-inch (0.64 cm) bolt or spike was driven

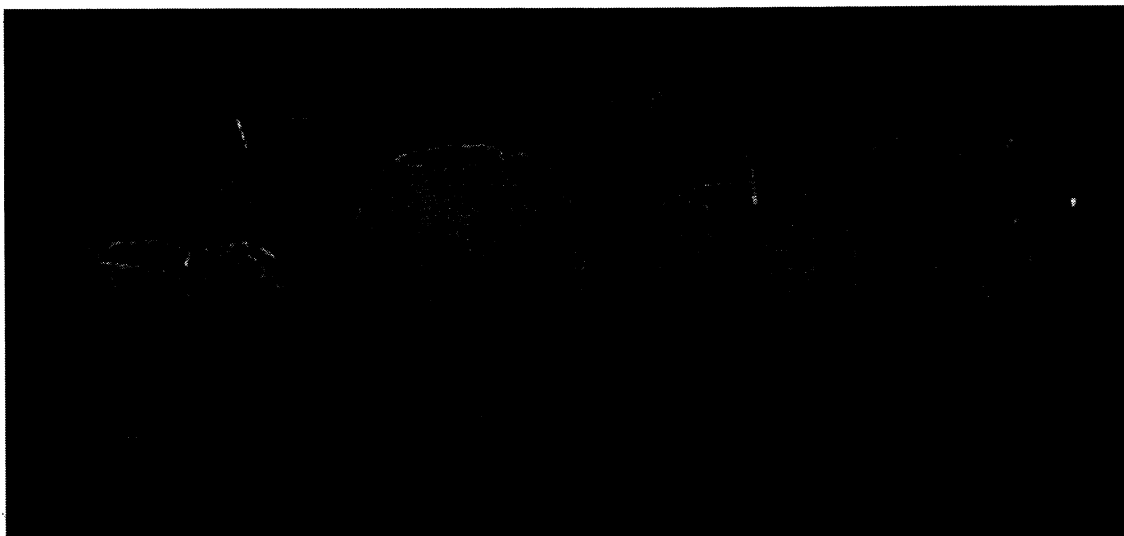


Figure 4-4. Boscawen's parrel trucks.

through the cap and into the mast to secure the cap in place. On three sides of the notch for the mast top iron eyebolts were fitted to hold the topping blocks which hoisted and lowered the mainsail.

Parrels

PARREL-TRUCKS are round balls of elm, or other wood, and have a hole through the middle, in which a rope is reeved, to form the parrels (Figure 4-4) (Steel 1932:134).

PARREL. A sort of collar, by which the yards are fastened at the slings to the masts, so that they may be hoisted or lowered with facility. Of parrels there are four sorts, viz., one sort is formed of a single rope, covered with spunyarn or leather, and having an eye spliced in each end; another sort is formed of two ropes, which reeved alternately through a rib and truck, and have an eye in one end; a third sort, calculated to confine the jaws of a jib-boom to the mast, is formed of a rope which reeves through several trucks without ribs; and a fourth sort is formed of a truss, by which the yard may at any time be slackened from the mast, or may be confined close by tackles connected to their lower ends, which lead upon the deck, and are most convenient for the lower yards. The first and second sorts are used for topsail and topgallant yards (Steel 1932:125).

DIMENSIONS: Overall diameter – 3 in (7.62 cm)
 Overall height – 3-1/8 in (7.94 cm)
 Interior diameter – 1-3/8 in (3.49 cm)

Good condition with a rope fragment inside when recovered.

02-106 PARREL TRUCK UNIT: 413 level G
 FIGURE: B-2 (a) MATERIAL: Ash

DIMENSIONS: Overall diameter – 3 in (7.62 cm)
 Overall height – 2-1/4 in (5.72 cm)
 Interior diameter – 1-1/4 in (3.18 cm)

Good condition with tool marks evident on the exterior.

02-237 PARREL TRUCK UNIT: 414 level Keelson
 FIGURE: B-2 (b) MATERIAL: Black Locust

DIMENSIONS: Overall diameter – 3-1/4 in (8.26 cm)
 Overall height – 2-9/16 in (6.51 cm)
 Interior diameter – 1-1/2 in (3.81 cm)

Slightly worn on one side with an irregular off-centered groove incised around the hole and a second groove around the center of the exterior surface.

02-250 PARREL TRUCK UNIT: 402 under hull
 FIGURE: B-2 (c) MATERIAL: Unknown

DIMENSIONS: Overall diameter – 2-3/8 in (6.03 cm)
 Overall height – 2-1/8 in (5.40 cm)
 Interior diameter – 7/8 in (2.22 cm)

Found outside the hull next to the stem 1-1/2 feet (45.72 cm) below the mud surface. It is in poor condition with a significantly worn portion. Because of its location and smaller size when compared with the other trucks, we cannot be certain this example is part of *Boscawen's* equipment.

STANDING RIGGING

Deadeyes

DEAD-EYES – Round flat wooden blocks, with three holes instead of sheaves, through which the laniards reeve, when setting up the shrouds, or stays. The power gained by the dead-eyes, is as the number of parts of the laniards rove through them; but, if the laniards be not well greased, the power will be greatly lost by friction, so that they are never applied as purchases, but merely for the better keeping the quantity gained of any shroud, or stay, when set up, and are much stronger than blocks with sheaves, when strain lies on a single pin (Steel 1932:119).

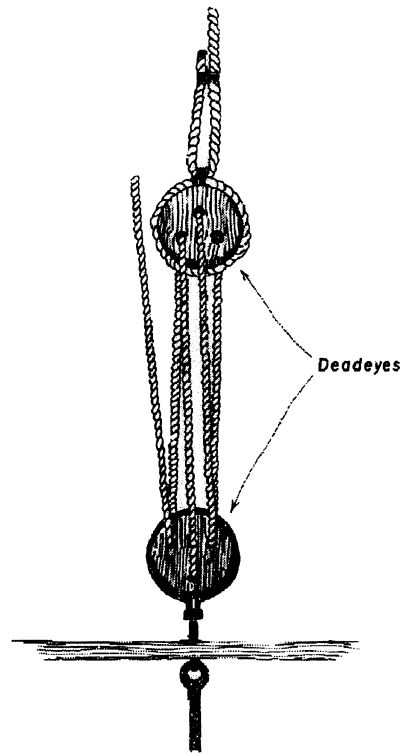


Figure 4-5. Deadeyes (By Kevin J. Crisman).

Deadeyes were employed in pairs to adjust the tension of the shrouds and stays supporting the mast (Figure 4-5). The two deadeyes were lashed together by a lanyard that was passed through the holes. The holes were faired by cutting a groove with a gouge to protect the lanyard from chaffing. At times, the left hole on the inboard side of a deadeye remained sharp where the lanyard was knotted. A groove was cut around the edge of the deadeye to accept the parceled and served shroud or an iron strap.

The wood needed to be tough, dense, close grained, and resistant to cracking, making lignum vitae or elm the choice woods; however, walnut, hickory or locust were also used successfully (Smith 1986:71). For weatherproofing, to prevent cracking, and add strength, deadeyes were often cooked in linseed oil for several hours. The iron strap of a lower deadeye was secured to a chain anchored to the side of the vessel by a

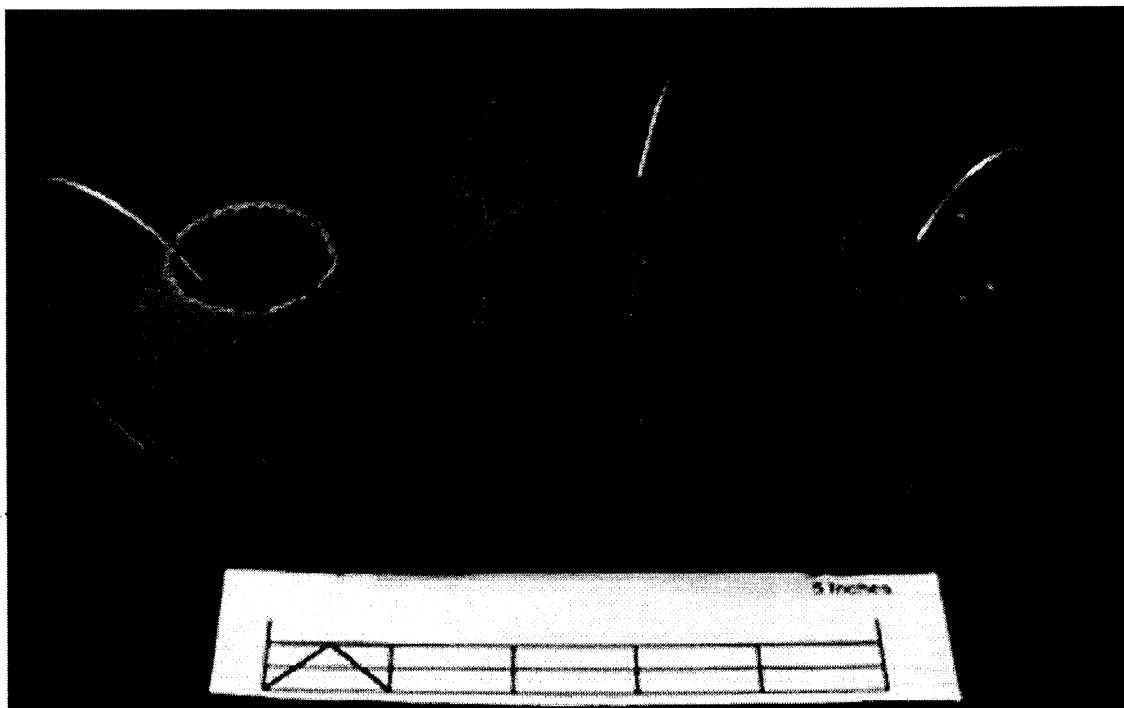


Figure 4-6. Shroud trucks 02-102, 02-118 and 02-236.

02-211 DEADEYE

UNIT: 406 level F

FIGURE: B-6

MATERIAL: Black Locust

DIMENSIONS: Diameter – 5-3/4 in (14.61 cm)

Thickness – 3-3/16 in (8.10 cm)

Channel Width – 1-1/4 in (3.18 cm)

Medium sized wooden deadeye in good condition. The channel width is 1-1/4 inches (3.18 cm) along the outer edge.

Shroud Trucks

SHROUD-TRUCKS are short cylindrical pieces of elm, etc., they have a hole through the middle, lengthways, a groove down the side, of the size of the shrouds, and a score round the middle to admit a seizing.

They are seized to the shrouds, to lead the ropes through, that they may be more readily found (Figure 4-6) (Biddlecombe 1990:36).

Shroud trucks were used to lead the running rigging lines through the maze of a vessel's rig. By lashing these pieces of wood to the shrouds, the running rigging that



Figure 4-7. A selection of Boscawen's blocks.

The use of block and tackle enabled small crews to hoist and lower the heavy spars and sails of sailing vessels. Similarly, in military vessels gun carriages were more easily managed by the mechanical advantage afforded by block and tackle. The block was carved from a single block of wood, fitted with a sheave and pin, and strapped with a rope or iron strap (Figure 4-8).

A total of ten blocks were recovered from *Boscawen* ranging in size from 5 inches (12.70 cm) to 8 inches (20.32 cm) in over all length. Although larger blocks of two or three sheaves were often used to hoist the yards of the main sails, only single sheave blocks were found during the excavation. These blocks are probably not representative of all sizes used on *Boscawen*, since sheaves for considerably larger blocks were also recovered.

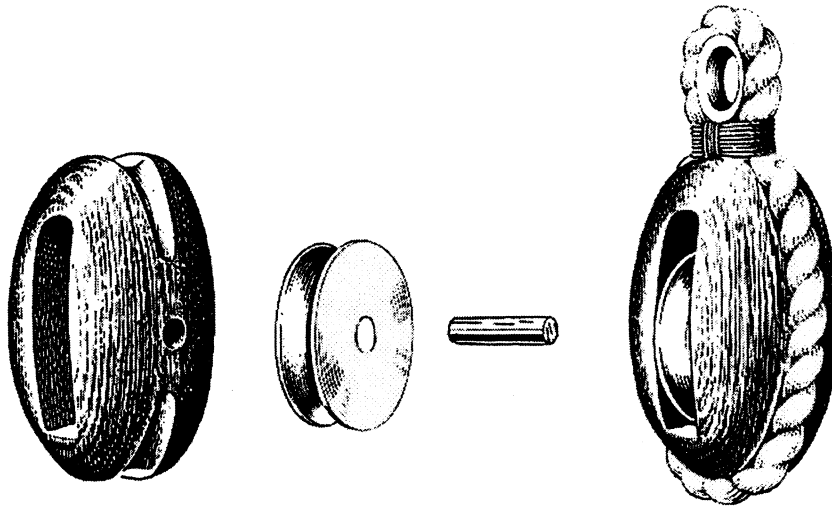


Figure 4-8. The components of a single sheave block (After Smith 1986:93).

02-043 SINGLE SHEAVE BLOCK

UNIT: 414 level E

FIGURE: B-10

MATERIAL: Ash or Elm

DIMENSIONS: Overall length – 5 in (12.7 cm)

Overall width – 4-1/8 in (10.48 cm)

Thickness – 2-1/2 in (6.35 cm)

One face is longitudinally cracked and detached. Red paint is noticeable on the surface. Somewhat worn, it contains a pin and sheave. The pin is 1/2 inch (1.27 cm) in diameter and 2-3/8 inches (8.57 cm) long. The sheave is 2-3/4 inches (6.99 cm) in diameter and 1/2 inch (1.27 cm) thick. The sheave is lignum vitae and pin is sugar maple.

02-046 SINGLE SHEAVE BLOCK

UNIT: 414 level E

FIGURE: B-11

MATERIAL: Unknown

DIMENSIONS: Overall length – 5 in (12.7 cm)

Overall width – 4 in (10.16 cm)

Thickness – 2-1/4 in (5.72 cm)

A wooden block complete with sheave and pin. Slight damage to the exterior of the block and cracked along the longitudinal axis allowing the two halves to be separated. Surface is painted red. The pin is 1/2 inch (1.27 cm) in diameter. The sheave is 3-1/4 inches (8.26 cm) in diameter and 3/4 to 7/8 inch (1.91 to 2.22 cm) thick. The sheave is lignum vitae and pin is sugar maple.

02-048 SINGLE SHEAVE BLOCK UNIT: 414 level E
 FIGURE: B-12 MATERIAL: Ash

DIMENSIONS: Overall length – 7 in (17.78 cm)
 Overall width – 6 in (15.24 cm)
 Thickness – 3 in (7.62 cm)

A wooden block complete with sheave and pin. Found with rope (06-066) inside and leather parcelling (04-018). The block is crudely hand carved of ash. The pin is 7/8 inch (2.22 cm) in diameter. The sheave is 3-1/2 inches (8.89 cm) in diameter. The sheave is lignum vitae and pin is sugar maple.

02-119 SINGLE SHEAVE BLOCK UNIT: 413 level G
 FIGURE: B-13 MATERIAL: Black Locust

DIMENSIONS: Overall length – 8 in (20.32 cm)
 Overall width – 5-3/4 in (14.61 cm)
 Thickness – 3-3/8 in (8.57 cm)

Wooden block complete with sheave and pin. The pin is 1 inch (2.54 cm) in diameter. The sheave is 4-1/2 inches (11.43 cm) in diameter and 3/4 inch (1.91 cm) thick. The sheave is lignum vitae and pin is sugar maple.

02-125 SINGLE SHEAVE BLOCK UNIT: 413 level G
 FIGURE: B-14 MATERIAL: Unknown

DIMENSIONS: Overall length – 5-3/4 in (14.61 cm)
 Overall width – 4-1/2 in (11.43 cm)
 Thickness – 2-7/8 in (7.30 cm)

Wooden block complete with sheave and pin. The pin is 3/4 inch (1.91 cm) in diameter. The sheave is 3 inches (7.62 cm) in diameter and 11/16 inch (1.75 cm) thick. The sheave is made of lignum vitae and pin is sugar maple.

02-126 SINGLE SHEAVE BLOCK UNIT: 413 level G
 FIGURE: B-15 MATERIAL: Black Locust

DIMENSIONS: Overall length – 6-3/4 in (17.15 cm)
 Overall width – 4-3/4 in (12.07 cm)
 Thickness – 2-1/2 in (6.35 cm)

A wooden block complete with sheave and pin with some visible insect damage. The pin is 7/8 inch (2.22 cm) in diameter. The sheave is 3-1/2 inches (8.89 cm) in diameter and 3/4 inch (1.91 cm) thick. The sheave is lignum vitae and pin is sugar maple.

02-131 SINGLE SHEAVE BLOCK UNIT: 413 level H
 FIGURE: B-16 MATERIAL: Elm

DIMENSIONS: Overall length – 7 in (17.78 cm)
 Overall width – 4-3/4 in (12.07 cm)
 Thickness – 3 in (7.62 cm)

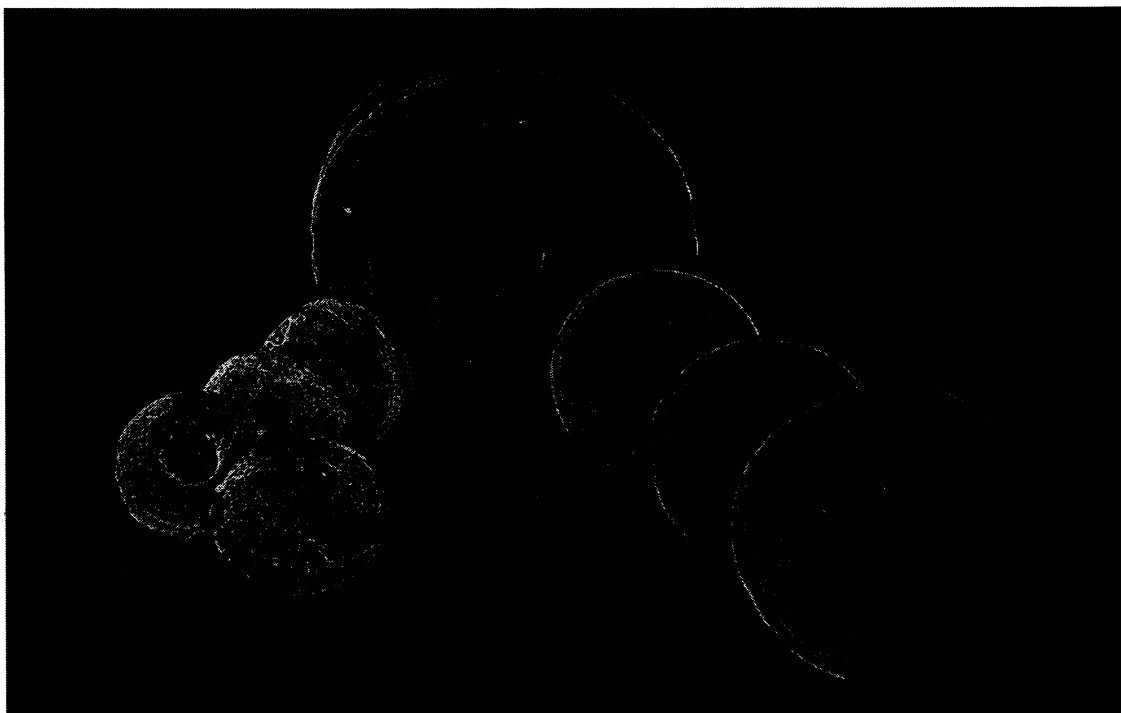


Figure 4-9. A selection of Boscawen's sheaves.

02-034 SHEAVE with PIN

UNIT: 403 level C

FIGURE: B-20

MATERIAL: Lignum Vitae

DIMENSIONS: Outer Diameter – 2-3/4 in (6.99 cm)
 Inner Diameter – 11/16 in (1.75 cm)
 Thickness – 5/8 in (1.59 cm)
 Pin Length – 2-3/8 in (6.03 cm)
 Pin Diameter – 5/8 in (1.59 cm)

Very worn, or eroded, sheave with slight remains of red paint of the end of the pin.

02-042 SHEAVE

UNIT: 403 level C

FIGURE: B-21

MATERIAL: Lignum Vitae

DIMENSIONS: Outer Diameter – 2-3/4 in (6.99 cm)
 Inner Diameter – 7/8 in (2.22 cm)
 Thickness – 5/8 in (1.59 cm)

Very worn, and eroded, condition with ill-defined outside edges.

02-044 SHEAVE

UNIT: 414 level E

FIGURE: B-22

MATERIAL: Lignum Vitae

DIMENSIONS: Outer Diameter – 6-5/8 in (16.83 cm)
 Inner Diameter – 1-1/2 in (3.81 cm)
 Thickness – 1-3/8 in (3.49 cm)

Good condition, but outer edges are cracked and damaged in places.

02-059 SHEAVE UNIT: 414 level E
 FIGURE: B-23 MATERIAL: Lignum Vitae
 DIMENSIONS: Outer Diameter – 3 in (7.62 cm)
 Inner Diameter – 1 in (2.54 cm)
 Thickness – 5/8 in (1.59 cm)

Very worn condition.

02-065 SHEAVE UNIT: 413 level 7
 FIGURE: B-24 MATERIAL: Lignum Vitae
 DIMENSIONS: Outer Diameter – 7 in (17.78 cm)
 Inner Diameter – 1-5/8 in (4.13 cm)
 Thickness – 7/8 in (2.22 cm)

Good condition, but outer edges are cracked and damaged in places.

02-079 SHEAVE UNIT: 403 level E
 FIGURE: B-25 MATERIAL: Lignum Vitae
 DIMENSIONS: Outer Diameter – 3 in (7.62 cm)
 Inner Diameter – 11/16 in (1.75 cm)
 Thickness – 13/16 in (2.06 cm)

Very worn, or eroded, condition with ill-defined outside edges.

02-082 SHEAVE UNIT: 413 level F
 FIGURE: B-26 MATERIAL: Lignum Vitae
 DIMENSIONS: Outer Diameter – 7-1/2 in (19.05 cm)
 Inner Diameter – 1-7/16 in (3.65 cm)
 Thickness – 1-9/16 in (3.97 cm)

Good condition.

02-095 SHEAVE UNIT: 413 level G
 FIGURE: B-27 MATERIAL: Lignum Vitae
 DIMENSIONS: Outer Diameter – 4 in (10.16 cm)
 Inner Diameter – 1 in (2.54 cm)
 Thickness – 7/8 in (2.22 cm)

Good condition.

02-100 SHEAVE UNIT: 413 level G
 FIGURE: B-28 MATERIAL: Lignum Vitae
 DIMENSIONS: Outer Diameter – 6-7/8 in (17.46 cm)
 Inner Diameter – 1-3/8 in (3.49 cm)
 Thickness – 1-1/8 in (2.86 cm)

Good condition, but outer edges are cracked and damaged in places.

02-124 SHEAVE
 FIGURE: B-29
 DIMENSIONS: Outer Diameter – 4-1/8 in (10.48 cm)
 Inner Diameter – 1 in (2.54 cm)
 Thickness – 7/8 in (2.22 cm)

UNIT: 413 level G
 MATERIAL: Lignum Vitae

Good condition with a scribed circle around the center hole.

02-339 SHEAVE with PIN
 FIGURE: B-30
 DIMENSIONS: Outer Diameter – 4-3/4 in (12.07 cm)
 Inner Diameter – 1 in (2.54 cm)
 Thickness – 7/8 in (2.22 cm)

UNIT: Unknown
 MATERIAL: Lignum Vitae

Good condition with slight wear around edges.

Block Pins

02-062 BLOCK PIN
 FIGURE: B-52 (b)
 DIMENSIONS: Overall length – 2-1/2 in (6.35 cm)
 Diameter – 5/8 in (1.59 cm)

UNIT: 403 level E
 MATERIAL: Unknown

Very good condition with red paint on ends.

02-322 BLOCK PIN
 FIGURE: B-55 (b)
 DIMENSIONS: Overall length – 2-1/2 in (6.35 cm)
 Diameter – 7/8 in (2.22 cm)

UNIT: Unknown
 MATERIAL: Unknown

Good condition.

Hooks and Thimbles

HOOK--A crooked piece of iron, of which there are several kinds, of different shapes, used at sea; as boat-hooks, can-hooks, cat-hooks, chain-hooks, etc. (Biddlecombe 1990:16).

Eleven hooks of different styles were recovered from *Boscawen*. Of the eleven, four were recovered with thimbles. The hooks ranged in size from 4-1/2 inches (11.43 cm) overall length to 18 inches (45.72 cm). Two most exceptional hooks were 03-009 and 03-510; the first was a strap hook which was fitted around a block, the

second had a flattened shank allowing it to be spiked to a surface to be used as a hanger. The remaining examples were standard iron hooks forged with eyes and mouths of varying dimensions.

03-005 HOOK UNIT: 414 level B
 FIGURE: B-31 MATERIAL: Iron

DIMENSIONS: Overall length – 6-1/2 in (16.51 cm)
 Outer eye diameter – 2-3/4 in (6.99 cm)
 Inner eye diameter – 1-1/2 in (3.81 cm)
 Shank thickness – 7/8 in (2.22 cm) tapering to 3/8 in (0.95 cm)
 Hook length – 3-1/8 in (7.94 cm)
 Hook mouth width – 2 in (5.08 cm)

Good condition with some oxidation. Eye is formed by two pieces of metal originating at the shank, bent around and overlapping.

03-006 HOOK UNIT: 414 level B
 FIGURE: B-32 MATERIAL: Iron

DIMENSIONS: Overall length – 6-3/4 in (17.15 cm)
 Outer eye diameter – 2-1/4 in (5.72 cm)
 Inner eye diameter – 1-1/4 in (3.18 cm)
 Shank thickness – 5/8 in (1.59 cm)
 Hook length – 3-3/16 in (8.09 cm)
 Hook mouth width – 1-3/4 in (4.45 cm)

Good condition with some oxidation.

03-039 HOOK WITH THIMBLE UNIT: 414 level E
 FIGURE: B-33 MATERIAL: Iron

DIMENSIONS: Overall length – 6-1/2 in (16.51 cm)
 Outer eye diameter – 2-3/8 in (6.03 cm)
 Inner eye diameter – 1-1/2 in (3.81 cm)
 Shank thickness – 5/8 in (1.59 cm)
 Hook length – 4 in (10.16 cm)
 Hook mouth width – 1-3/4 in (4.45 cm)
 Thimble diameter – 1-1/2 in (3.81 cm)
 Thimble width – 7/8 in (2.22 cm)

Hook is in good condition. The thimble is very corroded, thin, and fragile.

03-049 HOOK WITH THIMBLE UNIT: 414 level E
 FIGURE: B-34 MATERIAL: Iron

DIMENSIONS: Overall length – 5-3/4 in (14.61 cm)

Outer eye diameter – 2-5/8 in (6.67 cm)
 Inner eye diameter – 1-3/8 in (3.49 cm)
 Shank thickness – 3/4 in (1.91 cm)
 Hook length – 2-1/4 in (5.72 cm)
 Hook mouth width – 1-7/8 in (4.76 cm)
 Thimble diameter – 1 in (2.54 cm)
 Thimble width – 1 in (2.54 cm)

Both hook and thimble are in fairly good condition.

03-058 HOOK UNIT: 414 level E
 FIGURE: B-35 MATERIAL: Iron
 DIMENSIONS: Overall length – 5-1/4 in (13.33 cm)
 Outer eye diameter – 2 in (5.08 cm)
 Inner eye diameter – 1-1/4 in (3.18 cm)
 Shank thickness – 9/16 in (1.43 cm)
 Hook length – 3 in (7.62 cm)
 Hook mouth width – 1-5/8 in (4.13 cm)

Good condition when recovered. Unusual and characteristic tip that was bent over during production.

03-121 HOOK UNIT: 413 level G
 FIGURE: B-36 (b) MATERIAL: Iron
 DIMENSIONS: Overall length – 6-3/4 in (17.15 cm)
 Outer eye diameter – 2-5/8 in (6.67 cm)
 Inner eye diameter – 1-3/4 in (4.45 cm)
 Shank thickness 3/4 in (1.91 cm)
 Hook length – 3-1/2 in (8.89 cm)
 Hook mouth width – 2-3/8 in (6.03 cm)

Very good condition with minimal oxidation.

03-129 HOOK WITH THIMBLE UNIT: 402 level Keelson
 FIGURE: B-37 MATERIAL: Iron
 DIMENSIONS: Overall length – 5 in (12.7 cm)
 Outer eye diameter – 2-3/8 in (6.03 cm)
 Inner eye diameter – 1-1/4 in (3.18 cm)
 Shank thickness – 7/8 in (2.22 cm)
 Hook length – 2-5/8 in (6.67 cm)
 Hook mouth width – 1-1/2 in (3.81 cm)
 Thimble diameter – 7/8 in (2.22 cm)
 Thimble width – 7/8 in (2.22 cm)

Hook is in fair condition with a considerable amount of oxidation and corrosion when recovered. Additionally, a mass of unknown matter was found concreted to the shank of the hook. Only half of the thimble remains and it is very corroded, thin, and fragile.

Strap width – 1-1/4 in (3.18 cm)
 Shank thickness – 1 in (2.54 cm)
 Hook length – 4-1/8 in (10.48 cm)
 Hook mouth width – 2-3/4 in (6.99 cm)

Very good condition recovered. Significantly different hook from the others recovered that held a very large block in the iron strap and was generally used to hoist heavy equipment or spars. The interior dimensions of the strap suggest it was probably a single-sheave block.

03-008 THIMBLE UNIT: 414 level B
 FIGURE: B-36 (a) MATERIAL: Iron
 DIMENSIONS: Thimble diameter – 1-1/4 in (3.175 cm)
 Thimble width – 7/8 in (2.22 cm)

Only three-quarters of it remains which is corroded, thin, and fragile.

Parcelling

PARCELLING--A name given to long narrow slips of tarred canvas, and bound about a rope, in the manner of bandages, previous to being sewed. It is laid in spiral turns, as smoothly upon the surface as possible, that the rope may not become uneven and full of ridges (Biddlecombe 1990:22).

Two pieces of parcelling were recovered from *Boscawen*. Both are made of two strands of leather woven together. Parcelling was braided over a length of rope to increase its durability by making it watertight, maintaining a smooth surface, and providing the rope with a barrier against damage from friction. Often this was accomplished by worming, parcelling, and serving a rope and covering it in tar (Figure 4-10).

04-014 PARCELLING UNIT: 414 level E
 FIGURE: B-42 (a) MATERIAL: Leather
 DIMENSIONS: Length upon recovery – 4 in (10.16 cm)
 Length after conservation – 2-1/2 in (6.35 cm)
 Width – 5/16 in (0.79 cm)
 Thickness – 1/16 in (0.16 cm)

Two lengths of narrow leather tightly curled in good condition with a knot tied at one end. Upon recovery the parcelling was too fragile to unwind for an accurate measurement of its length. Additionally, after conservation the curling became tighter.

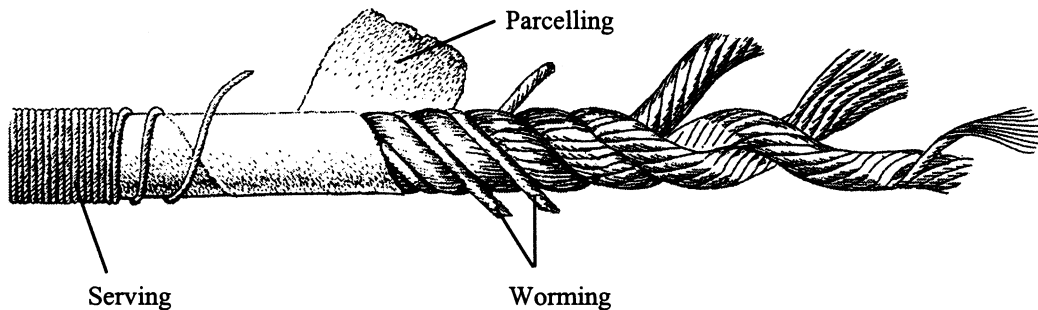


Figure 4-10. A diagram of the treatment of a length of rope. It has been wormed, parcelled, and served to protect it from excessive wear (After Smith 1986:26).

04-018 PARCELLING

UNIT: 414 level E

FIGURE: B- 42 (b)

MATERIAL: Leather

DIMENSIONS: Length upon recovery – 7-1/2 in (19.05 cm)

Length after conservation – 7-3/8 in (18.73 cm)

Width – 1/2 in (1.27 cm)

Thickness – 1/16 in (0.16 cm)

Two lengths of narrow leather wrapped together and tapering at one end, with rope 06-066 and block 02-048 attached.

Cordage, Lines, and Rope

CORDAGE—A general term for the running rigging of a ship, or all of the part of her rigging which is employed to extend, contract, or traverse the sails; as also for the rope which is kept in reserve to supply the place of such as may be rendered unserviceable (Biddlecombe 1990:10).

LINES— Cordage smaller than ropes, and formed by two or more fine strands of hemp; as houseline, made of three strands, used to seize blocks into their straps and the clues of sails, and to marl the skirts of sails to their bolt ropes (Biddlecombe 1990:19).

ROPES—All cordage in general, above one inch in circumference, which bear different names, according to their various uses. (Biddlecombe 1990:25).

The rope fragments that were recovered from *Boscawen* ranged in length from 12 inches (30.48 cm) to less than 1 inch (2.54 cm) in length with diameters of 1/4 inch (0.64 cm) to 3/4 inch (1.91 cm). A variety of rope would be necessary to rig *Boscawen* ranging in diameter from 1 to 3 inches (2.54 to 7.62 cm) (Steel 1932:267). However, little detail can be obtained from the recovered piece of rope. Although, some pieces are in quite good condition revealing the braiding or lay 'Z' or 'S' lay, or twist, of the rope, the majority are small pieces that more resemble a mass of strands of decomposing organic matter.

06-009 ROPE FRAGMENTS

UNIT: 414

FIGURE: B-43

MATERIAL: Rope

A group of five fragments of rope which measure 5-1/4 inches (13.33 cm), 4-1/2 inches (11.43 cm), 3-1/4 inches (8.26 cm), 3 inches (7.62 cm), and 2-3/4 inches (6.99 cm) in length and were approximately 1/2 inch (1.27 cm) in diameter. All have a Z-lay.

06-016 ROPE

UNIT: 413 level F

FIGURE: B-44 (a)

MATERIAL: Rope

A small fragment of S-lay rope 1-3/4 inches (4.32 cm) long and 1/4 inch (0.64 cm) in diameter.

06-017 ROPE FRAGMENT

UNIT: 413 level F

FIGURE: B-44 (b)

MATERIAL: Rope

Two small fragment of tarred rope 2 inches (5.08 cm) long and 3/4 inch (1.91 cm) in diameter.

06-019 ROPE FRAGMENT

UNIT: 413 level F

FIGURE: B-44 (c)

MATERIAL: Rope

A small fragment of Z-lay rope 2-1/2 inches (6.35 cm) long and 1/2 inch (1.27 cm) in diameter.

06-037 ROPE FRAGMENTS

UNIT: 413 level G

FIGURE: B-45

MATERIAL: Rope

Two fragments of braided rope 12 inches (30.48 cm) and 7-1/2 inches (19.05 cm) long and 3/4 inch (1.91 cm) wide.

- 06-039 ROPE FRAGMENTS UNIT: 413 level G
 FIGURE: B-46 (a & b) MATERIAL: Rope
 Two fragments of apparently two different Z-laid ropes. The first is 2-1/4 inches (5.72 cm) long and 1/2 inch (1.27 cm) in diameter. The second is 3-1/4 inches (8.26 cm) long and 3/4 inches (1.91 cm) in diameter.
- 06-041 ROPE FRAGMENTS UNIT: 413 level G
 FIGURE: B-46 (c) MATERIAL: Rope
 Two fragments an 1/2 inch (1.27 cm) diameter S-laid rope. The first is 1-1/2 inches (3.81 cm) long and the second is 2-3/4 inches (6.99 cm) long.
- 06-066 ROPE FRAGMENT UNIT: 414 level E
 FIGURE: B-48 (a) MATERIAL: Rope
 A fragment of Z-laid rope 3-3/4 inches (9.53 cm) long and 3/4 inch (1.91 cm) in diameter recovered from wooden block 02-048 and wrapped with parcelling 04-018.
- 06-067 ROPE FRAGMENT UNIT: 413 level G
 FIGURE: B-47 MATERIAL: Rope
 A group of seven rope fragments of varying style. The first is a braided piece, 7 inches (17.78 cm) long and 1/2 inch (1.27 cm) in diameter.
- 06-068 ROPE FRAGMENTS UNIT: 413 level G
 FIGURE: B-48 (b, c, & d) MATERIAL: Rope
 Three fragments of Z-laid rope 3-3/4 inches (9.53 cm), 3-1/2 inches (8.89 cm), and 3 inches (7.62 cm) long with 3/4 inch (1.91 cm) diameter.
- 06-069 ROPE FRAGMENTS UNIT: 413 level G
 FIGURE: B-49 MATERIAL: Rope
 Seven rope fragments of undetermined character, possibly treated with tar or resin.
- 06-098 ROPE FRAGMENTS UNIT: 412 level D
 FIGURE: B-50 MATERIAL: Rope
 Seven rope fragments—two pieces of cord, two Z-laid pieces of rope, three pieces of undetermined character, possibly treated with tar or resin.
- 06-106 ROPE FRAGMENTS UNIT: 412/413 level DB
 FIGURE: B- 51 (a) MATERIAL: Rope
 Three pieces of undetermined character, possibly treated with tar or resin.
- 06-123 ROPE FRAGMENTS UNIT: 412/413 level DB
 FIGURE: B- 51 (b) MATERIAL: Rope
 Fragile coil of rope of undetermined character.

MISCELLANEOUS WOOD ARTIFACTS

The following are the remaining wooden artifacts, including beads, toggles, and a dowel, possibly used for a variety of nonspecific tasks in the rigging of a vessels such as *Boscawen*.

02-056 WOODEN RING FRAGMENT UNIT: 403 level D
 FIGURE: B-52 (a) MATERIAL: Black Locust
 DIMENSIONS: Outer Diameter – 1-1/2 in (3.81 cm)
 Inner Diameter – 1/2 in (1.27 cm)
 Thickness – 1/2 in (1.27 cm)

One half of a wooden ring.

02-063 TOGGLE or BLOCK PIN UNIT: 404 level E
 FIGURE: B-52 (c), B-53 (a) MATERIAL: Soft wood
 DIMENSIONS: Overall length – 2-5/16 in (5.87 cm)
 Diameter – 5/8 in (1.59 cm)
 Thickness at Groove – 3/8 in (0.95 cm)

Fair condition with a groove in the center which could be wear from a sheave.

02-099 TOGGLE UNIT: 404 level E
 FIGURE: B-53 (b) MATERIAL: Soft wood
 DIMENSIONS: Overall length – 1-5/16 in (5.87 cm)
 Diameter – 5/8 in (1.59 cm)
 Thickness at Groove – 3/8 in (0.95 cm)

Fair condition with a groove in the center which could be wear from a sheave.

02-163 RING UNIT: 413 level DB
 FIGURE: B-54 MATERIAL: Unknown
 DIMENSIONS: Outer Diameter – 1-1/8 in (2.86 cm)
 Inner Diameter – 1/2 in (1.27 cm)
 Thickness – 3/8 in (0.95 cm)

Wooden ring rounded on one side and flat on the other with a turned mark on both sides.

02-173 DOWEL/SPINDLE UNIT: 512 level E
 FIGURE: B-55 (a) MATERIAL: Sugar Maple
 DIMENSIONS: Overall length – 7 in (17.78 cm)
 Diameter – 1-1/8 in (2.86 cm)

Round, smooth lathe turned wooden dowel with one flat end and the other rounded in good condition.

02-182 TOGGLE	UNIT:	Unknown
FIGURE: B-53 (c)	MATERIAL:	Unknown
DIMENSIONS: Overall length – 2 in (5.87 cm)		
Diameter – 5/8 in (1.59 cm)		
Thickness at Groove – 3/8 in (0.95 cm)		
Fair condition.		

SUMMARY OF ARTIFACTS

The rigging material recovered during the excavation and listed above offers little information regarding about the actual rig of *Boscawen*. No record of the dimensions of the rig have been found, and the step and mast cap are the only artifacts that provide any definitive information about *Boscawen*'s rig. Of the other items listed above, little can be discerned other than their general function. Additionally, the location of these other artifacts and their worn character suggests that many of these item were discarded equipment or spare parts. However, the presence of such a large quantity of material is intriguing and provides a large archaeological collection that can be compared with similiar material recovered from other excavations.

A small collection of rigging items were recovered from the French frigate *Machault*. This vessel was built in France but served in Canada in 1760 during the final year of the French and Indian Wars. Specifically, two deadeyes were recovered; however, they were more robust and fitted with iron hoops that attached to the chainwhales of the frigate (Sullivan 1986). Similiarly, two deadeyes were recovered during the Cornwallis Cave Shipwreck excavation (Bass et al. 1976). Additionally, a 9-inch (22.86 cm) single sheave block, 16-inch (40.64 cm) single sheave block, and an iron strap hook with an 11-inch (27.94 cm) long strap were recovered. A much larger collection of rigging material was found during the Yorktown Shipwreck Archaeologi-

cal Project. This excavation of a Revolutionary War transport recovered 8 deadeyes, 33 sheaves, 4 blocks, 1 double-block, parrel trucks, and a large amount of cordage (Broadwater 1996).

Comparing the items recovered from *Boscawen* to those found on other vessels illustrates the common usage of various rigging material, however, such a comparison does little to assist in reconstructing her rig. Instead, a thorough understanding of the evolution of the sloop rig is needed to begin the reconstruction.

CHAPTER V

THE DEVELOPMENT OF THE SLOOP

During the sixteenth and seventeenth centuries a technical revolution occurred in the rigging of small vessels in northern Europe. For centuries square sails were used to power the ships of northern Europe. However, fore-and-aft rigs gave small ships improved maneuverability and required smaller crews. Consequently, as fore-and-aft rigs were introduced into northern Europe during the sixteenth and seventeenth centuries they quickly replaced the older rigs. Through the years one fore-and-aft rig became the most common, the sloop rig (Leather 1970; Simper 1983; Teuscher 1983, 1984, 1985; Thompson 1992).

A sloop-rigged vessel is characterized by one mast to which a fore-and-aft mainsail is attached to a gaff at the head of the sail and a boom at the foot of the sail. Forward of the mast are one or more jibsails. Additionally, above the gaff a gaff-topsail can be set (Figure 5-1) (Davis 1974:2). Larger sloop rigged vessels may also be rigged with a square sail on the mainmast as well as a square topsail. Although today the sloop rig remains the most common fore-and-aft rig, its origin is obscure.

TERMINOLOGY

The term "sloop" first appeared in the English language on January 22, 1629, in a letter from English merchants on the east coast of India (Baker 1987:38). These merchants were writing to their superiors in Java to request small vessels so that they could compete with Dutch merchants who kept "always some 5 or 6 sloopes and junks trading . . . trading from port to port." Apparently the word was taken from the Dutch *sloep* which was used for a ship's boat or shallop (Jockin-la Bastide and van Kooten

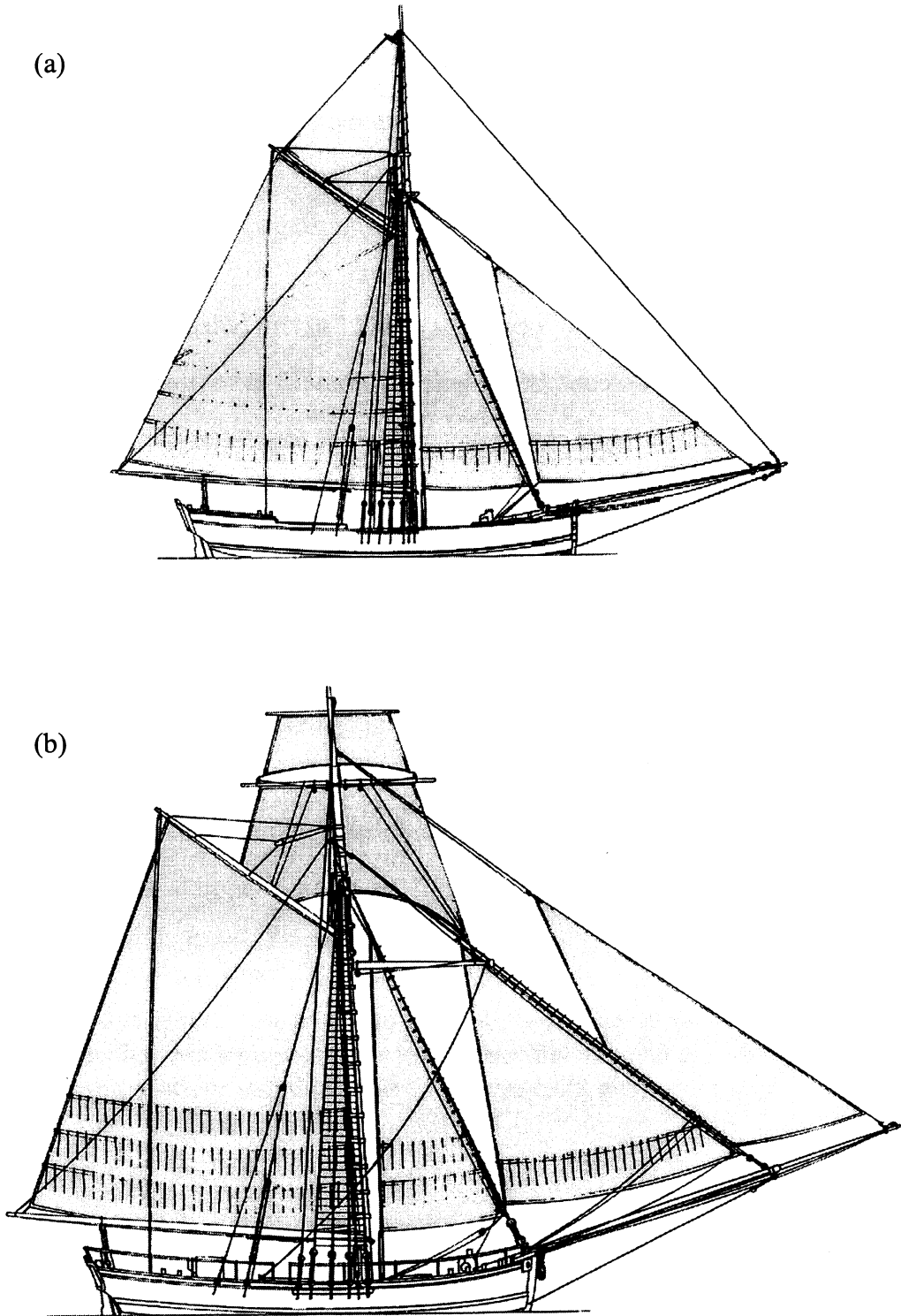


Figure 5-1. Basic (a) and full (b) sloop rigs (After Marquardt 1986).

1978:501). “Shallop” is the Anglicized form of the word *chaloupe*, the French spelling of *sloop* (Morris 1927:42; Baker 1987:xii). Throughout the sixteenth and seventeenth centuries these terms were used interchangeably to identify various small craft (Baker 1987:39-40).

Shallop

“Shallop” appeared first in 1576 in an account from Martin Frobisher’s search for the Northwest Passage to China comparing an Eskimo boat to a Spanish shallop. Thereafter, numerous references to shallops were made by early explorers and colonists referring to native craft and their own small craft, frequently ships’ boats which were often brought to the New World disassembled—*chaloupe en fagot*—and constructed upon arrival (Baker 1987:1).

Writing about ships’ boats between 1620 and 1623, Manwayring states, “other small Boats, which [ships] carry for lightnesse, to hoise in and out quickly, are called Skiffes and Shallops, according to their forme”(Manwayring 1972:10). In *Boteler’s Dialogues*, when asked about the ship’s boats, he answered, “They are these; the long-boat; the skiff, or shallop; and the barge” (Perrin 1929:194) and offered the following description of the shallop:

It is a smaller and lighter, and so a nimbler boat than the long-boat, and the peculiar employment of it is to row speedily upon all occasions, from one place or ship to another . . . (Perrin 1929:195).

The early usage of “shallop” was very general; in fact, William Bradford used the terms “shallop” and “boat” indiscriminately in his *Of Plimoth Planation* (Morris 1927:43). Additionally, early descriptions offer little detail about the construction and rigging of these shallops, some described as fitted with one mast and others with two. However, as more thorough descriptions were written of shallops, the vessels were no

longer simply small utility craft but were evolving into larger merchant vessels.

During the seventeenth century specialized shallops and two-masted “double shallops” were being built. In his *History of New England*, Governor Winthrop recorded meeting with a fishing shallop off Cape Ann when his ships arrived in 1630 (Baker 1962:43). In the same location, in 1635, a “great shallop” was wrecked and ten years later a 10-ton shallop capsized in Boston Harbor. Court documents from 1675 recorded a shallop “that was large enough to have its own ‘boat’” (Baker 1962:44).

The development of the larger shallops brought about further confusion between the terms “shallop” and “sloop.” In contemporary English naval records, where terms were used interchangeably, the size of shallops reached that of the smallest Pepysian naval sloops, having about a 40 ft (12m) keel length (Baker 1987:39).¹

The rapid evolution of the shallop is best illustrated by two definitions written only thirty years apart. In 1750, Blanckley (1988:149) defines a shallop as a “small light Vessel, with only a small Main and Fore-mast, and Lugg-sails to haul up and let down on Occasion.” Three decades later, Falconer (1970:260) defines a shallop as “a sort of large boat with two masts, and usually rigged like a *schooner*.” Eventually, later shallops were often referred to as schooners (Edson 1989:198). The overlap of these terms probably led to the decline in the usage of “shallop” which was supplanted by “schooner.”

It is difficult to assess the actual construction and rigging of the small boats brought to the New World by explorers and colonists; in fact, the identification of their own craft and native craft as shallops may be indicative the term’s universality. Furthermore, the broad use of the term caused it to overlap with another frequently used term—“sloop.”

¹ The term sloop was used in the Pepysian navy to denote the number and size of guns carried on the vessel, not the rig of the vessel (Morris 1927:86).

Sloop

“Sloop” appears only three times in Winthrop’s *The History of New England* (1630-1649) and not at all Bradford’s *Of Plimoth Plantation* (1620-1647) (Baker 1987:46). Although the lists of vessels arriving and clearing Boston in 1661-1662 do not include any sloops, by 1680, in the *Foreign Correspondence* of Connecticut, ten of twenty-five vessels mentioned are sloops. In the same year, a sloop in Salem, Massachusetts is recorded in the will of a colonist named John Turner (Morris 1927:86). However, like “shallop,” early usage of “sloop” is associated with small craft of unspecified construction and rigging. Additionally, as previously mentioned, the English navy had another specific use for the term.

In 1676, the English navy officially began using the term “sloop” (Morris 1927:85). The navy’s use of this term did not refer to the rig of the vessel; rather, it was the rating of a vessel that carried less than 18 guns mounted on a single deck (Chapelle 1935:52). This too has caused much confusion in studying the development of the sloop rig. When R.C. Anderson (1922:109) first discovered Pepys’s lists of 22 sloops in the navy of Charles II, he guessed they were single-masted vessels and wrote, “we can safely assume that the sloops of this date did not carry a mizzen mast.” After further study, he found that these ships, in fact, were rigged with two and three masts (Anderson 1923:214). Nevertheless, naval sloops occasionally were fore-and-aft rigged with only one mast (i.e. sloop-rigged).

Ambiguity regarding sloops can be found in countless other references. The *Dictionnaire de Marine*, published in 1702 contains the following definition of a sloop:

This is a sea-going vessel, used for the service of and communication between large ships; it also is used to make short trips to sea; although some of them make long trips, and even ocean voyages. Every sloop, used for the service of large ships, has a crew of at least six: the officer, who is at the helm, and five oarsmen, one at each oar. Commonly it is a boatswain who is in command (Clark 1904:24).

In 1732, Thomas Riley Blanckley wrote:

“Sloops—are Sail’d & Masted as Mens fancys leads them sometimes with One Mast, with Two, and with Three, with Bermudoes, Shoulder of Mutton, Square Lug & Smack Sails, they are in Figure either Square or Round Stern’d” (Baker 1987:38).

However, the vagueness these definitions sharply contrasts Falconer’s (1970:270) definition less than fifty years later:

[The sloop is] a small vessel furnished with one mast, the main-sail of which is attached to a *gaff* above, to the mast on it’s foremost edge, and to a long boom below; by which it is occasionally shifted to either quarter.

Apparently, soon after Blanckley’s very general definition, the meaning of the term sloop narrowed to become descriptive of a specific style of rigging. In fact, when defining a cutter, a similar contemporary vessel, Falconer (1970:93) stated it was “rigged as a sloop.” Additionally, a specific sloop rig is referred to in the following Naval Act of 1784, ordering:

All vessels belonging in the whole, or in part, to any of H.M. subjects, called *Cutters, Luggers, Shallops, or Wherries* (of what build-soever), and all vessel belonging as aforesaid of any other description, whose bottoms are clench work, unless they shall be square rigged, or fitted as sloops, with standing bowsprits; and all vessels belonging as aforesaid the length of which shall be greater than in the proportion of 3½ft. to 1 ft. in breadth . . . which shall be found within the limits . . . shall be forfeited (C.A.G.B, ed’s note *Mariner’s Mirror* 1912:22).

By the latter half of the eighteenth century not only had the components of the sloop rig been developed, but they had come together to form an identifiable rig. This rig included a fore-and-aft gaff mainsail, two or three headsails, and a square topsail. Additionally, eighteenth-century sea-going sloops often included a square course,

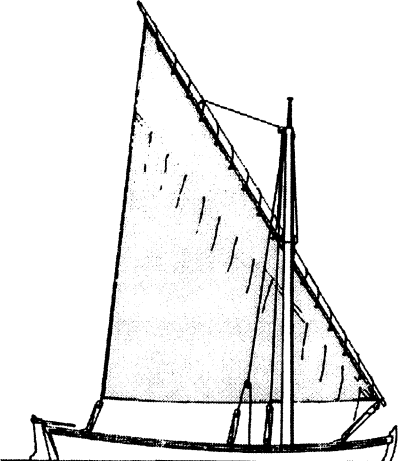
topgallant, and gaff-topsails (Baker 1987:119). This rig was the culmination of the separate development of each of its components.

MAINSAILS

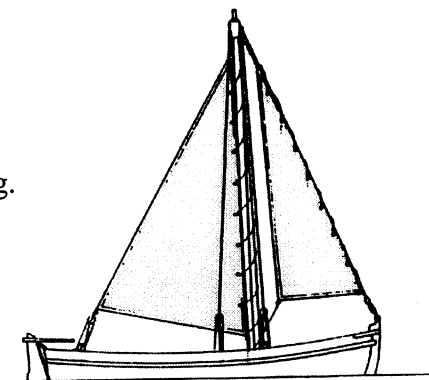
Prior to the fifteenth century square sails were the most common rigs in northern Europe. In southern Europe, however, evidence uncovered at Thasos from the second century A.D. suggests a long history of the use of both the lateen and sprit rigs (Bowen 1957; Casson 1956, 1960, 1966; La Roërie 1956, 1957; Marquardt 1986). In the early part of the fifteenth century, Iberian sailors in southern Europe replaced lateen sails on their caravels with square sails—a rig that was better adapted to long ocean voyages— while sailors in northern Europe adopted fore-and-aft rigs for better handling of their small craft. Pictorial evidence of a sprit rig in use in Sweden in 1525 is possibly the earliest evidence of this sail in northern Europe (Kemp 1976:334). Soon other fore-and-aft rigs, such as the leg-of-mutton, gaff, and triangular sail, or as it was later called, the Bermuda sail, were being employed in the northern waters.

Again, the origin of these sails and their development eludes our knowledge. A common explanation was that they all developed from the lateen rig (Figure 5-2). Carr Laughton (1956:333-4) suggested the Dutch sailors, after adopting the lateen sail, improved upon it by stepping the forward end of the yard and removing the mast, thereby creating the leg-of-mutton rig by “convert[ing] the yard itself into a mast.” He wrote that this occurred around 1545 but provided no supporting evidence. In fact, the earliest pictorial evidence of the leg-of-mutton is found in a watercolor painted by Cornelis Claessoon van Wieringen, *De Overtoomse weg en vaart* (Road and canal of the Overtoom), dated 1601 (Sleeswyk 1983:378). Two vessels are seen on a canal outside Amsterdam, each with two masts, triangular sails, short headsticks, and booms. Interestingly, these rigs are highly developed forms of the basic leg-of-mutton rig seen

(a) Lateen rig.



(b) Leg-of-mutton rig.



(c) Sprit rig.

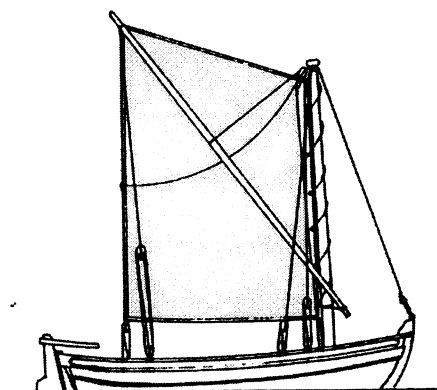


Figure 5-2. Fore-and-aft rigs (After Marquardt 1986).

in a later work, dated c. 1619 (Sleeswyk 1983: 377).

The mast of the early leg-of-mutton rig was stepped as close to the stem as possible. It was not supported by stays, nor shrouds, and it raked sharply aft. The luff of the triangular sail was laced to the mast and the sail was usually not rigged with a boom. Sleeswyk (1983:381) suggests that this evolved from the Peruvian leg-of-mutton based on the theory that it was brought to Europe by early Pacific explorers such as Bartolomé Ruiz. Ruiz, who was the first to encounter these Peruvian balsa rafts rigged with two leg-of-mutton sails, recorded his observations in 1526, during Pizarro's second expedition. To support this theory, Sleeswyk illustrates the Dutch interest in other foreign technologies such as the land yachts introduced from China by Jan Huygen van Linschoten in his *Itinerario* (1595). Sleeswyk (1983:381) concludes that the gaff rig eventually developed from the leg-of-mutton, independent of any influence from the lateen.

A much more simple explanation exists for the development of the gaff rig; i.e. that it developed from the sprit rig. The sprit rig is characterized by a four sided fore-and-aft sail set on a sprit, a long spar running diagonally across the sail. The top of the spar supports the peak of the sail while the heel of the spar is held in a collar called the snorter at base of the mast. Converting this sail to a gaff involved the least amount of innovation as it could be accomplished simply by shortening the sprit while raising its heel up and fastening it to the mast with cheeks and parrals (Morris 1927:33). This theory is supported by the fact that the gaff was referred to as a *half-sprit* well into the eighteenth century (Goodwin 1911:307). Furthermore, a picture reinforces this explanation by depicting an intermediary stage of the development although it postdates the earliest appearance of the gaff (Morris 1927:33).

The first representation of a gaff is found on a map of Amsterdam by Balthasar Floriszoon van Berkenrode, dated 1625 (Sleeswyk 1983:379). A brief study of Dutch

maritime art of the second half of the seventeenth century reveals its rapid incorporation. By 1660, the long gaff was being used in England and by 1670 it was in New York (Morris 1927:87). The term “Gaff” appeared in print in *Falconer’s Marine Dictionary* defined as:

a sort of boom or pole, frequently used in small ships, to extend the upper edge of the mizen; and always employed for the same purpose on those sails whose foremost edges are joined to the mast by hoops or lacings, and which are usually extended by a *boom* below. Such are the main-sails of all sloops, brigs, and schooners (Falconer 1970:136).

As this mainsail evolved, a number of auxiliary sails on small craft developed for the first time. Not only did these sails increase the overall canvas area, they also enabled greater maneuverability and increased efficiency of the craft.

HEADSAILS

The earliest documented evidence of a jib is found in *The Adoration of the Shepherds*, in 1512. Painted by Jacob Corneliszoon van Oostsanen, it is now housed in the Museo Nazionale di Capodimonte in Naples (Sleeswyk 1983:380). The same type of rig shown in van Oostsanen’s work is seen in a detail of an engraving by Pieter Bast, dated 1599, showing a sprit rigged *boeier* with a jib (de Groot and Vorstman 1980: ill. no. 19).

The development of the jib remains uncertain. Only the motive can be firmly established; a headsail was desired to balance the turning force of the fore-and aft mainsail. This most likely occurred as the vessels grew in size and the mainsail became too cumbersome to handle with a small crew. The headsail was not an invention; instead, it was an innovation—for the first time a sail was laced to a stay. The likelihood of proving this theory is very slight unless some documentation is found.

Equally difficult to prove is another common explanation of the jib having

developed from the lateen. Morris (1927:37) summarizes this theory succinctly: by cutting the lateen sail beside the mast and replacing the forward end of the yard with a stay, the forward end of the lateen sail was transformed into the jib while the aft portion of the lateen sail was transformed into a gaffsail. Such a transformation is much more complicated than simply lacing a sail to a stay.

Regardless of its origin, by the beginning of the seventeenth century the jib was frequently being used on small Dutch craft. Near the middle of the century, staysails began to be used on ships and the extended jib-boom was employed by 1700 or soon after (Anderson and Anderson 1926:210). In 1705 the jib was officially introduced into the British navy for use on small ships and sloops (Kemp 1976:432).

SQUARE SAILS

Employed by sailors as early as the Bronze Age, square sails were a common feature of large craft at the end of the fifteenth century, although the combining of this sail with a fore-and-aft rig on one mast did not come until much later (Kemp 1978:67). In 1561-62, Pieter Bruegel completed a series of ship drawings. From these engraver Frans Huys printed a series of five prints one of which included a sprit rigged vessel with a topsail and staysail (De Groot and Vorstman 1980: ill. no. 11). Close inspection reveals, however, that what was identified as a staysail is in fact a square mainsail, and one of the earliest illustrations of the combination of a topsail and fore-and-aft rig.

SLOOP-RIG

During the sixteenth and seventeenth century numerous developments occurred in northern Europe in the rigging of small craft. A variety of new fore-and-aft mainsails were introduced throughout the region. Additionally, fore-and-aft headsails were developed, enhancing the overall performance of vessels equipped with these

sails. Combined with the common square sail, the new rigs afforded mariners new opportunities by expanding the range of conditions and waters through which their vessels could navigate.

Two common craft of the period, the shallop and sloop, were often rigged with any one or any combination of these sails. Ultimately, one general combination of sails—a gaff mainsail, headsails, and a square topsail—distinguished the vessels upon which they were rigged from other vessels. These vessels were sloops and they carried a sloop rig.

As the sloop-rig continued to develop additional sails, include main squaresails, topgallant sails, and studding sails were added to increase the efficiency of the craft. However, a review of eighteenth century sloop illustrations reveals that throughout this era the standard sloop rig remained the gaff mainsail, headsails, and topsail.

CHAPTER VI

RECONSTRUCTING THE RIGGING OF *BOSCAWEN*

The rigging material recovered during the excavation reveals much of the material used in fitting out military vessels during the French and Indian War. The amount and type of preserved material was not sufficient, however, to enable a reconstruction of the rigging of *Boscawen*. In fact, considering the lack of definitive standards for rigging, the wide variation of techniques among the various shipwrights, and the lack of data on the dimensions of *Boscawen*'s mast and spars, it is not possible to re-create precisely the design of *Boscawen*'s rigging. Nevertheless, based on what history tells us about shipbuilding at the time and the archeological remains, we can establish the rough parameters of Loring's design.

TREATISES ON THE RIGGING OF SLOOPS

The earliest known manuscripts of naval architecture, such as that of sixteenth-century shipwright Matthew Baker, provide only very basic guidelines for the construction of sailing vessels. Of the numerous shipbuilding treatises written during the seventeenth and eighteenth centuries, few paid much attention to the rigging of the vessels. Even as late as 1768, Swedish shipbuilder Fredrik Henrik af Chapman, in his publication the *Architectura Navalis Mercatoria*, classified vessels primarily by hull construction. He listed the vessels' rig but only as a secondary classification. In fact, Chapman seemed to believe that the appearance of the rigging was more important than its function. He wrote "it is not sufficient to study merely to regulate the height of the masts, and the length of the yards, by the size of the ships; but also to use those which have such a proportion among themselves, that all the rigging may make a handsome appearance" (Chapman 1967:95).

Other contemporary authors noted that variation in the construction and rigging of vessels resulted from numerous factors including the service for which the vessel was intended, the preferences of the builder, and the availability of material (Broadwater 1989:121). Others, however, wrote specifically about the rigging of vessels.

The most noted of these was David Steel who in 1794 completed a four-volume treatise on the rigging of eighteenth-century vessels. Like his predecessors and contemporaries, Steel concentrated on formula for larger sea-going vessels with multiple masts. In fact, although he covered in some detail the rigging of single-masted vessels, his definition of sloops was vague, stating they “are vessels with one mast, and rigged as cutters, but much lighter” (Steel 1932:191). Regardless, for the rigging of sloops and other single-mast vessels, Steel gave the following formula:

Proportions of Masts, Yards, etc., for Sloops, Smacks, and Hoys.

Proportional Lengths.

Mast and topmast in one, thrice and $\frac{3}{4}$ the breadth of the vessel.
 Mast to the rigging-stop or hound $\frac{3}{4}$ the whole length.
 Mast and topmast to the stop of the topmast $\frac{40}{41}$ of the whole length.
 Topgallant-mast to the rigging-stop $\frac{4}{7}$ of the length of the mast.
 Boom $\frac{2}{3}$ of the mast. Cross-jack-yard $\frac{2}{5}$ of the mast.
 Gaff $\frac{3}{5}$ of the boom. Topsail-yard $\frac{4}{5}$ of the cross-jack-yard.
 Spread-yard $\frac{5}{8}$ of the mast. Topgallant-yard $\frac{5}{6}$ of the topsail-yard.
 Bowsprits $\frac{5}{9}$ of the mast.

Proportional Diameters in Fractional Parts of an Inch to Every Foot in Length.

Mast $\frac{1}{4}$	Gaff $\frac{1}{4}$	Topsail-yard $\frac{2}{10}$
Topgallant-mast $\frac{3}{8}$	Spread-yard $\frac{1}{7}$	Topgallant-yard $\frac{1}{8}$
Boom $\frac{3}{16}$	Cross-jack-yard $\frac{2}{10}$	Bowsprit $\frac{3}{8}$

Most shipbuilders agreed that the spars should be in proportion to the length of the mast, but there was little agreement about the precise relation between the spars and the mast. For example, Falconer wrote in 1769, “the exact height of the masts, in

proportion to the form and size of the ship, remains yet a problem to be determined.” Similarly, Steel wrote that the selection of a mast configuration was simply a matter of preference. However, Steel provided a formula to calculate the length of the mast to be $\frac{3}{4}$ the sum of the depth of the hold, the length of the deck, and the extreme breadth. Along with this formula, he stated that the diameter of the mast was $\frac{3}{4}$ inch (1.91 cm) for each yard (91.44 cm) in length and provided a table of tapering for the mast and spars.

SETTLING ON A SLOOP

Correspondence between Amherst and Loring shows that Loring was initially ordered to obtain rigging for the construction of a brig of 120 to 130 tons. Two weeks later, Amherst ordered Loring to obtain sufficient rigging for two Snows of 18 guns each. Finally, Loring and Amherst decided to construct a brig and a sloop.

If Loring outfitted *Boscawen* with a full topsail rig, her spars would have included a mast, topmast, topgallant-mast, bowsprit, jib-boom, boom, gaff, cross-jack yard, spread-yard, topsail yard, and topgallant-yard. Using Steel’s formula the dimensions of these spars can be calculated based upon the dimensions of the hull. The archaeological remains of *Boscawen*’s hull reveal that she was 75 feet (22.86 m) long, with an extreme breadth of 25 feet (30.48 m), and a depth of hold of 6 feet (1.83 m) (Kevin J. Crisman 1995 pers. comm.). Assuming Loring constructed her in keeping with Steel’s conventions, *Boscawen*’s mast would have been 79- $\frac{1}{2}$ feet (24.23 m) long and had a maximum diameter of 19- $\frac{7}{8}$ inches (50.48 cm). A survey of the dimensions of vessels within the Royal Navy by John Fincham, a master shipwright in the royal dockyards in 1818, found two sloop-rigged cutters with comparable measurements with mast lengths of 79.95 feet (24.37 m) and 78.9 feet (24.05 m) long (Fincham 1982:67).

Given these dimensions and Steel's aforementioned formula, the dimensions of *Boscawen's* spars would have been:

Mast and topmast in one:	93-3/4 feet (28.58 m)
Mast to the rigging-stop or hound:	70-1/3 feet (21.44 m)
Mast and topmast to the stop of the topmast:	91-1/2 feet (27.89 m)
Topgallant-mast to the rigging-stop:	45-7/16 feet (13.85 m)
Boom:	53 feet (16.15 m)
Gaff :	31-4/5 feet (9.69 m)
Spread-yard:	49-11/16 feet (15.14 m)
Cross-jack-yard:	31-4/5 feet (9.69 m)
Topsail-yard:	25-11/25 feet (7.75 m)
Topgallant-yard:	21-1/5 feet (6.46 m)
Bowsprits:	44-1/6 feet (13.46 m)

The mast was stepped approximately 25 feet (7.62 m) from the stem. At the top of the mast a mast cap was fitted through which the topmast was passed and fastened. Finally, a topgallant-mast was then fastened to the topmast. The rake of the mast was one and a half inches to every yard in length of the mast (Steel 1932:4).

The mast was secured in place by the standing rigging consisting of shrouds and stays. The yards, gaff, and boom were held to the mast with parrel collars. The sails, including a mainsail, gaffsail, foresail, jib, jib staysail, topgallant, topsail, and cross-jack square-sail, were laced to the spars. Finally, the traditional system of running rigging of halyards, braces, buntlines, chuelines, leechlines, tacks, lifts, and sheets would have been employed to trim the sails.

No single authoritative source can be cited for Loring's construction of *Boscawen* and the fitting out of her rigging; therefore, the above information illustrates only a hypothetical reconstruction of *Boscawen's*. As we shall see, archaeological evidence suggests that the dimensions of *Boscawen's* rigging were quite different from those calculated with contemporary formulae.

SPARS

As no remains of the spars were recovered, the only archeological evidence associated with them is the mast step and the mast cap. Nevertheless, the dimensions of the notch in the mast step show the size of the heel of the mast and from this it is possible to estimate the overall dimensions of the mast. Similarly, the square notch in the mast cap provides another means of assessing the size of the mast. Finally, the hole through which the topmast passed reveals the diameter of the topmast and thus provides another rough means of judging the size of the mast. All of this evidence indicates that the *Boscawen's* spars were much smaller than those obtained using Steel's formula.

Steel states that the heel of a sloop's mast should be $\frac{6}{7}$ its maximum diameter (Steel 1932:50). Given a diameter of $19\frac{7}{8}$ inches (50.48 cm), the heel would be 17 inches (43.18 cm), one inch (2.54 cm) larger than the maximum length and twice the width of the notch in the step. Furthermore, the head of a Steel-formula the mast would be $\frac{2}{3}$ of its maximum diameter (i.e. $13\frac{1}{4}$ inches (33.66 cm)). However, instead of the calculated diameter, the head of the mast was only 7 inches (17.78 cm) wide. It is unlikely that Loring tapered the mast so drastically. Assuming that it was tapered in a traditional fashion, a mast with a head 7 inches (17.78 cm) in diameter would have had a maximum diameter of $10\frac{1}{2}$ inches (26.67 cm) and would have tapered to a heel of 9 inches (22.86 cm). Such a mast would stand only 42 feet (12.80 m) or less than 60% of a mast constructed in accordance with Steel's formula.

Similarly, the hole through which the topmast was passed reveals the diameter of the topmast. Following Steel's table, the topmast with a maximum diameter of 9 inches (22.86 cm) would be 24 feet (7.32 m) long.

STANDING RIGGING

Little is revealed by the remains of the standing rigging which includes the deadeyes, parrel trucks, and fragments of rope. However, a comparison of these items to similiar finds and a review of eighteenth century shipbuilding treatises demonstrates that recovered standing rigging elements were consistent with the shipbuilding conventions of the time.

RUNNING RIGGING

Few pieces of the archaeological remains of the running rigging provide significant information regarding the rigging of *Boscawen*; however, the rough finish of a few of the blocks demonstrates the haste with which many of the pieces were constructed. At the same time, the red paint on three of the blocks suggests that the construction was in keeping with an interesting tradition of Royal Navy shipbuilding of the time. *Boscawen*'s main deck bulwarks and gun tackle may have been painted red. This was reportedly done so the gun crews would not be distracted by the blood of their fallen comrades during a time of battle (Kemp 1976:362). Additionally, it is possible that these blocks served another unknown purpose at another time for which they were painted red and were discarded or spares store in *Boscawen*'s hold when the sloop was abandoned.

RIGGING *BOSCAWEN*

Although the collection of artifacts provides few details about the rigging of *Boscawen*, additional details can be found in the only known painting of *Boscawen*. In his painting of Crown Point in 1759, Thomas Davies shows *Boscawen* and *Duke of Cumberland* at anchor (Figure 6-1). *Boscawen* can be seen to the left of *Duke of Cumberland*. Although the illustration is small and lacking in detail, *Boscawen*'s single

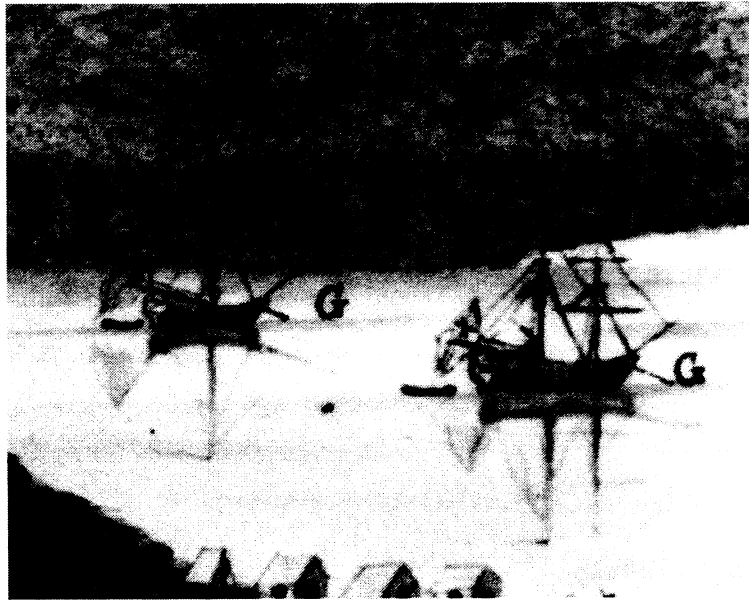


Figure 6-1. Boscawen (at left) and Duke of Cumberland at anchor in Lake Champlain (A detail of Thomas Davies' 1759 painting of Crown Point. Courtesy, Winterthur Museum).

mast, boom, and jibstays are clearly visible. In contrast to *Duke of Cumberland* no yards are seen in *Boscawen's* rig suggesting she carried no squaresails, but was limited to a main gaffsail, foresail, jib, and jib staysail. Davies' painting and the smaller than standard mast step and mast cap suggest *Boscawen* was carried a rig smaller and simpler than one defined in naval architectural treatises of the time.

Considering the obstacles faced by Amherst and Loring while hurriedly building a fleet during wartime, a smaller than standard rig is not surprising. Additionally, *Boscawen's* hull differed from its sea-going contemporaries in one of its dimensions, specifically, the depth-of-hold which was quite shallow. A smaller rig would lessen the danger of capsizing while sailing Lake Champlain (Kevin J. Crisman 1998, pers. comm.). Finally, the smaller rig would have been easier to manage with *Boscawen's* mostly-landlubber crew.

Using the dimensions of the mast step and mast cap to calculate the height of

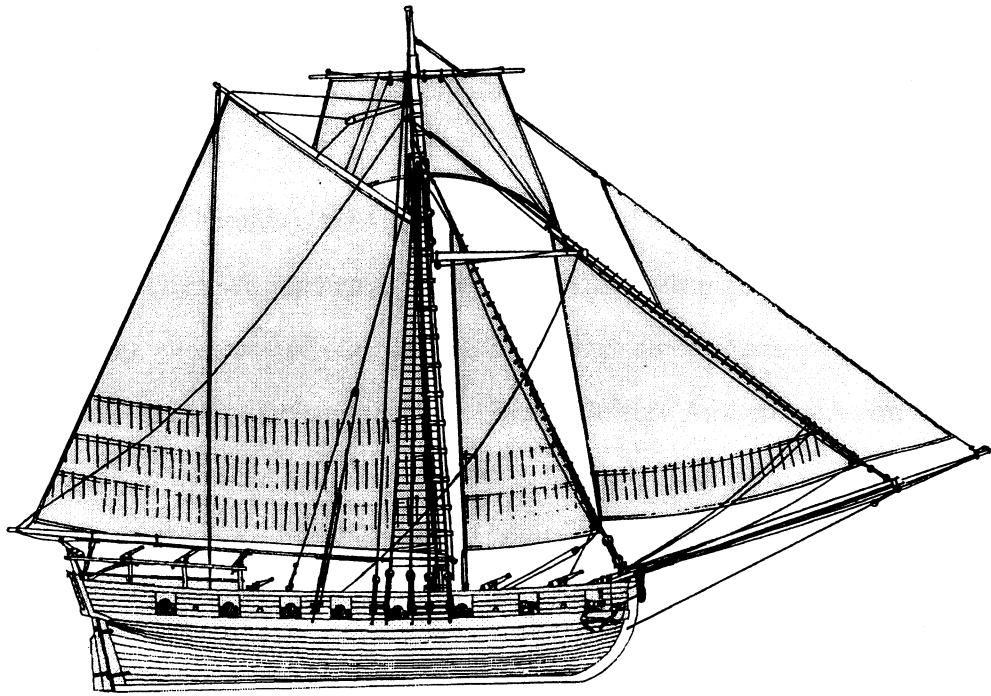


Figure 6-2. A reconstruction of the rigging plan of the sloop *Boscawen*.

Boscawen's mast reveals that instead of carrying a standard mast and topmast of approximately 90 (27.43 m) feet, *Boscawen*'s was probably closer to 70 feet (21.34 m) tall. Without a mast tall or strong enough to be fitted with a full compliment of sails, *Boscawen* likely carried only the most necessary canvas: the mainsail, foresail, jib, and jib staysail. A brief review of eighteenth-century sloop illustrations shows that in addition to these sails, the majority of sloops of this era were fitted with a square topsail. On *Boscawen* the addition of a topsail could have been easily managed without additional crew and would afford Loring more versatile sailing in the varying winds blowing across Lake Champlain. As such, a reconstruction of *Boscawen*'s rig is seen in Figure 6-2. As limited in sail area as it was, *Boscawen*'s rig enabled her, along with the *Duke of Cumberland*, to pursue, engage, and defeat the French fleet that sailed upon Lake Champlain.

CHAPTER VII

CONCLUSION

More than two hundred years after the French and Indian War, the discovery of three vessels buried beneath the muddy bottom of Lake Champlain led to the excavation, identification, and study of one, the 115-ton British sloop *Boscawen*. During the summer of 1759, under the orders of British General Jeffery Amherst, *Boscawen* and the brig *Duke of Cumberland* were constructed to defeat a French fleet to assume control Lake Champlain and the Champlain Valley

Hastily constructed and immediately pressed into service upon completion, the two vessels captured the French fleet and secured control of the lake within days. Returned to Ticonderoga for the winter, *Boscawen* again saw service the following year as a transport troop during the successful campaign against the New France. With the French defeated, the fleet lost its strategic significance. Again the vessels returned to Ticonderoga where they were tied to the docks of the King's Shipyard, stripped of armament and rigging, and left to settle into the muddy bottom of Lake Champlain.

The discovery of these vessels and their subsequent excavation is significant because they were the first colonial warships built on Lake Champlain and among the earliest freshwater warships built in North America. The two-year excavation sponsored by the Champlain Maritime Society and the Fort Ticonderoga Association recovered approximately 5,000 artifacts from the submerged remains of *Boscawen*. Meticulously recorded and conserved, analysis of these artifacts has revealed much about the vessel hastily constructed during the final campaigns of French and Indian War.

This thesis has presented the rigging artifacts recovered during the excavation of *Boscawen*. Of the 5,000 artifacts, only a small portion—approximately 90 items—are

rigging items, but this is a sizable archaeological collection with few parallels. The artifacts include deadeyes, blocks, sheaves, parrel trucks, seizing trucks, iron hooks, rope, and leather parcelling. Related objects include a mast step and mast cap.

These items demonstrate a few key characteristics of *Boscawen's* rig. Most importantly, the mast step and mast cap reveal that *Boscawen's* mast was likely to have been only three-quarters of the size of the size of a sloop rig as called for in naval architectural treatises of the time. It is difficult to say whether or not Loring and his workers attempted to follow standards of the time. Although many of the elements recovered such as the deadeyes and blocks were manufactured to the specifications of the time, the assemblage may very well have been a hodge-podge of that which was available for use. Despite the limitations that forced Loring to settle on a dwarfed rig and necessitated the hasty fabrication of various rigging material, he constructed for General Amherst two vessels that within days of sailing secured control of Lake Champlain and eventually assisted in the final conquest of France's largest North American colony.

REFERENCES

ANDERSON, RICHARD CHARLES.

- 1922 Some Additions to the Brigantine Problem. *Mariner's Mirror* 8(4):109-16.
- 1923 The Rig of the Pepysian Sloop. *Mariner's Mirror* 9(7):214.

ANDERSON, ROMOLA and RICHARD CHARLES ANDERSON.

- 1926 *The Sailing Ship-Six Thousand Years of History*. Robert M. McBride & Co. New York.

B., C.A.G.

- 1912 Cutter and Sloop [editor's note]. *Mariner's Mirror* 2:22.

BAKER, WILLIAM A.

- 1962 *Colonial Vessels*. Barre Publishing Co., Barre, Massachusetts.
- 1987 *Sloops & Shallops*. University of South Carolina Press, Columbia.

BASS, GEORGE F., I. NOEL-HUME, JOHN O. SANDS and J. RICHARD STEFFY,

- 1976 *The Cornwallis Cave Shipwreck*. MS on file, Texas A&M University, College Station, Texas.

BELLICO, RUSSELL P.

- 1992 *Sails and Steam in the Mountains: A Maritime and Military History of Lake George and Lake Champlain*. Purple Mountain Press, Fleischmanns, New York.

BIDDLECOMBE, G.

- 1990 *The Art of Rigging*. Reprint of the 1925 edition. Dover Publications, Inc., New York.

BLANCKLEY, THOMAS RILEY.

- 1988 *A Naval Expositor*. Reprint of 1750 edition. Jean Boudriot, Rotherfield, East Sussex.

BOWEN, R.L. Jr.

- 1957 Fore-and-Aft Sails in the Ancient World. *Mariner's Mirror* 43:160-164.

BROADWATER, JOHN D.

- 1989 *Yorktown Shipwreck 44Y088: Stores and Cargo from a British Naval Supply Ship from the American War for Independence*. Unpublished M.A. thesis, Department of American Studies, College of William and Mary, Williamsburg, Virginia.

CASSON, LIONEL.

- 1956 Fore-and-Aft Sails in the Ancient World. *Mariner's Mirror* 42:3-5.
 1960 The Sprit-Rig in the Ancient World. *Mariner's Mirror* 46:16.
 1966 Studies in Ancient Sails and Rigging. *American Studies in Papyrology* 1:43-58.

CHAPELLE, HOWARD I.

- 1935 *The History of American Sailing Ships*. Bonanza Books, New York.

CHAPMAN, FREDRIK H.

- 1967 *Architectura Navalis Mercatoria, 1768*. Edward W. Sweetman, New York.

CLARK, A.H.

- 1904 *The History of Yachting, 1600-1815*. G.P. Putnam's Sons, New York.

COHN, ARTHUR B.

- 1985 The Fort Ticonderoga King's Shipyard Excavation: 1984 Field-Season Report. *Bulletin of the Fort Ticonderoga Museum* 14 (6):337-356.

CRISMAN, KEVIN.

- 1985a The Construction of the *Boscawen*. *Bulletin of the Fort Ticonderoga Museum* 14 (6):57-371.
 1985b The Fort Ticonderoga King's Shipyard Excavation: The Artifacts. *Bulletin of the Fort Ticonderoga Museum* 14 (6):375-436.
 1988 Struggle for a Continent: Naval Battles of the French and Indian Wars in *Ships and Shipwrecks of the Americas*, edited by George F. Bass, Thames and Hudson, London:129-148.

DAVIS, CHARLES GERARD.

- 1974 *Rigs of the Nine Principal Types of American Sailing Vessels*. Peabody Museum, Salem, Massachusetts.

DE GROOT, I. and R. VORSTMAN.

- 1980 *Sailing Ships: Prints by the Dutch Masters from the Sixteenth to the Nineteenth Century*. Viking Press, New York.

EDSON, M.A. JR.

- 1989 The Schooner Rig: Its First Appearance and Development. *The American Neptune* 49(3):198-207.

FALCONER, W.

- 1970 *Falconer's Marine Dictionary, 1780*. Reprint of the 1780 edition. Augustus M. Kelley, New York.

FINCHAM, JOHN

- 1982 *A Treatise on Mastmaking Ships and Mast Making*. Reprint of the 1829 edition. Conway Maritime Press, London.

GAGE, THOMAS

- 1775 Naval Documents from the Gage Papers 1759-1775. Crown Point State Historic Site Library, Crown Point, New York

GOODWIN, S.

- 1911 Cutter and Sloop. *Mariner's Mirror* 1(11):306-12.
1912 Cutter and Sloop. *Mariner's Mirror* 2(1):20-2.

JOCKIN-La BASTIDE, J.A. and G. Van KOOTEN (Editors)

- 1978 *Cassell's English-Dutch/Dutch-English Dictionary*. MacMillan, New York.

KEMP, P. (Editor)

- 1976 *The Oxford Companion to Ships and the Sea*. Oxford University Press, London.
1978 *The History of Ships*. Orbis, London.

KNOX, JOHN.

- 1968 *Journal of Captain John Knox, Volume III*. Greenwood Press, New York.

LAUGHTON, L.G.C.

- 1956 The Bermuda Rig. *Mariner's Mirror* 42(4):333-35.

LEATHER, J.

- 1970 *Gaff Rig*. Granada, London.

MANWAYRING, H.

- 1972 *The Seaman's Dictionary, 1644*. Reprint of the 1644 edition. Edited by R.C. Alston. The Scholar Press, Menston, England.

MARQUARDT, KARL HEINZ.

- 1986 *Eighteenth-century Rigs and Rigging*. Conway Maritime Press, London.

MIKSCH, HEIDI

- 1985 The Fort Ticonderoga King's Shipyard Excavation: The Conservation Program. *Bulletin of the Fort Ticonderoga Museum* 14 (6):371-374.

MORRIS, EDWARD P.

- 1927 *The Fore-and-Aft Rig in America*. Yale University Press, New Haven.

PARGELLIS, STANLEY

1969 *Military Affairs in North America, 1748-1765*. Archon, Connecticut.

PERRIN, W.G.,ed,

1929 *Boteler's Dialogues*. Vol. 65, Navy Records Society, London.

RICHARDS, FREDERICK B.

1981 *The Black Watch at Ticonderoga. Proceedings of the New York State Historical Association*. Glens Falls, New York

La ROËRIE, L.G.

1956 Fore and Aft Sails in the Ancient World. *Mariner's Mirror* 42:238-239.

1957 Fore and Aft Sails in the Ancient World. *Mariner's Mirror* 43:329.

SIMPER, ROBERT

1983 Old Gaffers Live Forever. *Sea History* 29:46-7.

SLEESWYK, A.W.

1983 The Origin and Development of the Triangular Sail and the Gaff Sail in Seventeenth Century Holland. *Mariner's Mirror* 73(4):377-383.

SMITH, HERVEY G.

1986 *The Marlinspike Sailor*. Reprint of 1956 edition. John de Graff, Inc., New York.

STEEL, DAVID

1932 *Steel's Elements of Mastmaking, Sailmaking, and Rigging*. Arranged by Claude S. Gill. Edward W. Sweetman, New York.

SULLIVAN, CATHERINE

1986 *Legacy of the Machault: a Collection of 18th Century Artifacts*. National Historic Parks and Sites Branch, Parks Canada. Canadian Government Publishing Center, Quebec.

TEUSCHER, PHILIP T.

1983 Sailing Craft of the Caribbees: I. *Sea History* 30:32-3.

1984 Sailing Craft of the Caribbees: I. *Sea History* 31:46-8.

1985 A Sandbagger for All Seasons. *Sea History* 36:8-9.

THOMPSON, P.

1992 Western Caribbean Survivors From the Age of Working Sail. *Mariner's Mirror* 78:336-338.

WAR OFFICE RECORDS [W.O.R.]

- 1759 *Jeffrey Amherst Papers* W / O 14 / 61,62. Public Record Office, Kew, England.
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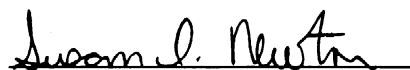
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APPENDIX B

ARTIFACT ILLUSTRATIONS

KEY TO ILLUSTRATIONS

Included in this appendix are the illustrations and photographs of the the artifacts cataloged in Chapter 4. For each illustration a scale is included both in inches and centimeters, as seen below.

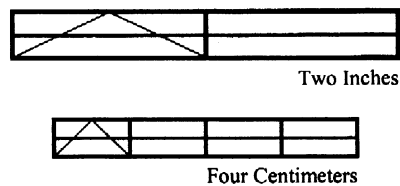


Illustration credit is given by the illustrator's initials in parentheses in the caption at the bottom of each page. No credits appear with the photographs as all were taken and produced by the author. Below is a key to the artist's initials:

WB	W. Bayreuther
SC	S. Cooper
KC	K. Crisman
AE	A. Erwin
TS	T. Stone
PZ	P. Zak

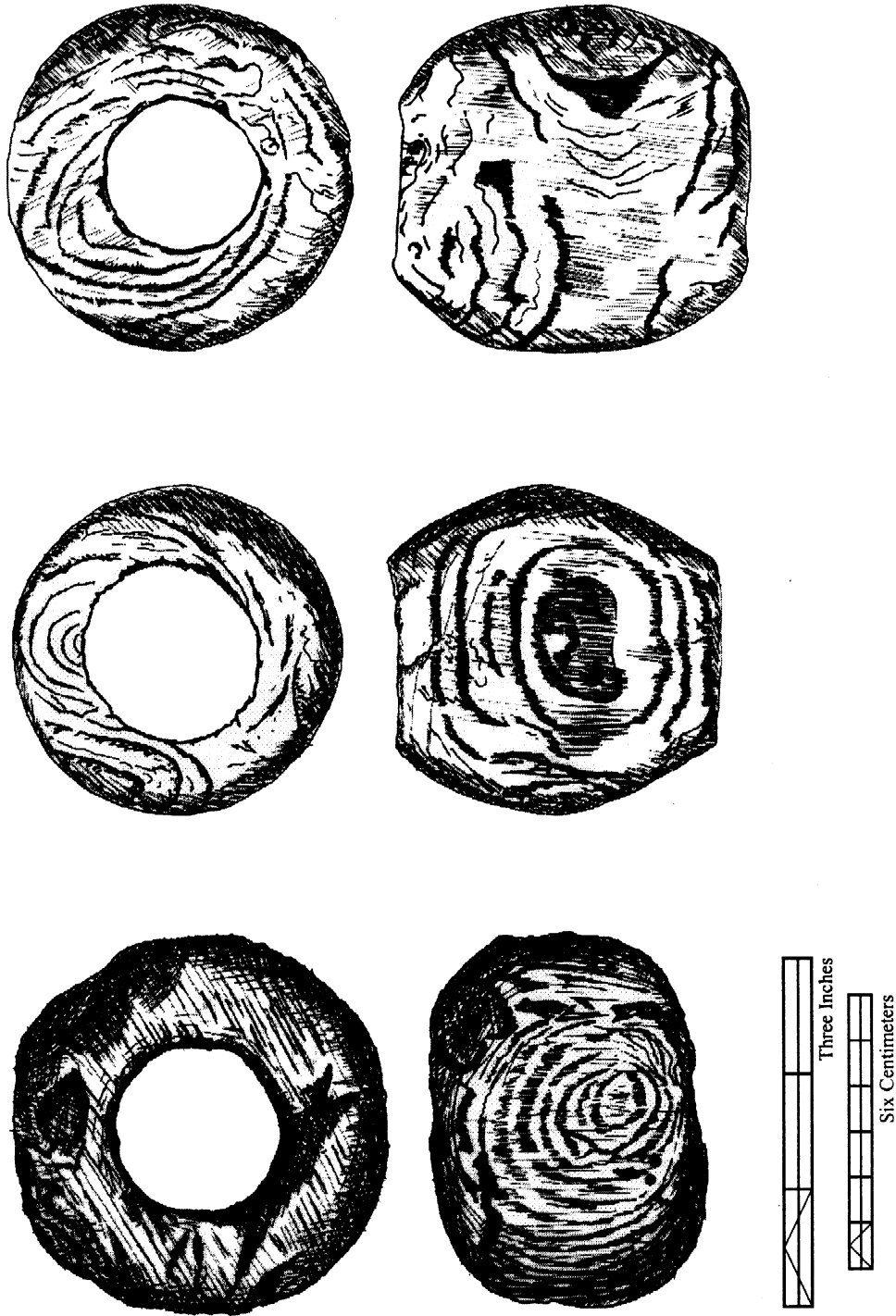


Figure B-1. Parrel Trucks (a) 02-032 (SC), (b) 02-096 (TS), and (c) 02-097 (TS).

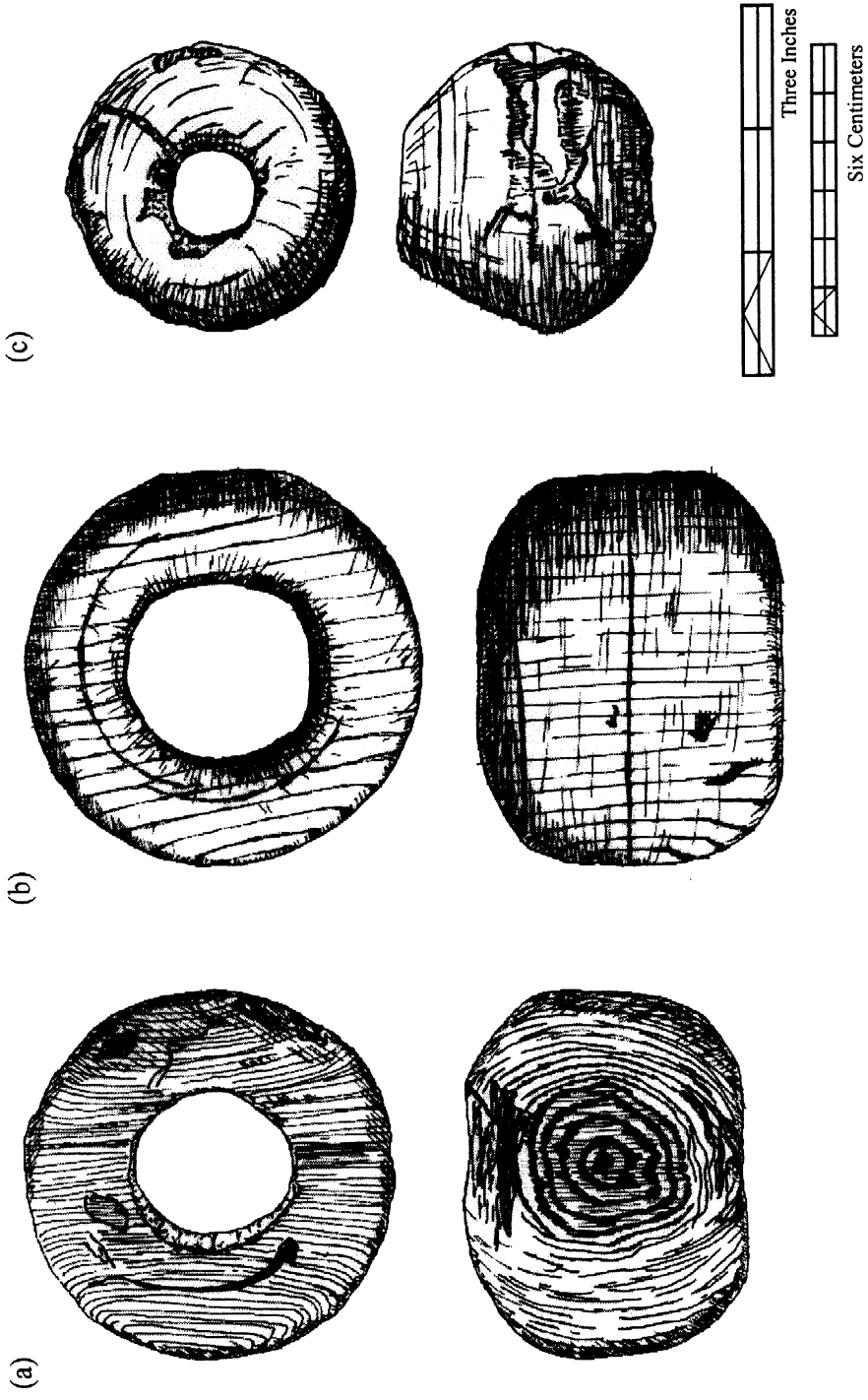
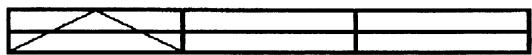
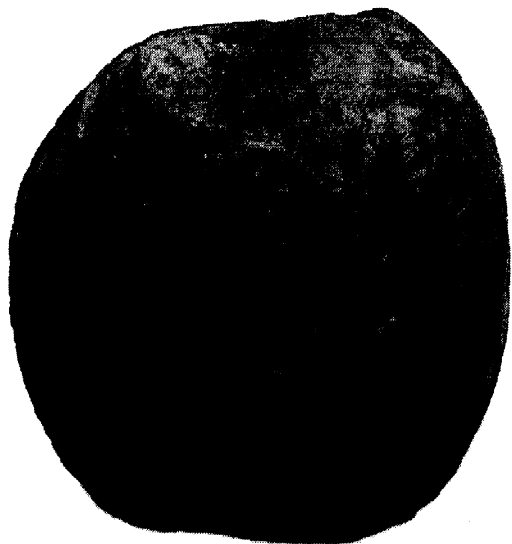
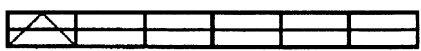


Figure B-2. Parrel Trucks (a) 02-106 (TS), (b) 02-237 (SC), and (c) 02-250 (SC).



Three Inches



Six Centimeters

Figure B-3. Parrel Truck 02-071.

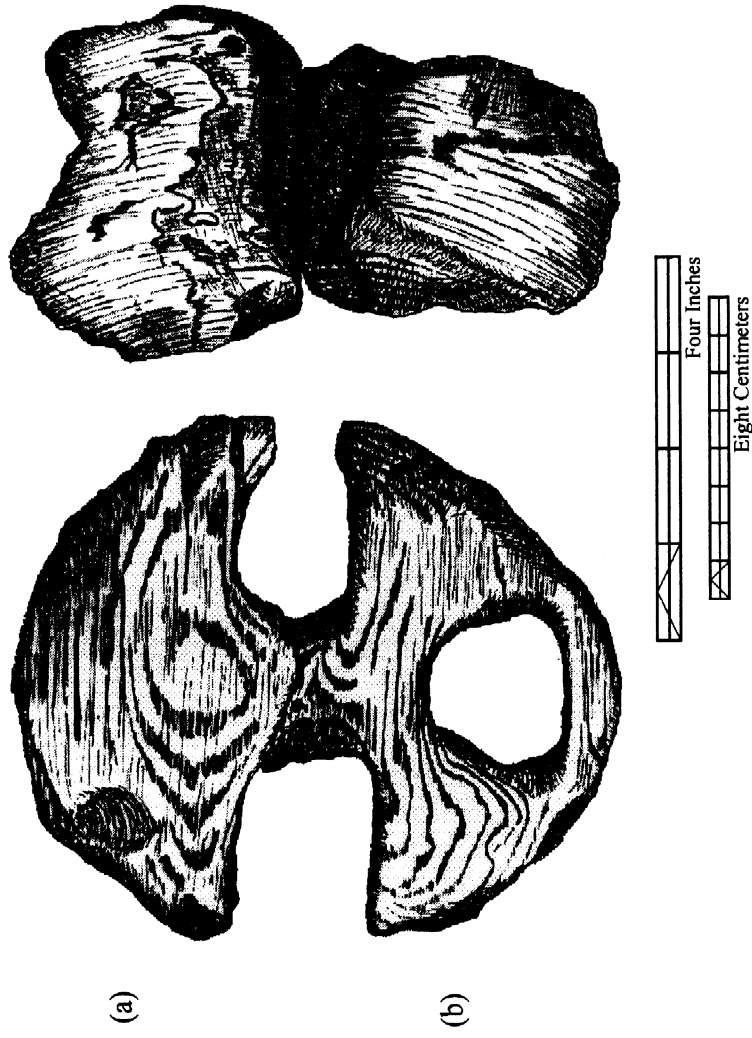


Figure B-4. Deadeye fragments (a) 02-010 (SC) and (b) 02-061 (SC). Together they form one heavily-eroded deadeye.

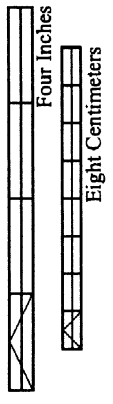
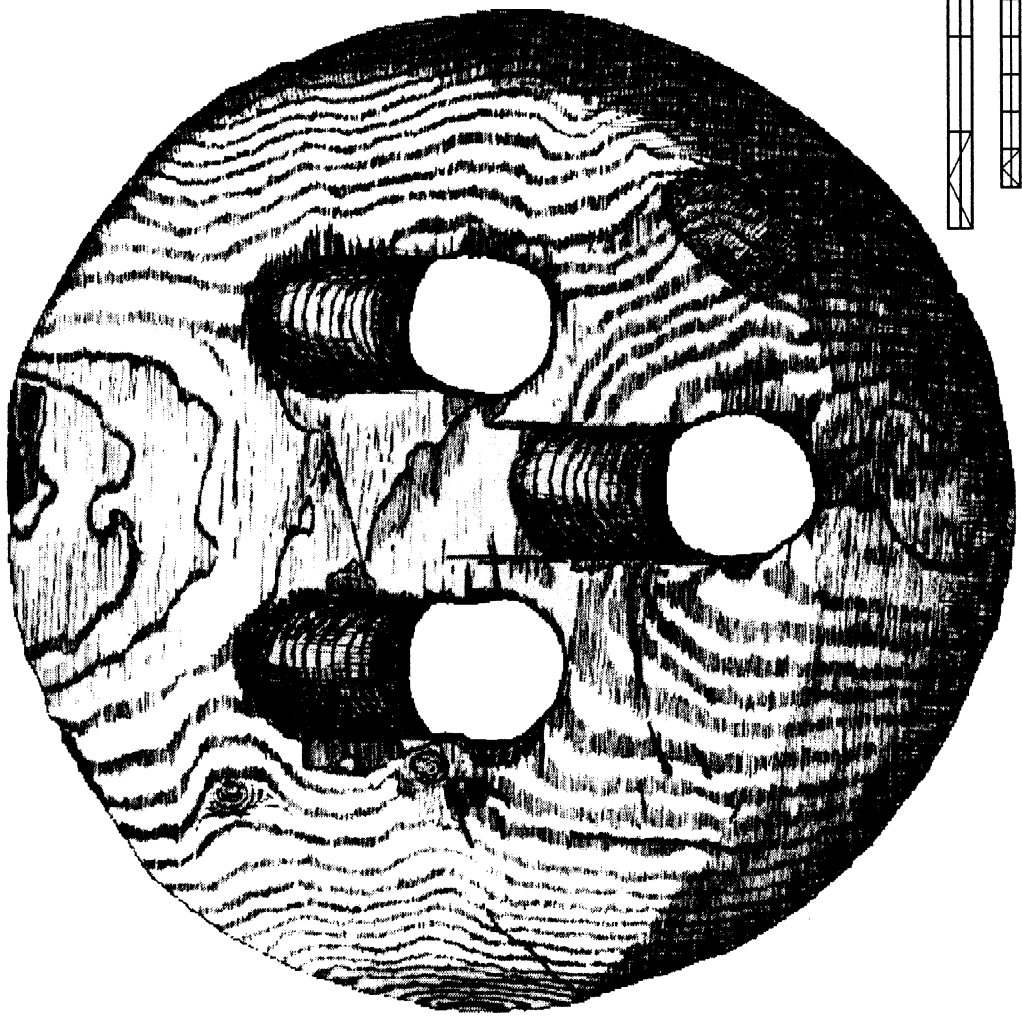
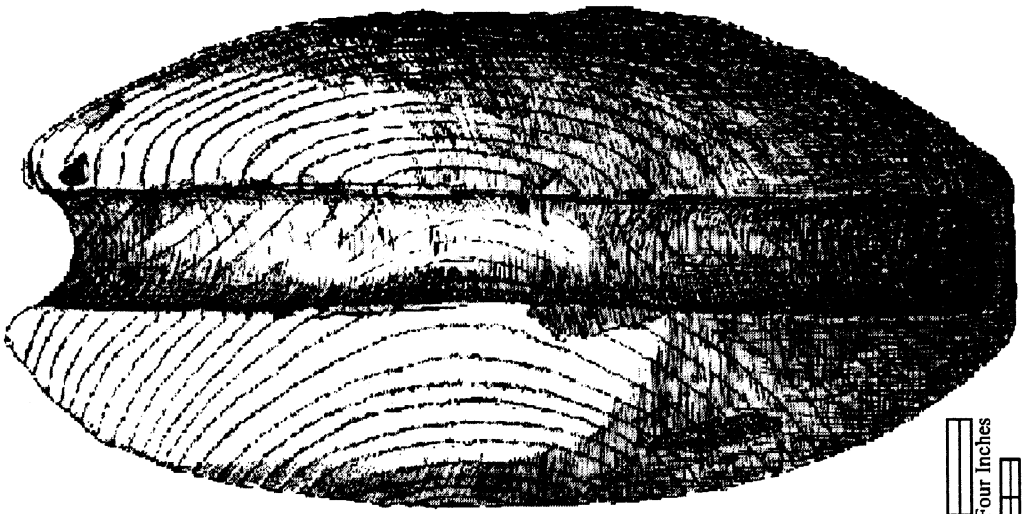


Figure B-5. Deadeye 02-121 (SC).

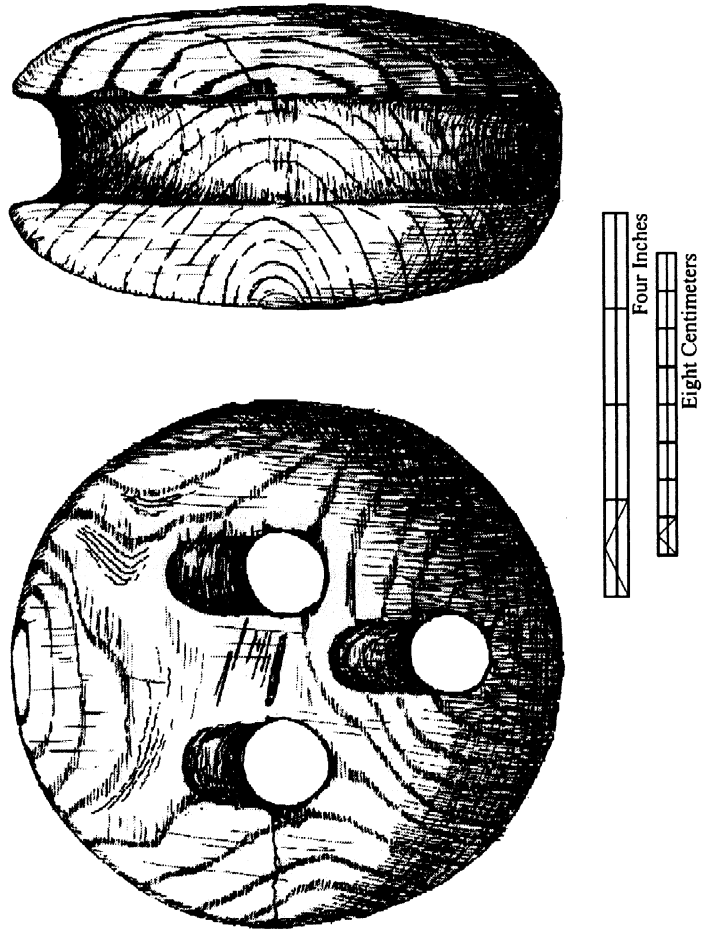


Figure B-6. Deadeye 02-211 (SC).

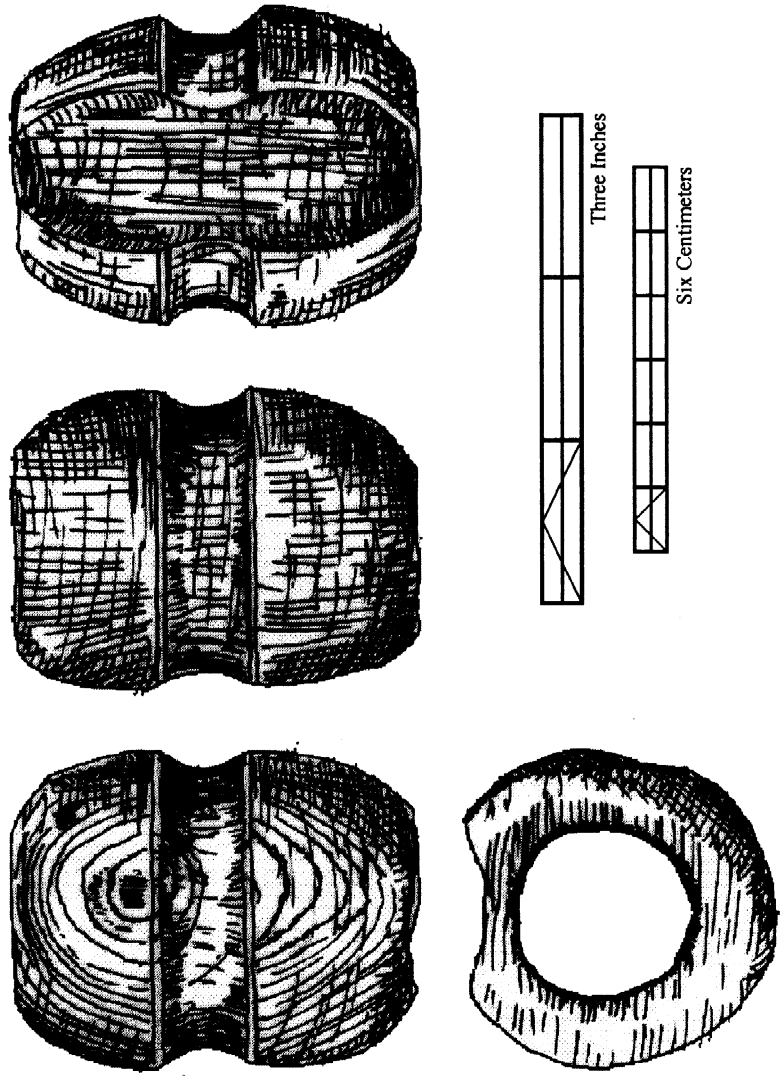


Figure B-7. Shroud Truck 02-102 (PZ).

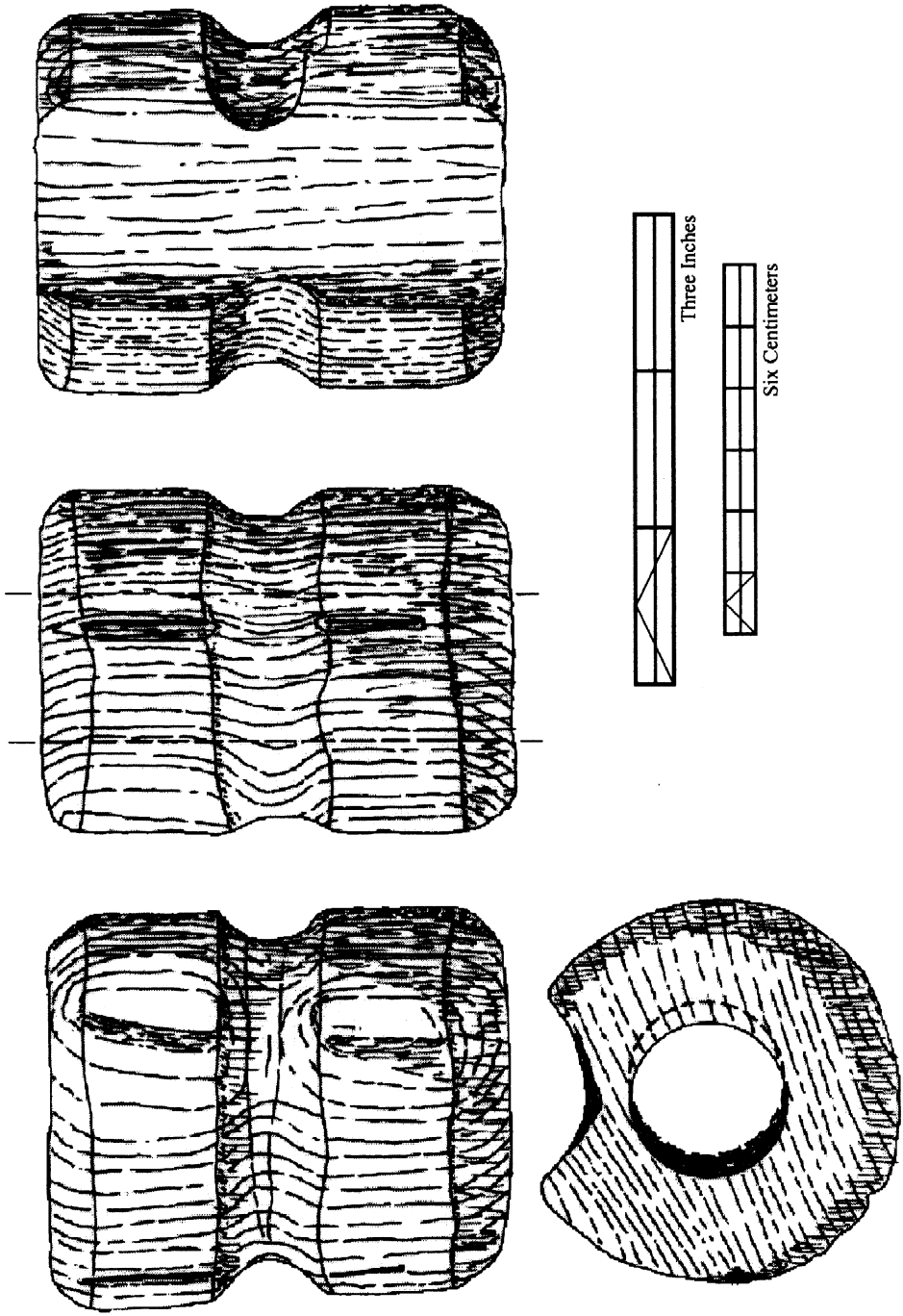


Figure B-8. Shroud Truck 02-118 (WB).

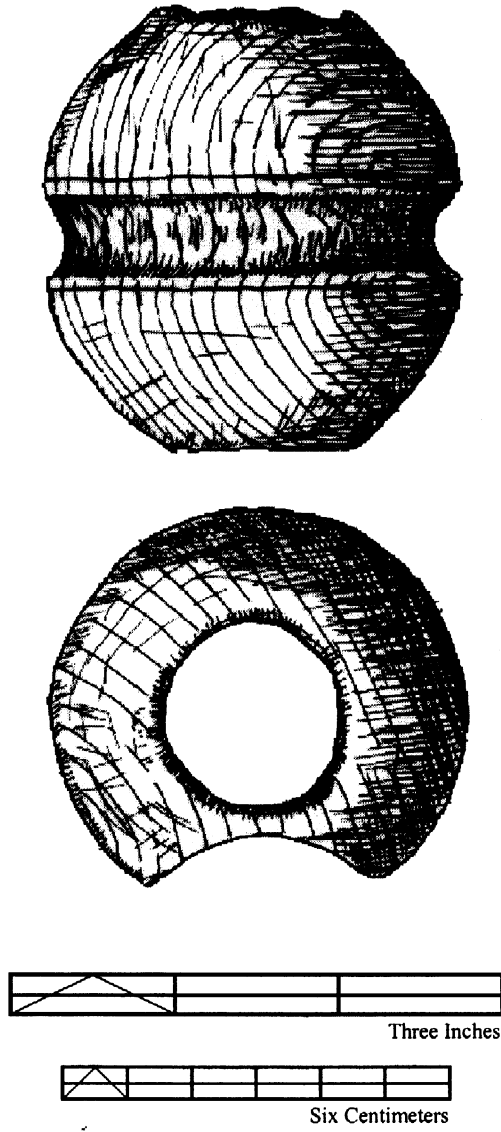


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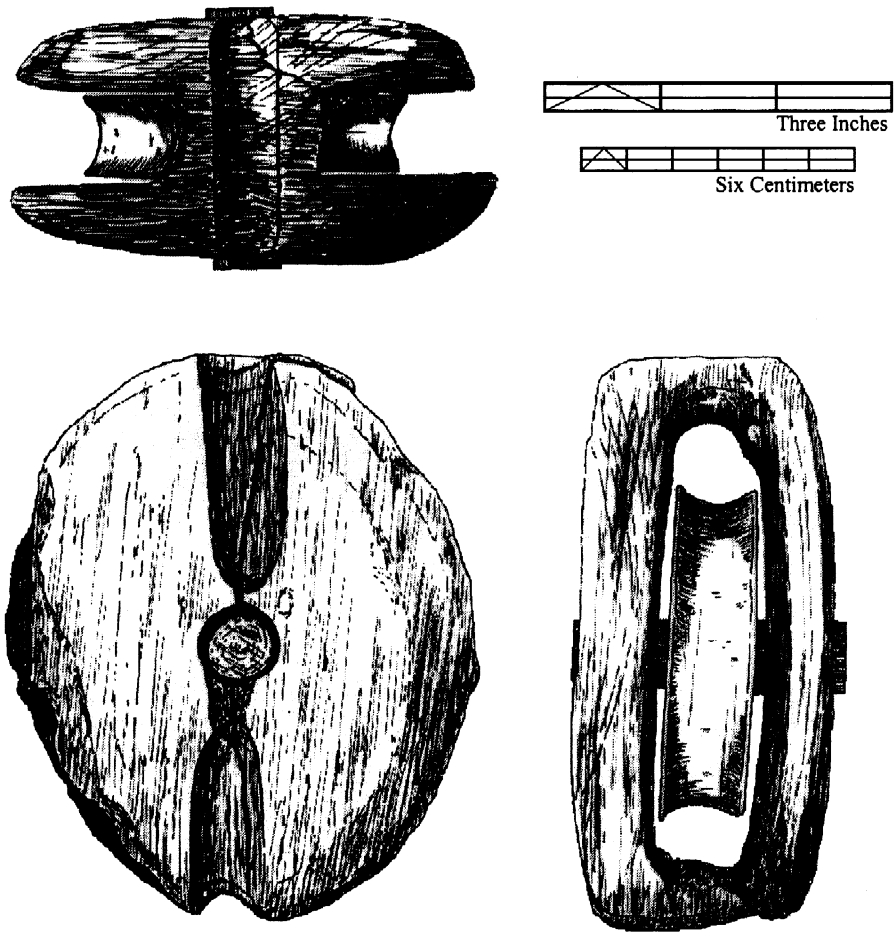


Figure B-10. Single Sheave Block 02-043 (KC).

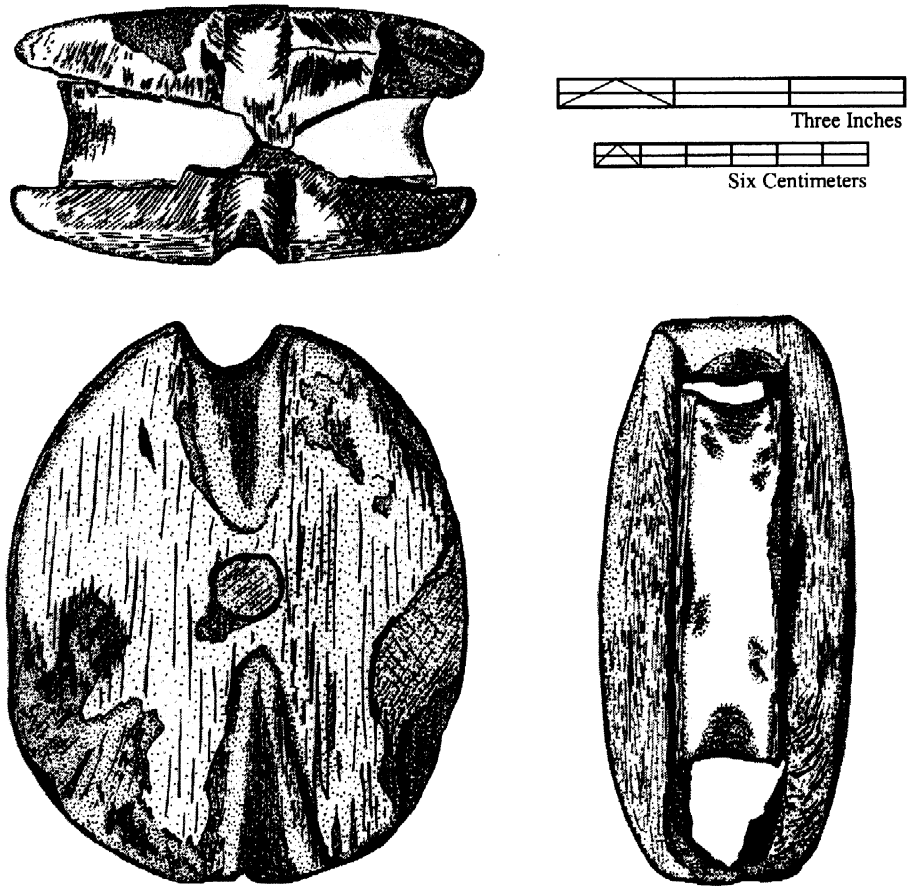


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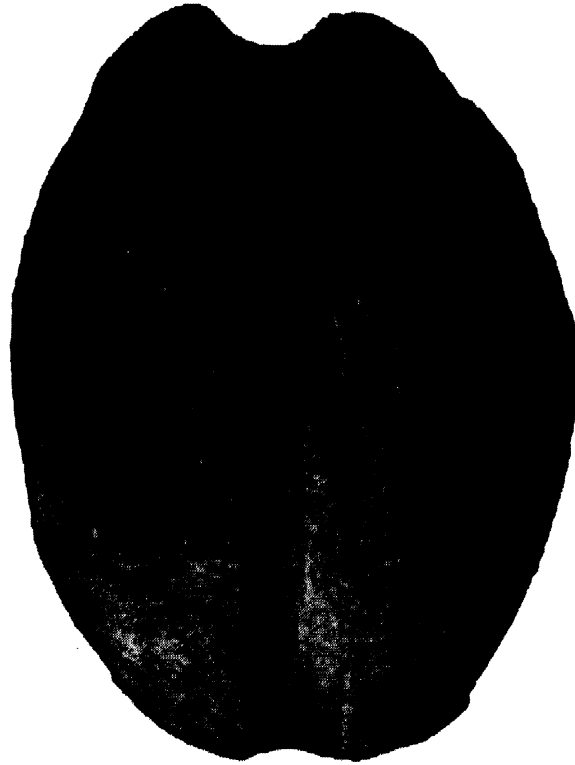


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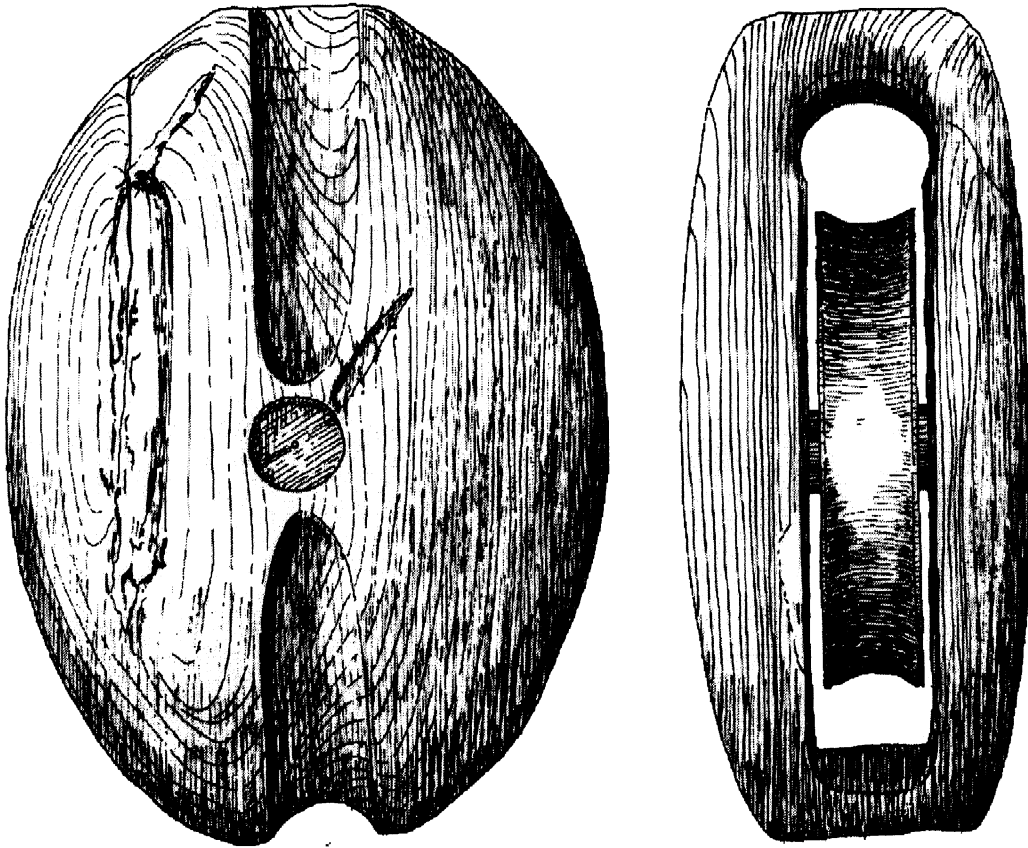
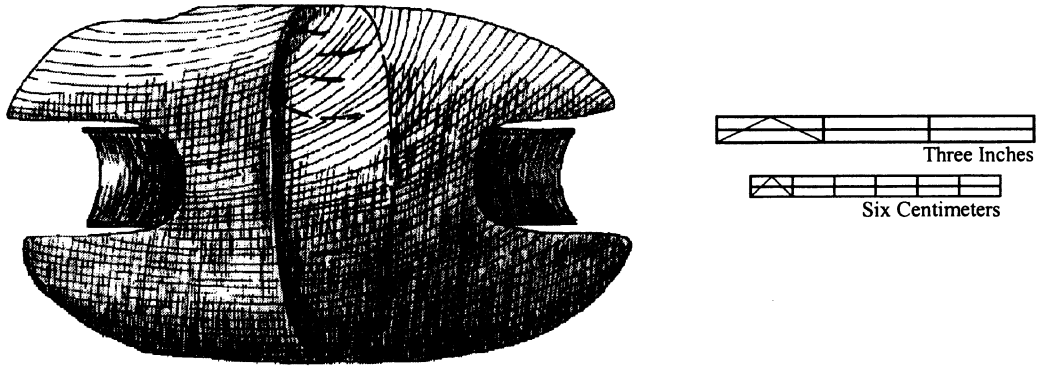


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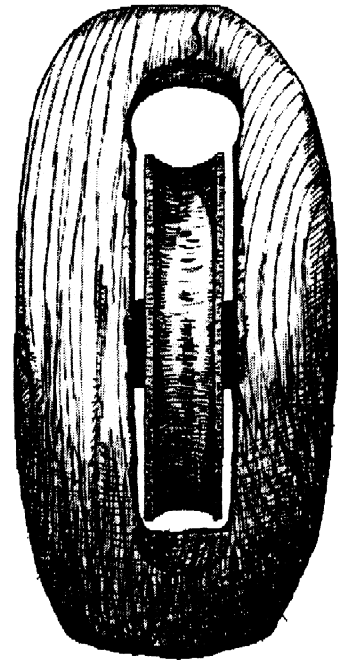
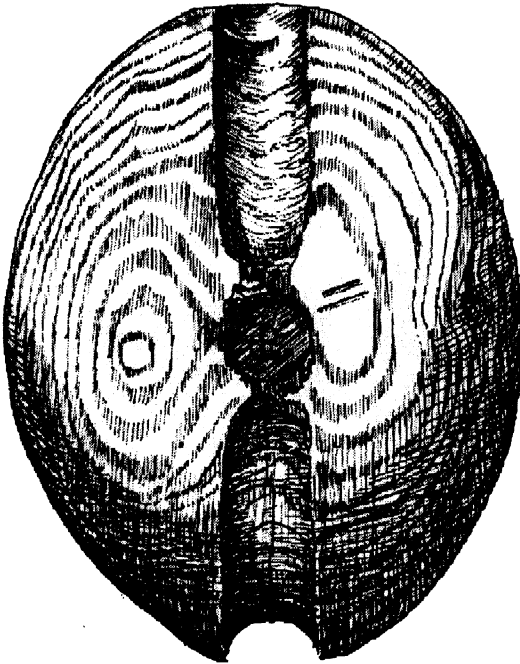
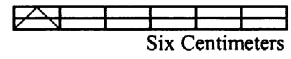
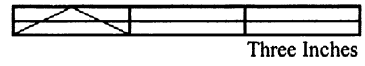
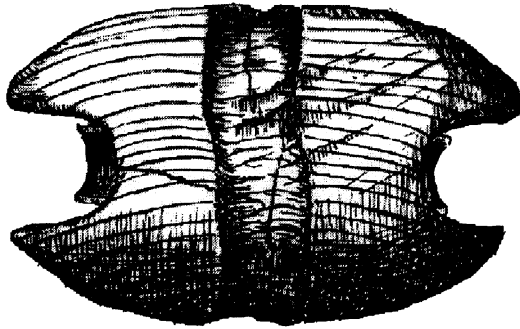


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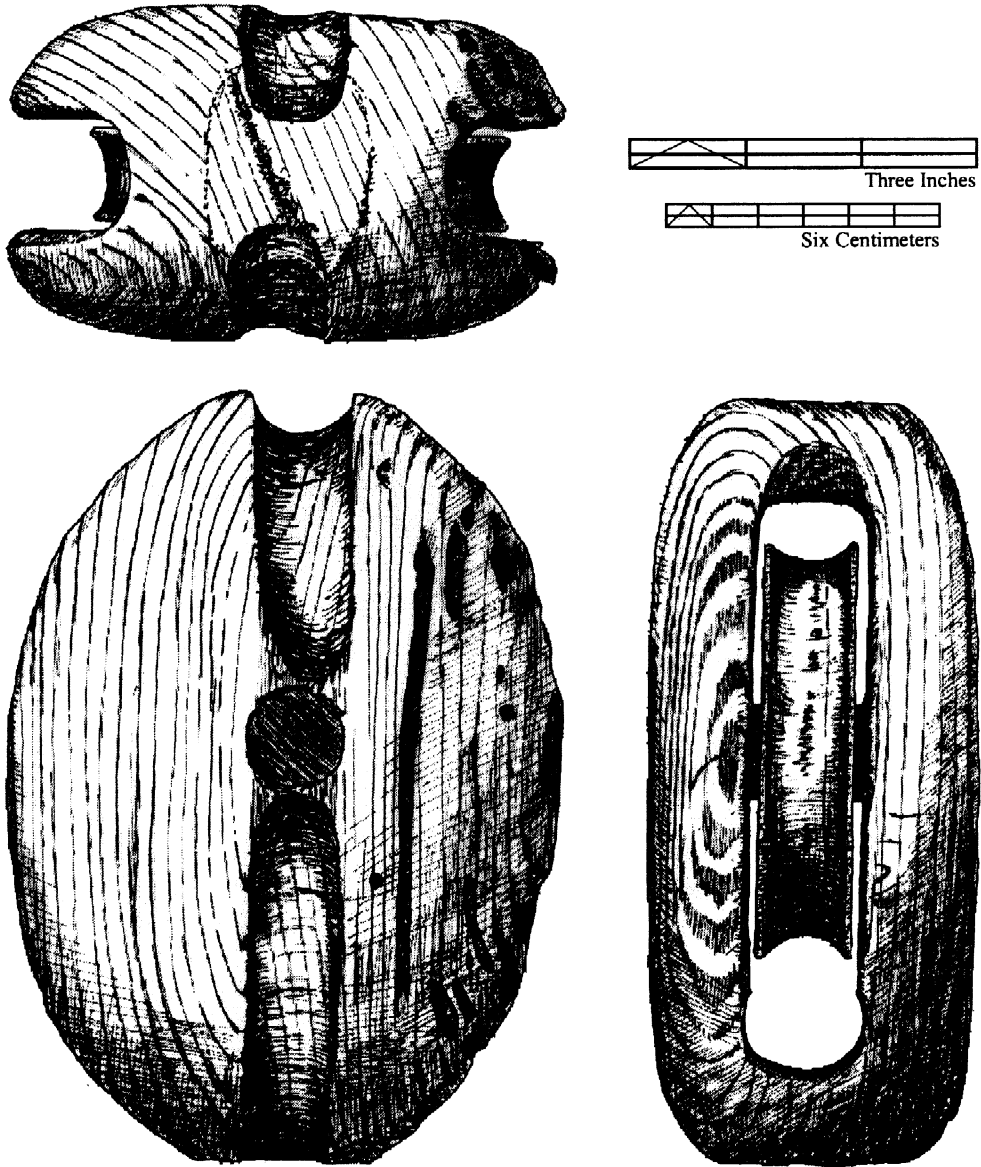


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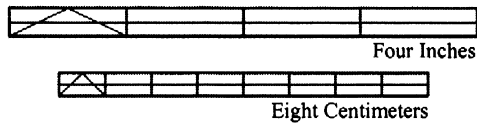
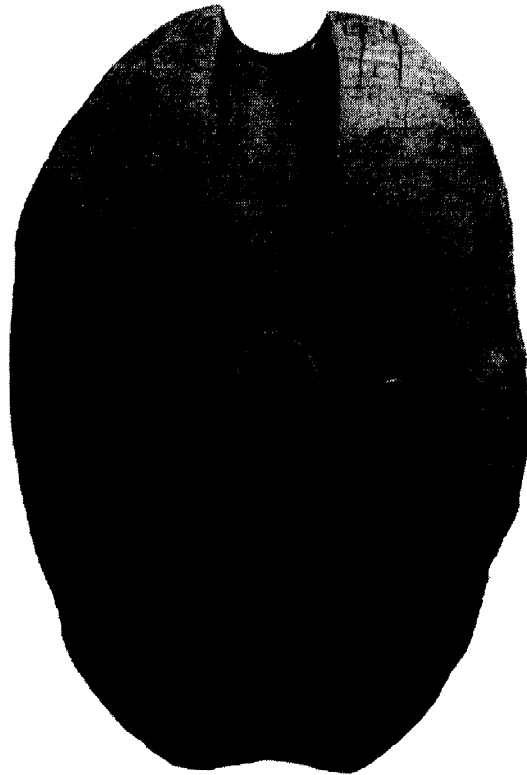


Figure B-16. Single Sheave Block 02-131.

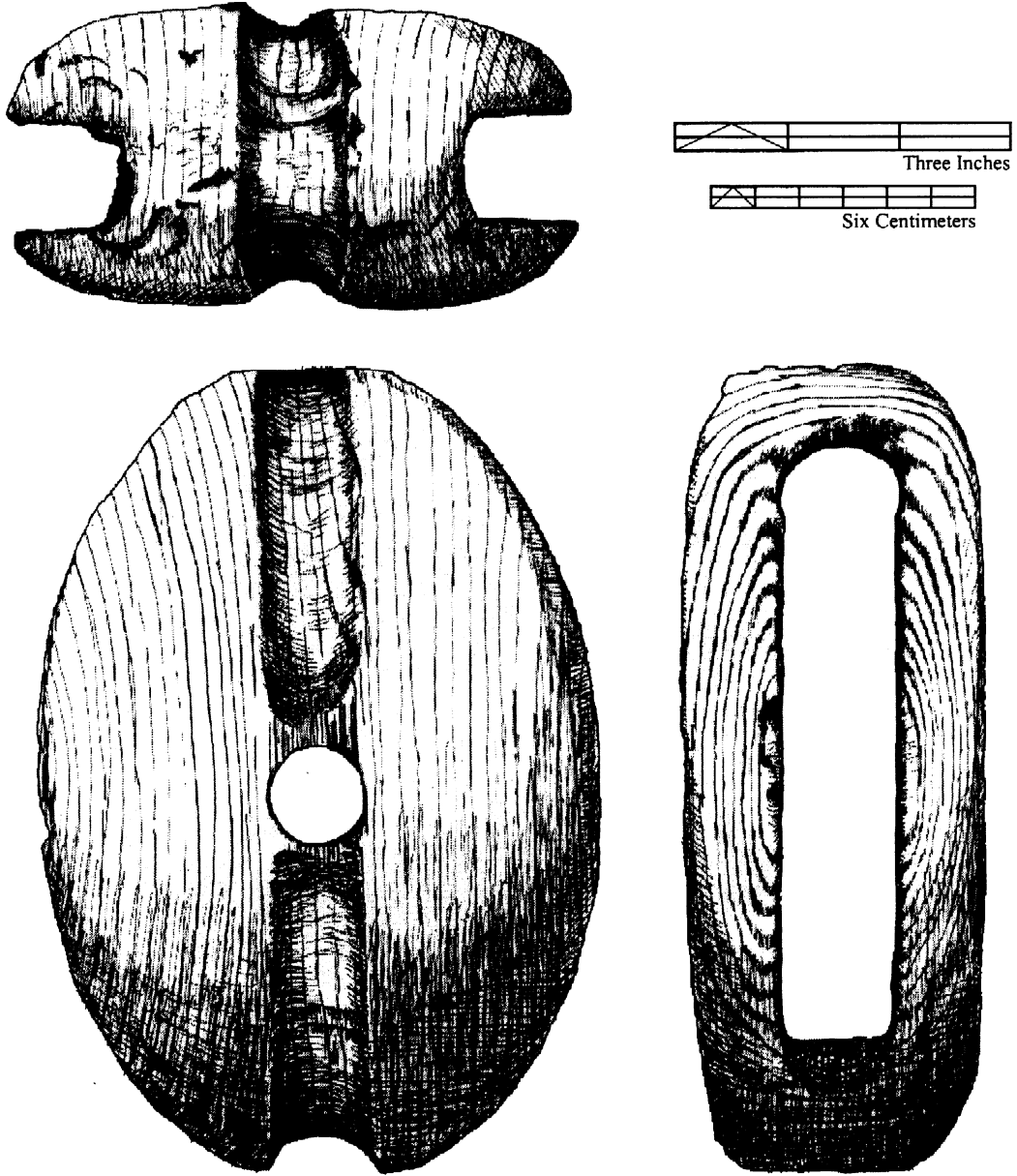


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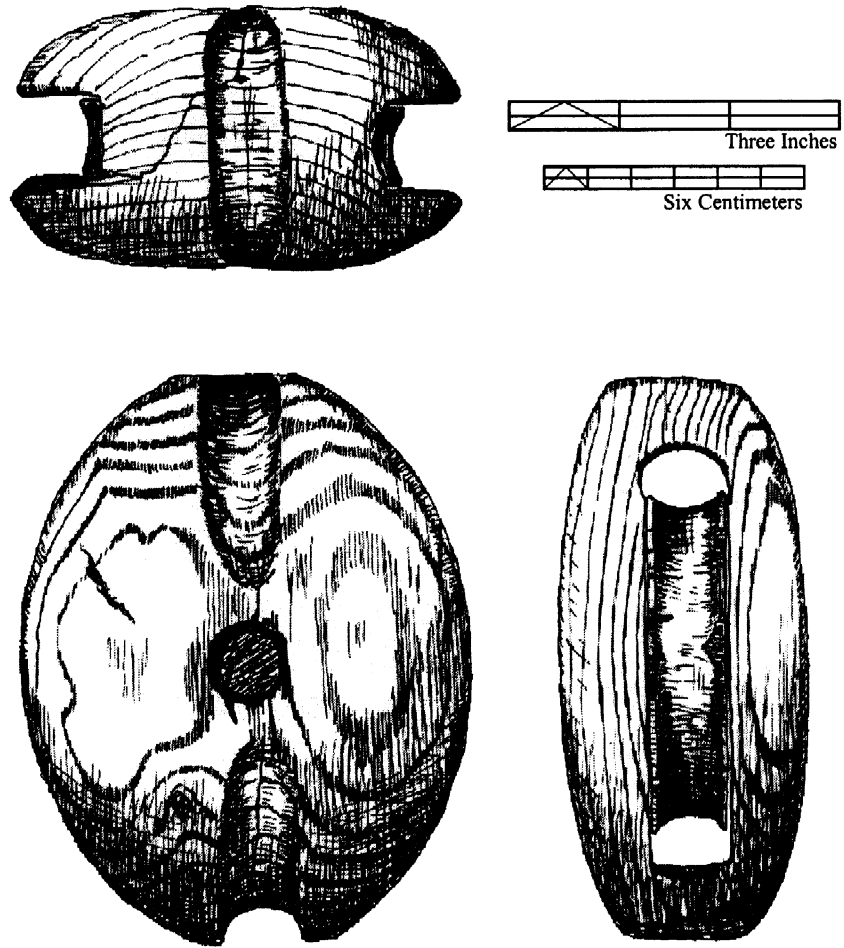


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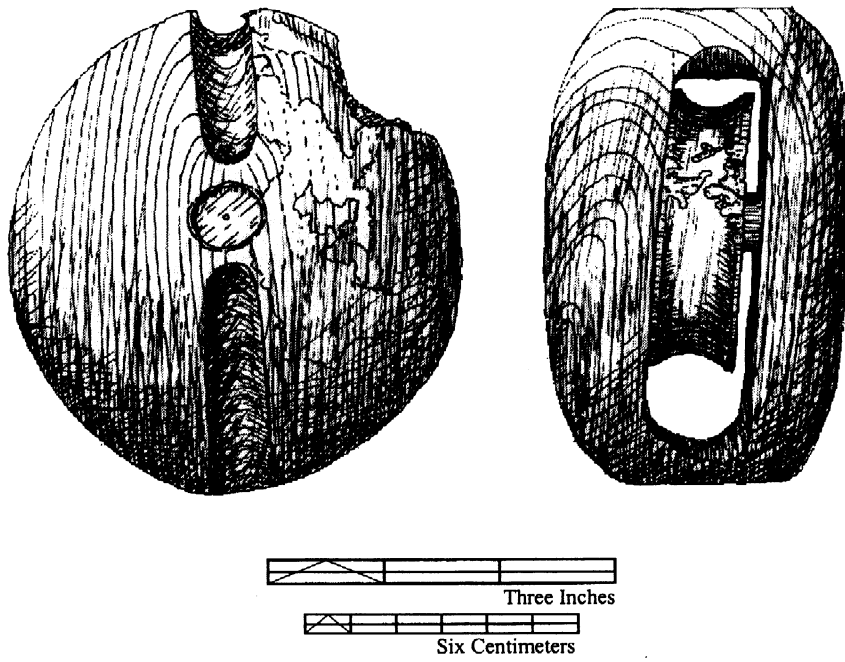


Figure B-19. Single Sheave Block 02-298 (KC).

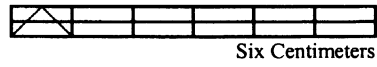
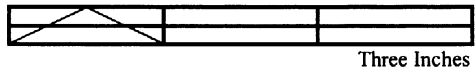
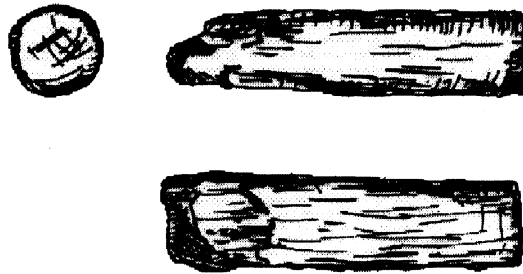
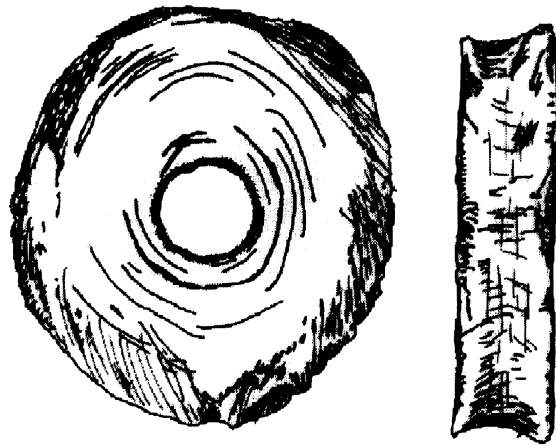
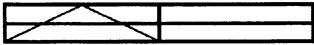
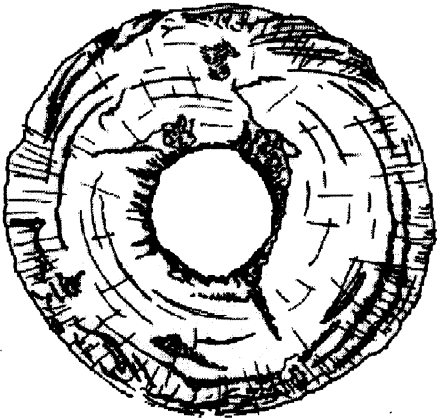
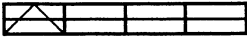


Figure B-20. Sheave with Pin 02-034 (PZ).



Two Inches



Four Centimeters

Figure B-21. Sheave 02-042 (SC).

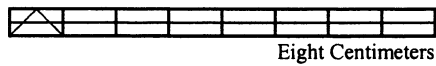
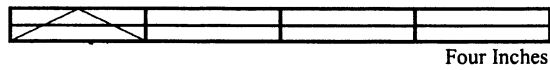
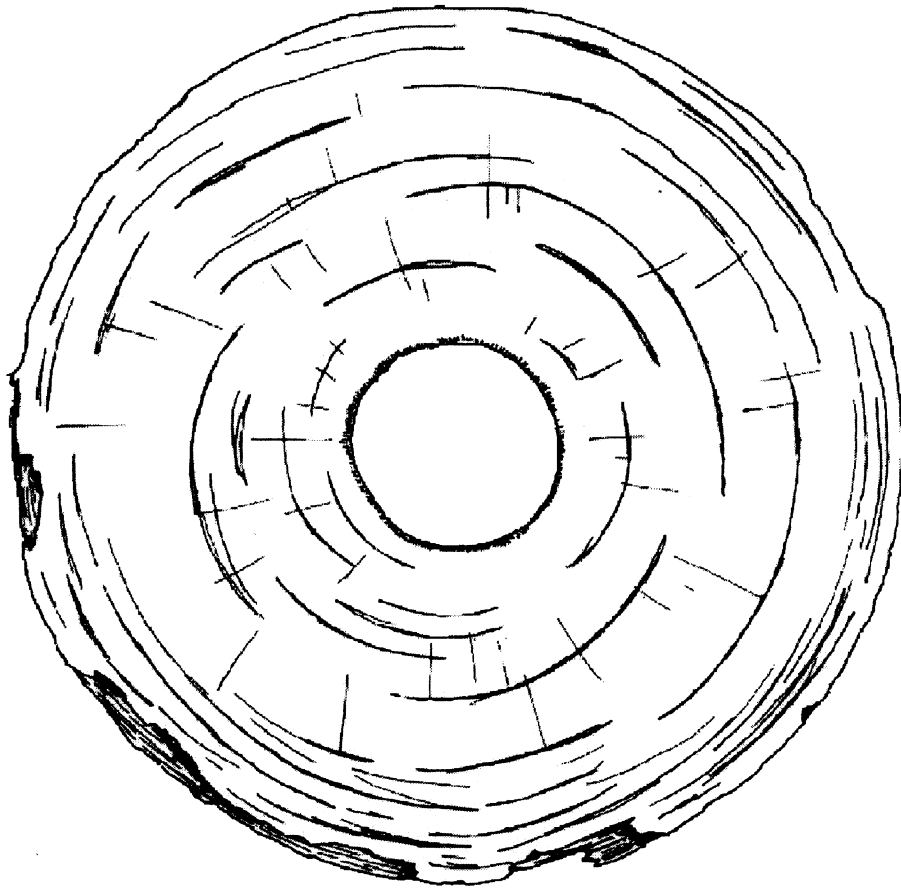
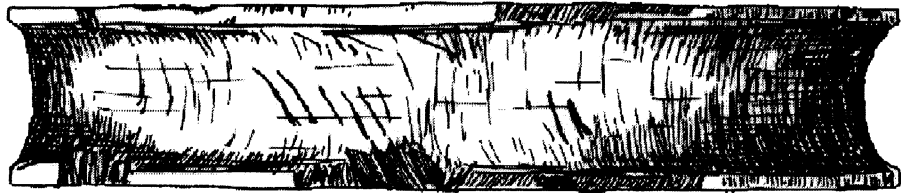
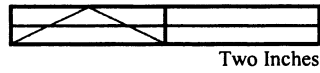
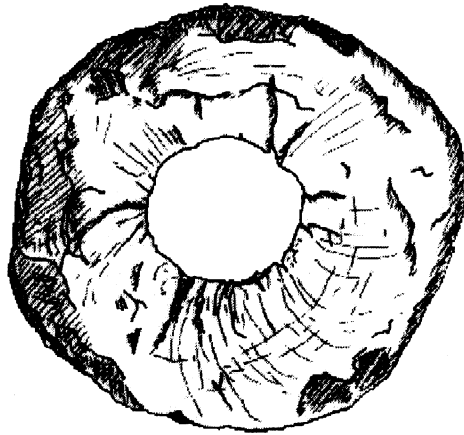
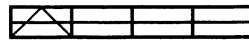


Figure B-22. Sheave 02-044 (SC).



Two Inches



Four Centimeters

Figure B-23. Sheave 02-059 (TS).

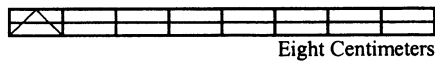
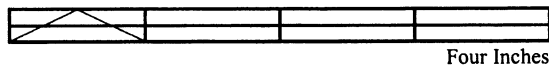
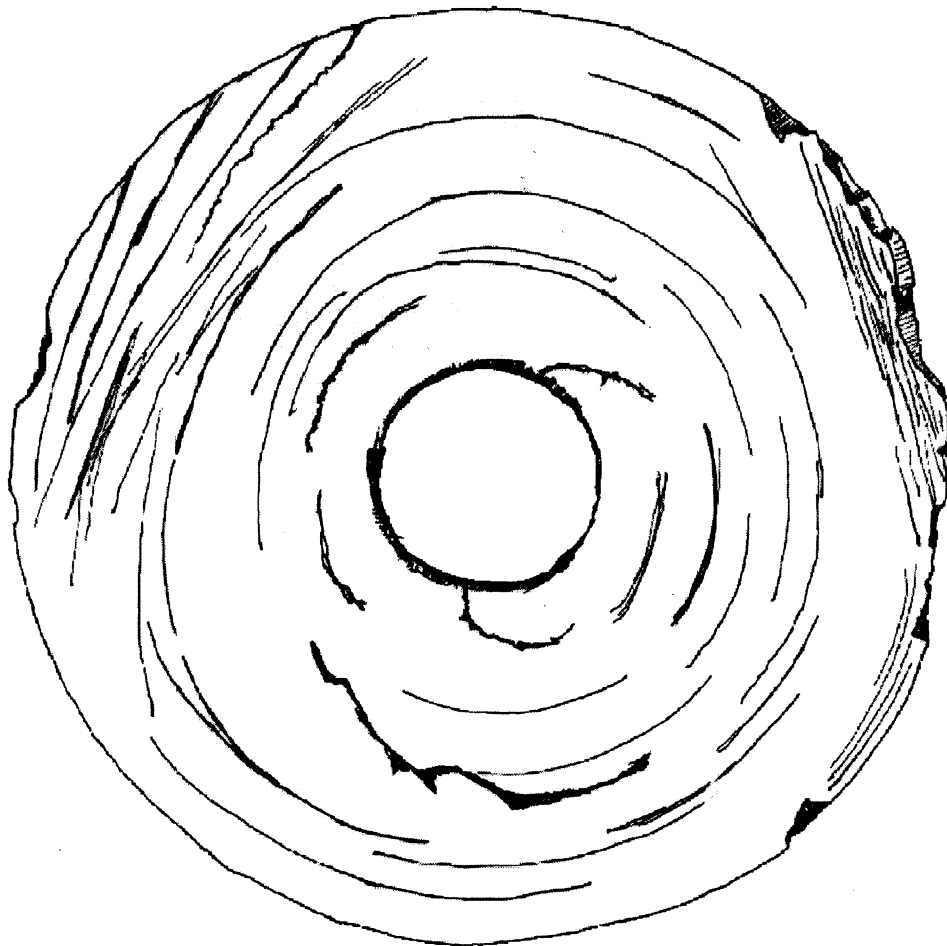
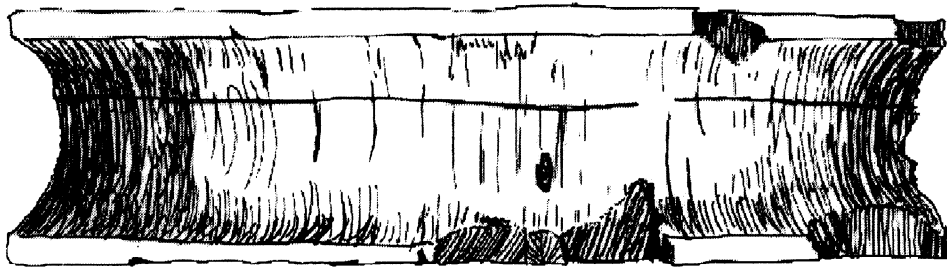


Figure B-24. Sheave 02-065 (SC).

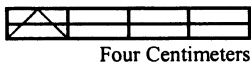
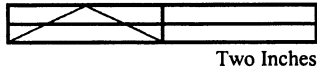
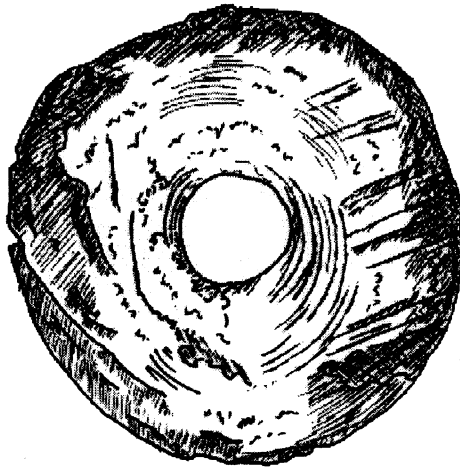


Figure B-25. Sheave 02-079 (TS).

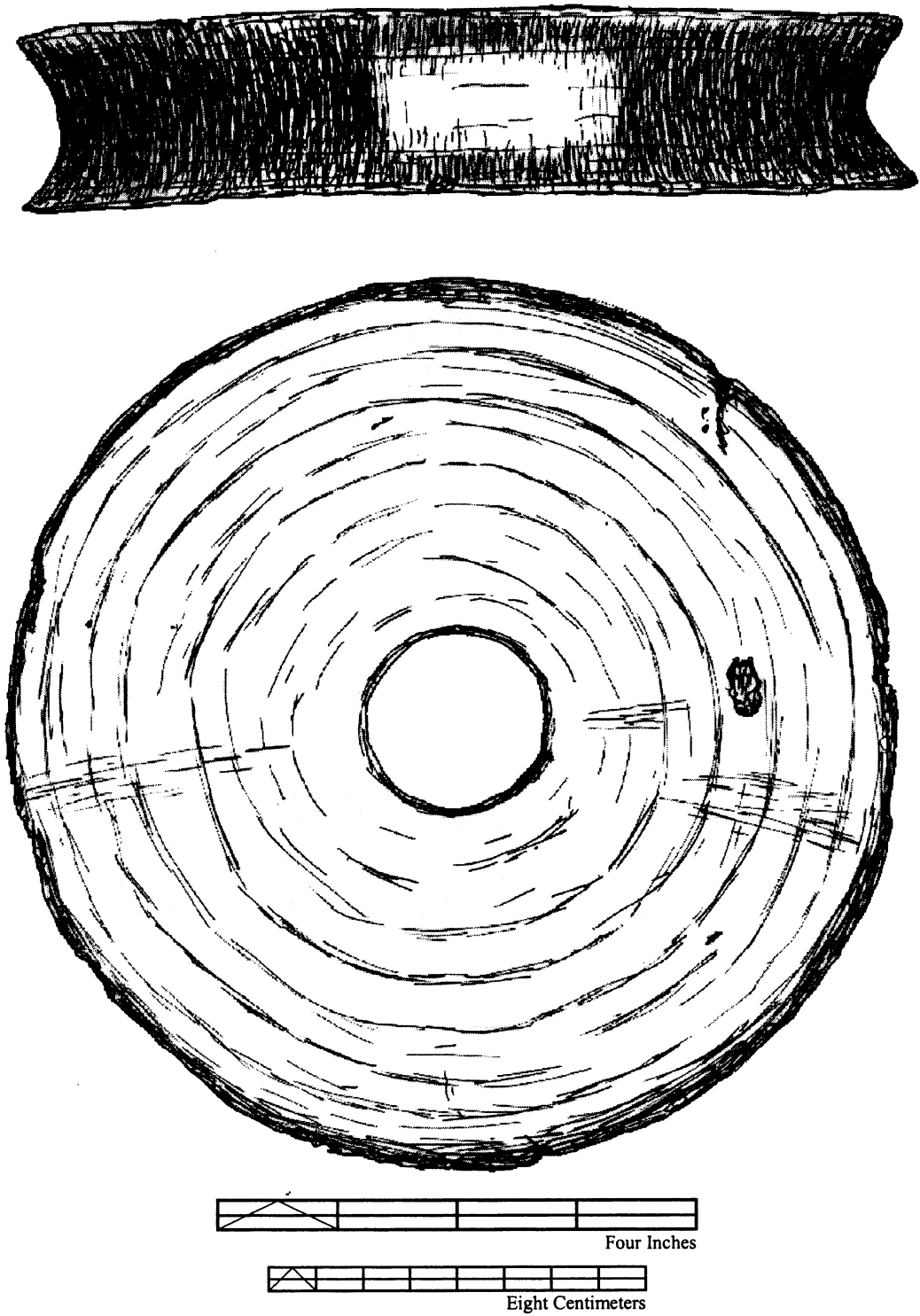


Figure B-26. Sheave 02-082 (AE).

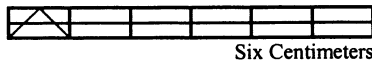
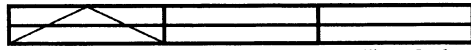
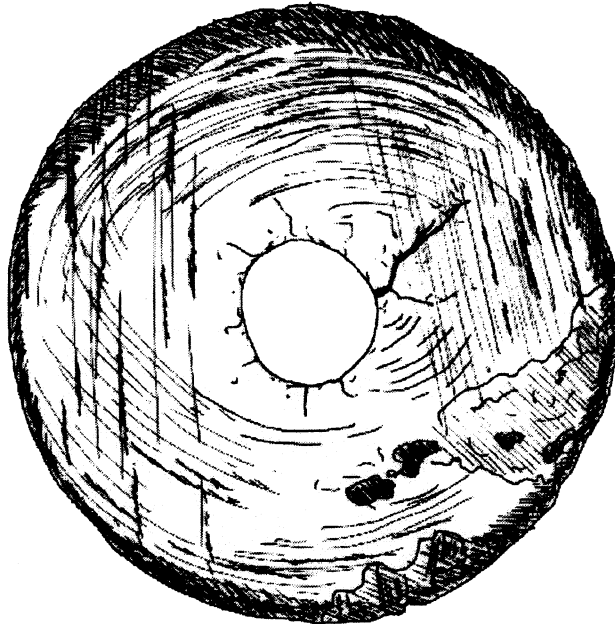


Figure B-27. Sheave 02-095 (TS).

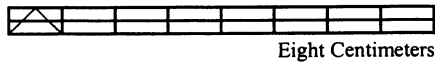
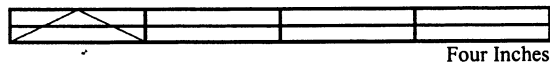
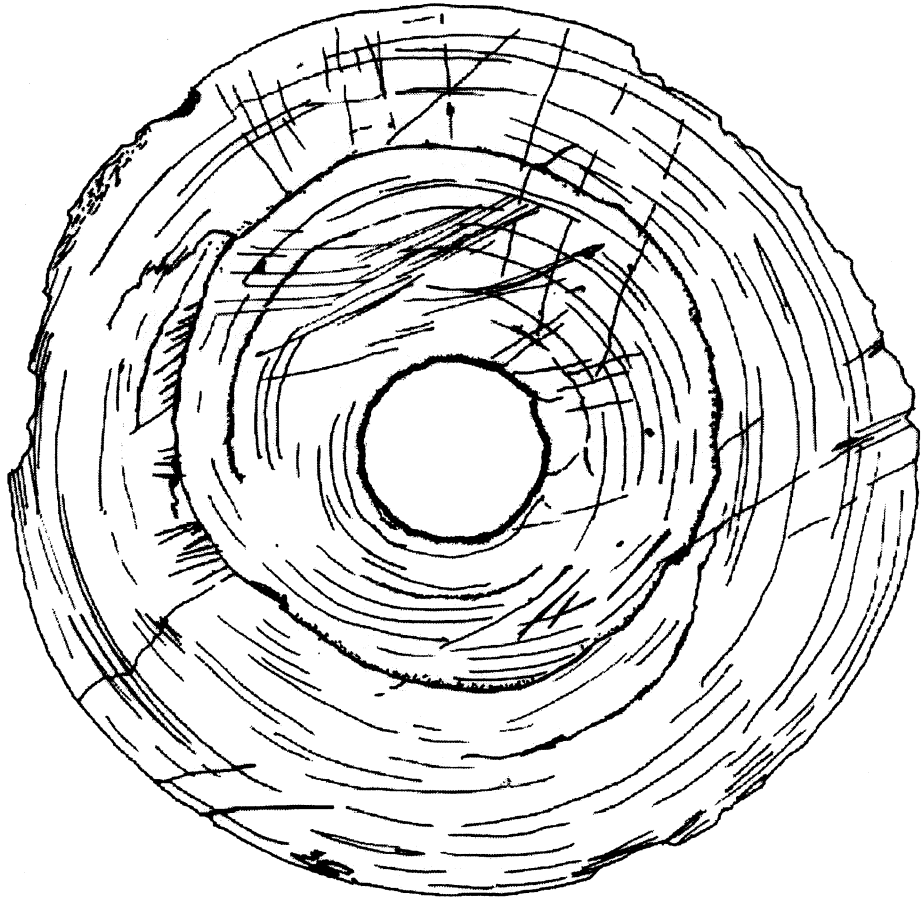
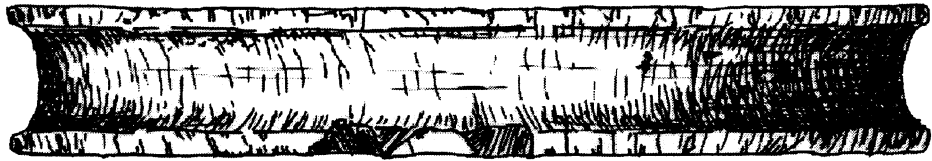


Figure B-28. Sheave 02-100 (TS).

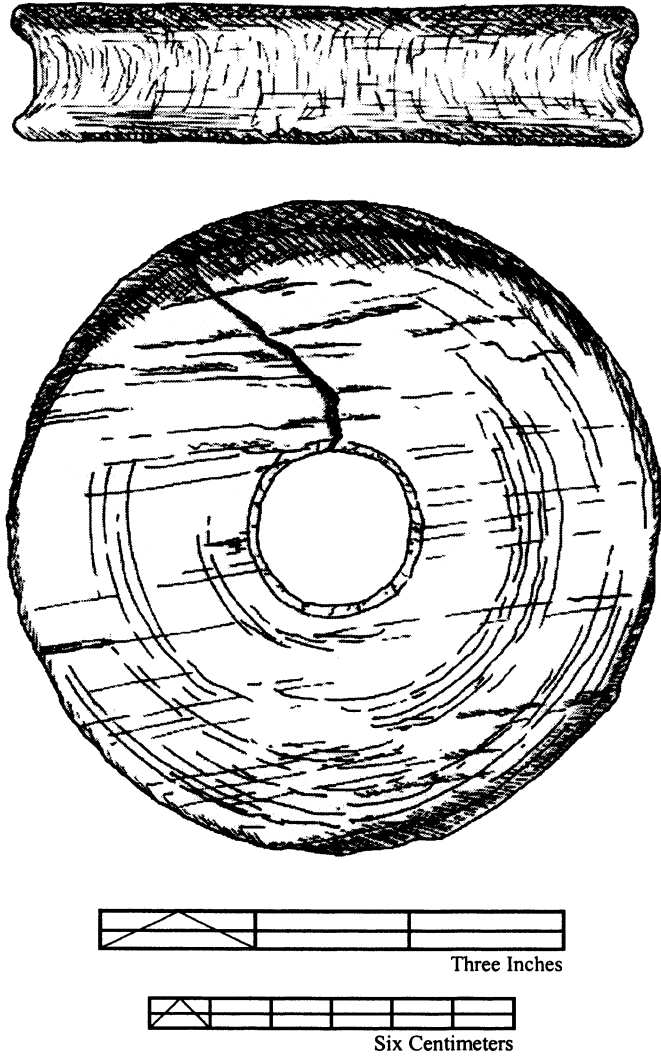


Figure B-29. Sheave 02-124 (TS).

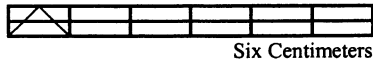
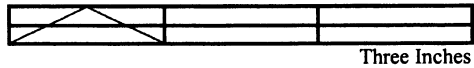
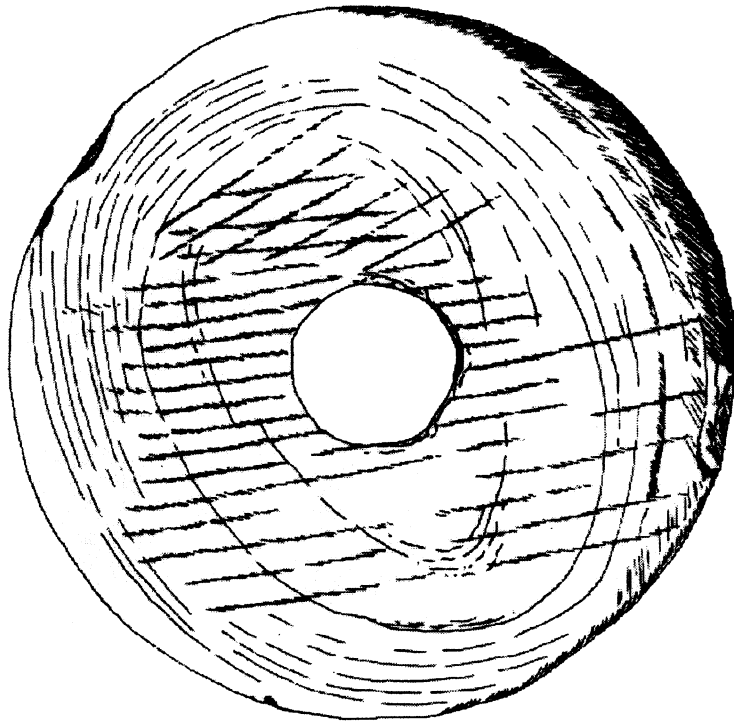
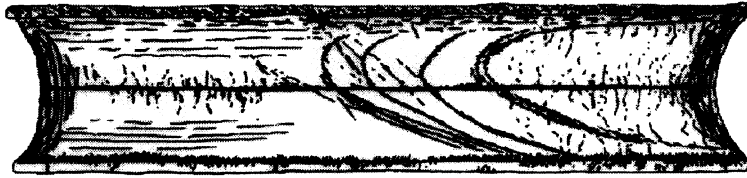


Figure B-30. Sheave 02-339 (TS).

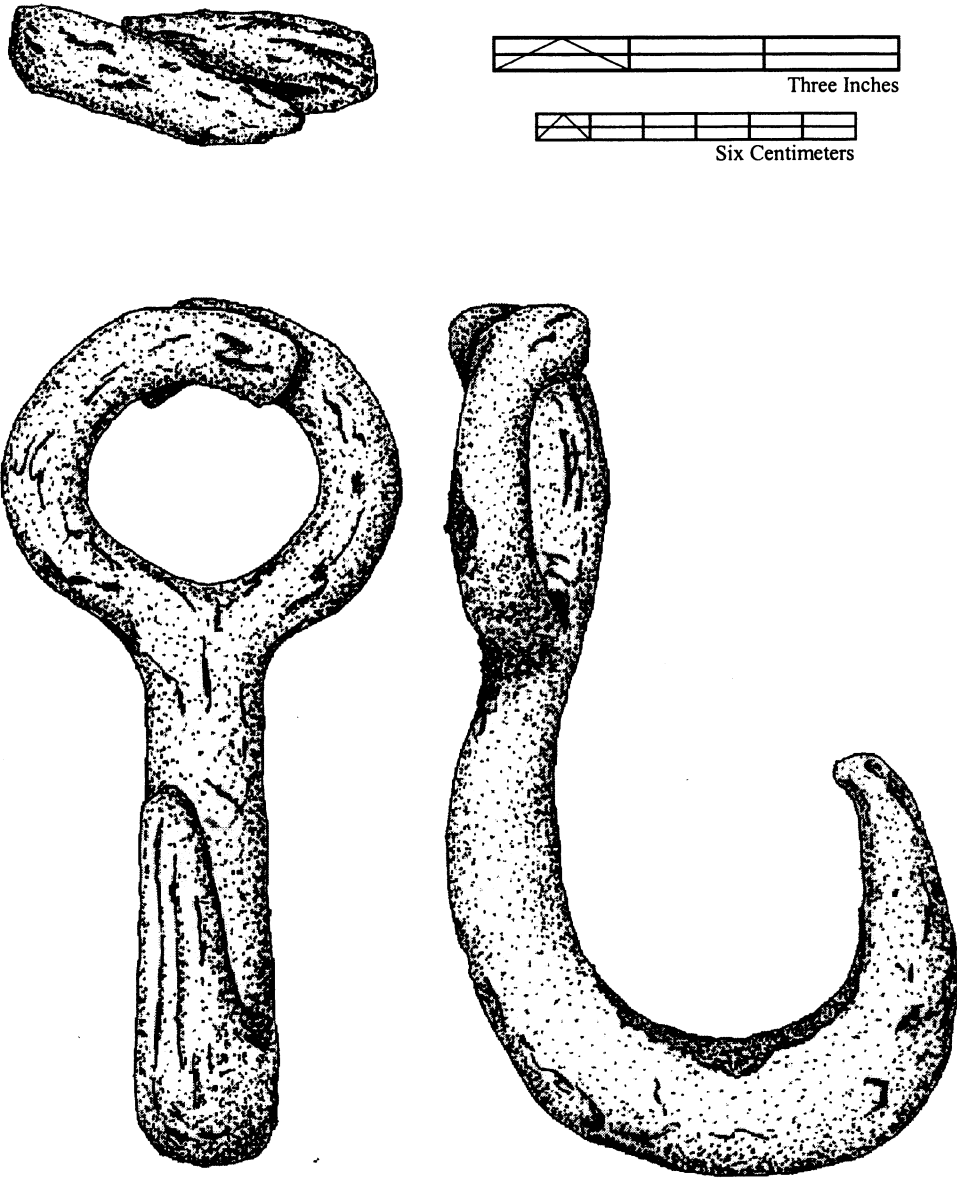


Figure B-31. Hook 03-005 (TS).

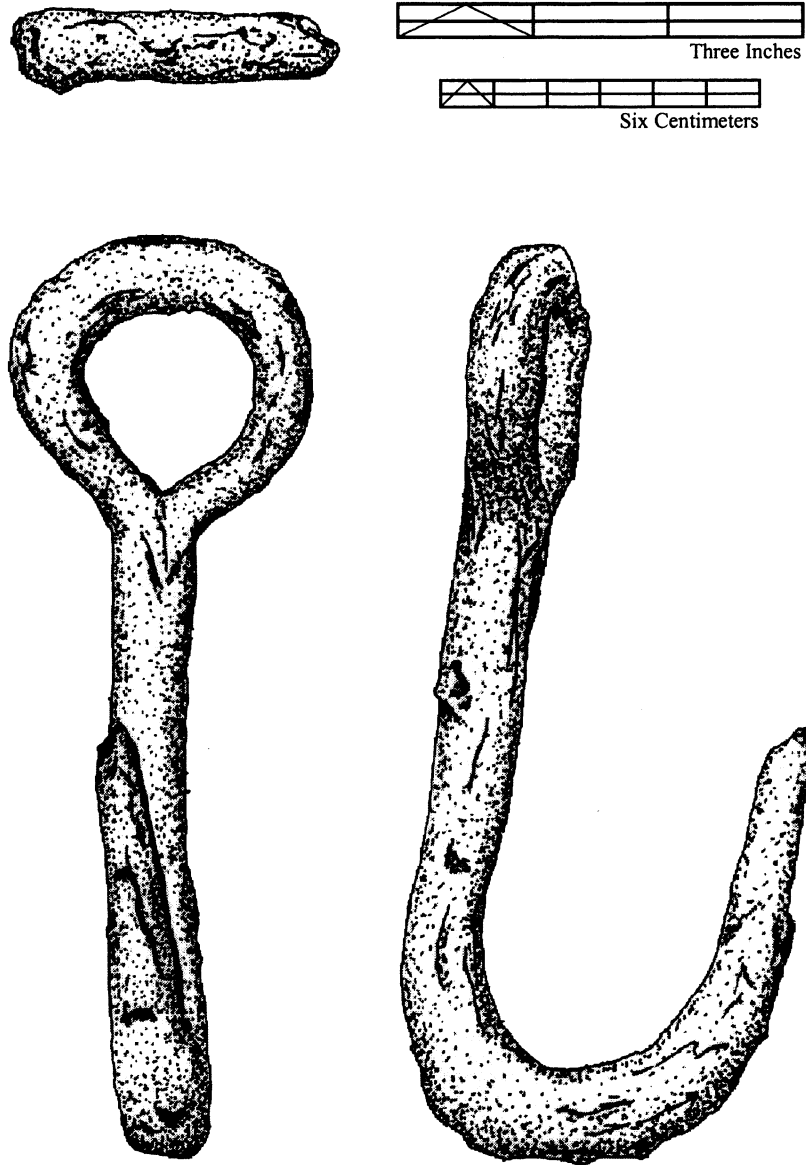


Figure B-32. Hook 03-006 (TS).

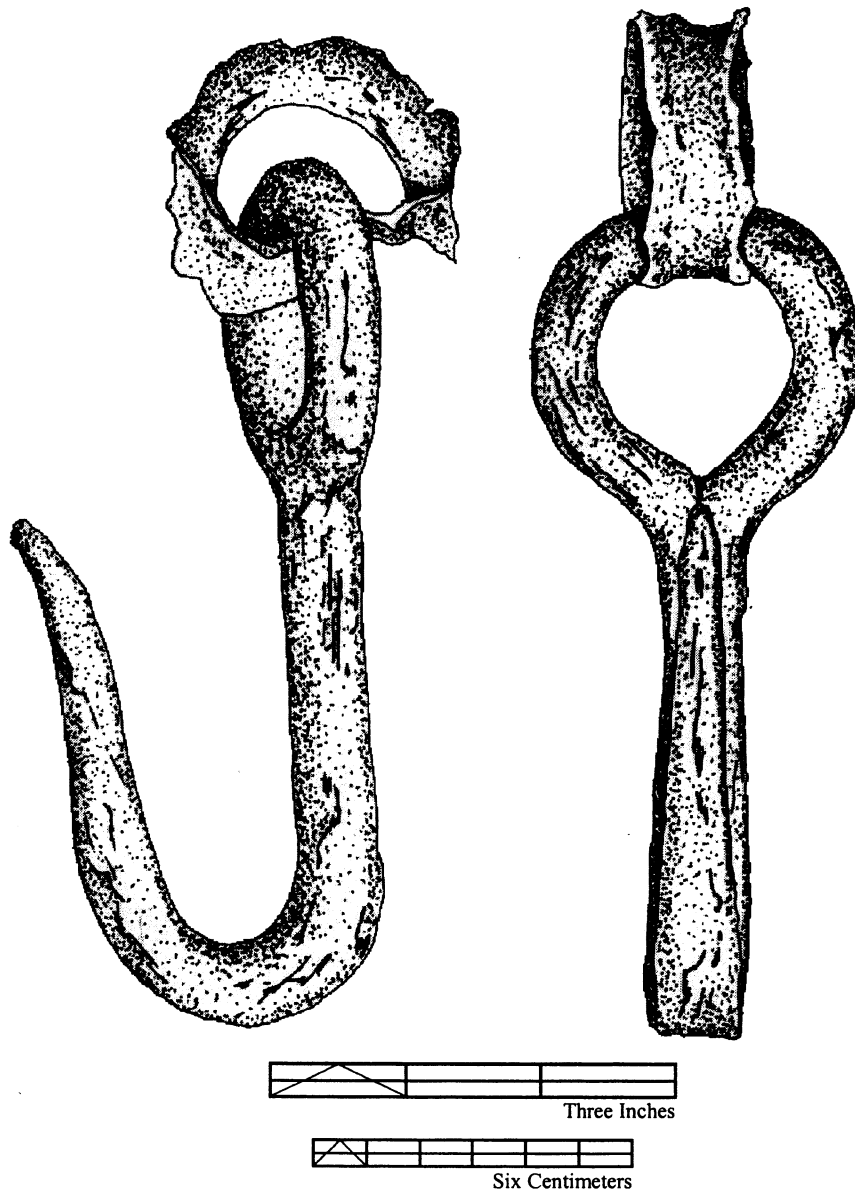


Figure B-33. Hook and Thimble 03-039 (TS).

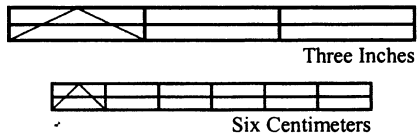
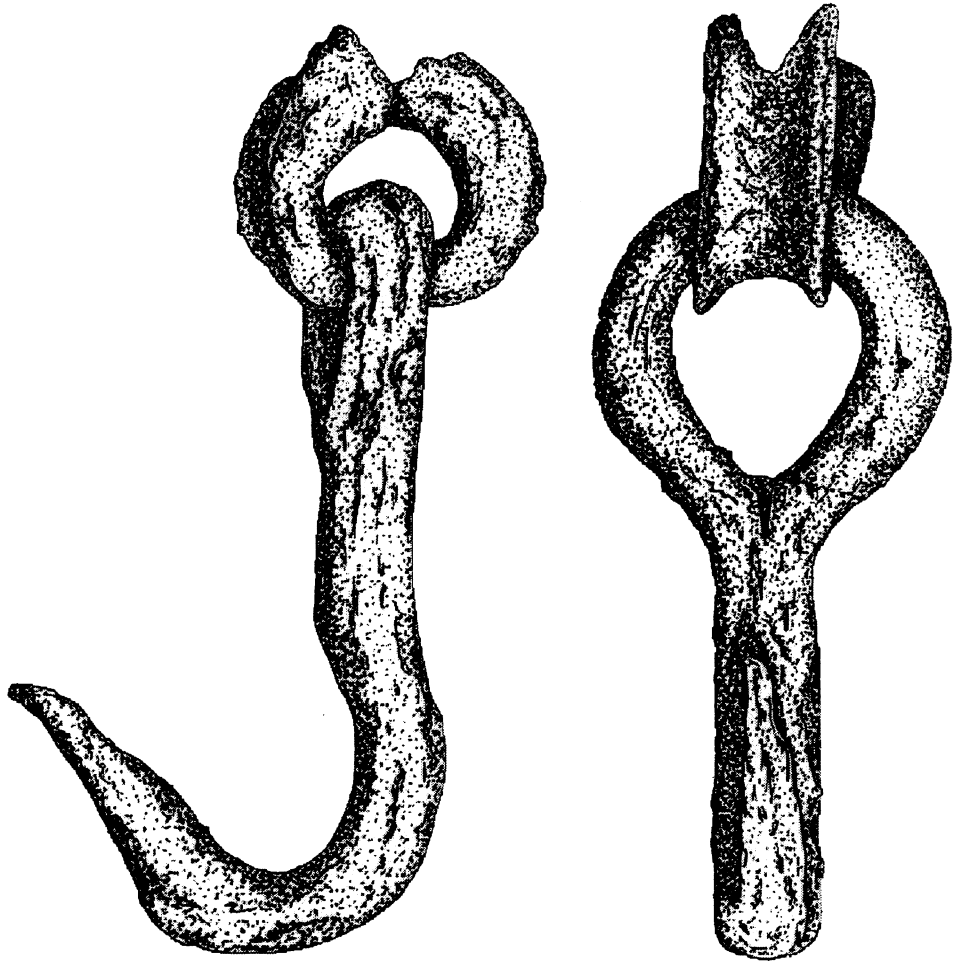


Figure B-34. Hook and Thimble 03-049 (TS).

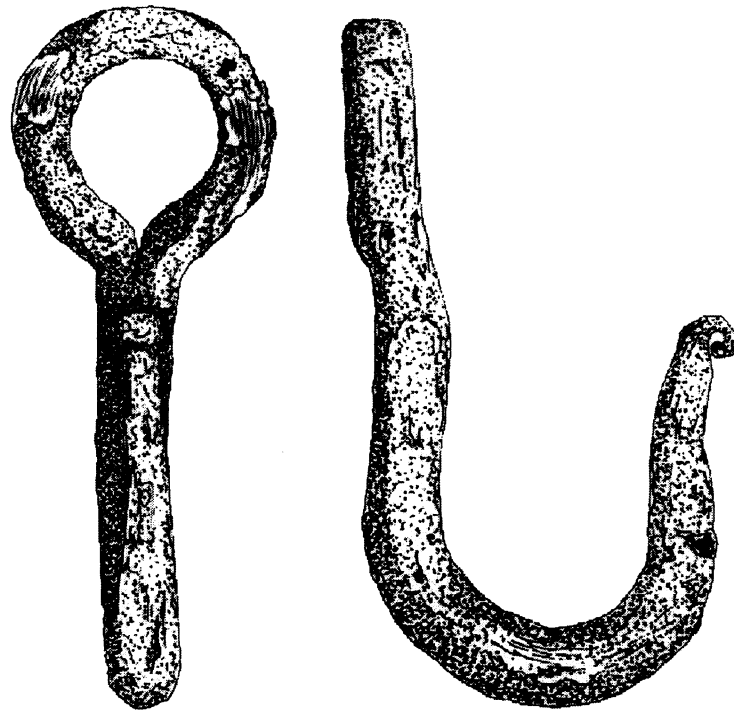


Figure B-35. Hook 03-058 (TS).

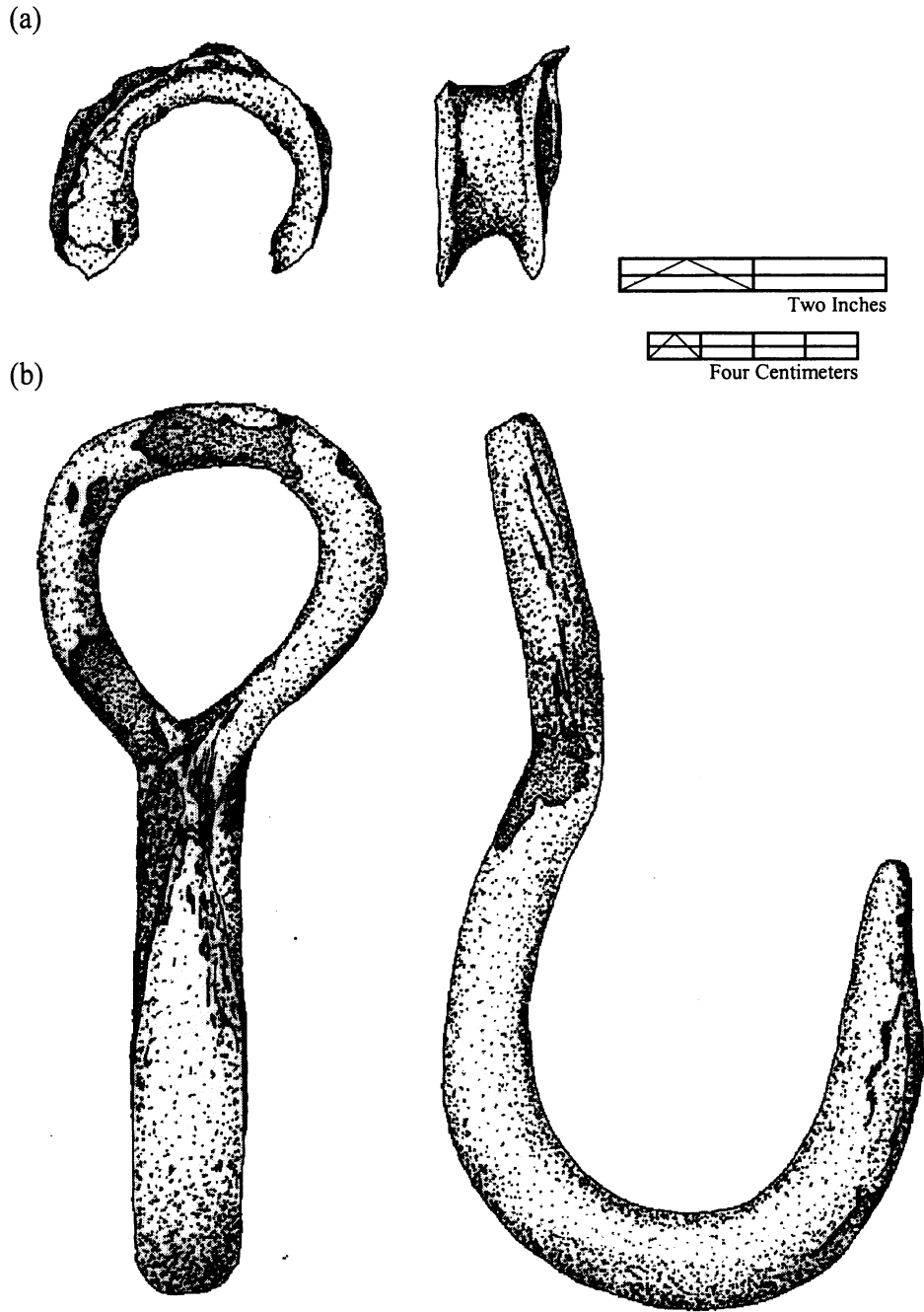


Figure B-36. Thimble (a) 03-008 and Hook (b) 03-121 (PZ).

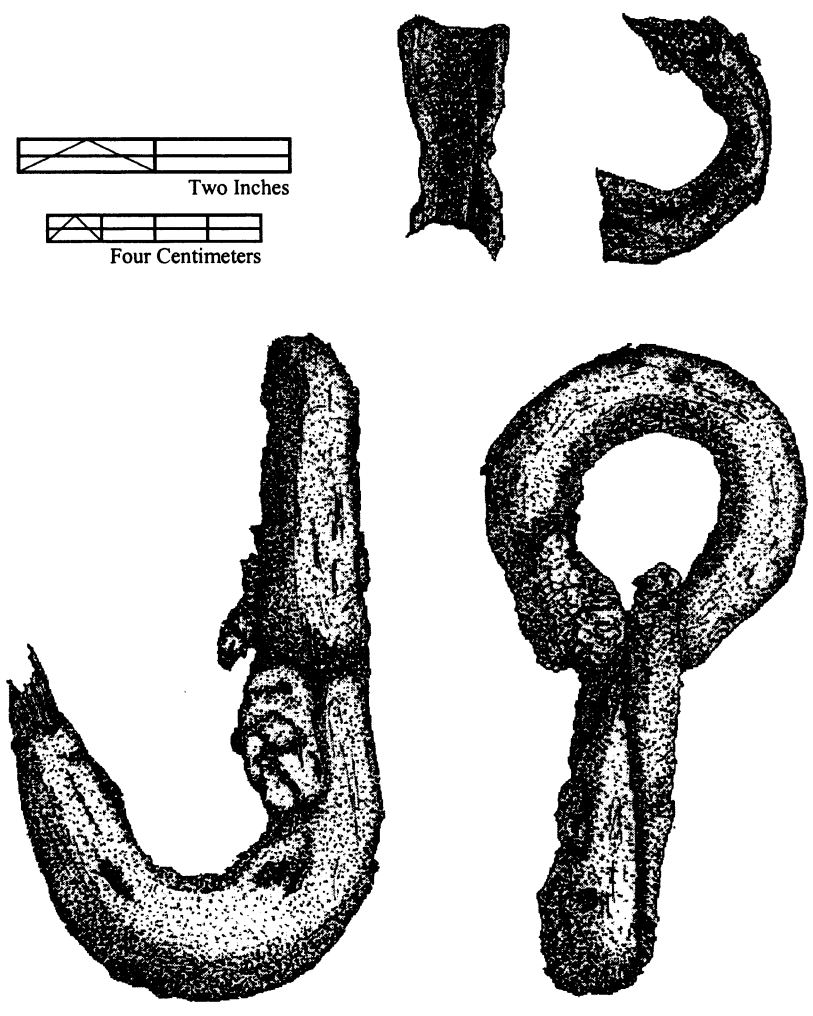


Figure B-37. Hook and Thimble 03-129 (AE).

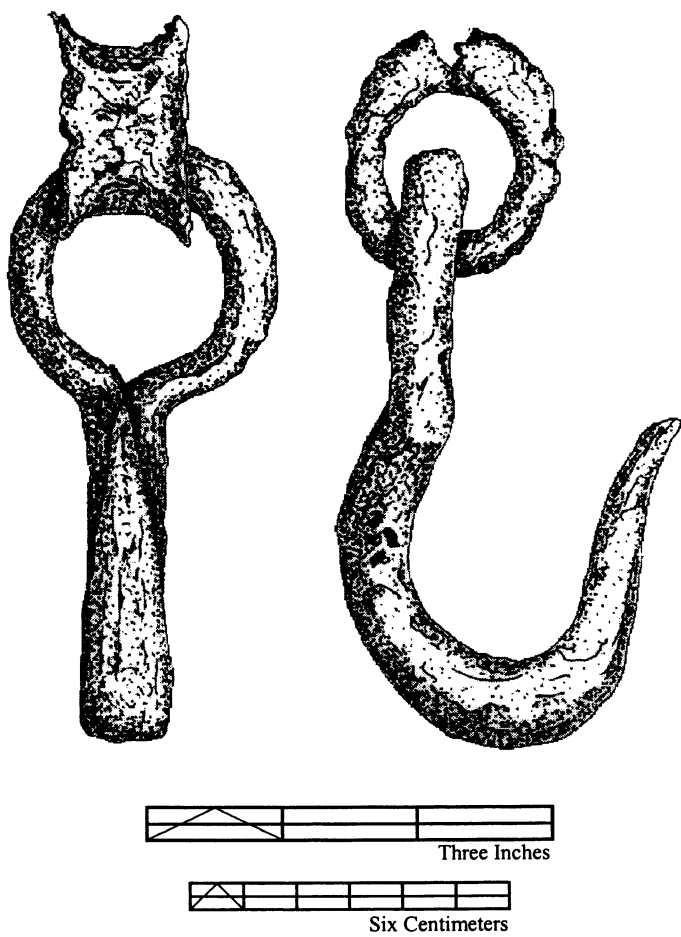


Figure B-38. Hook and Thimble 03-443 (TS).

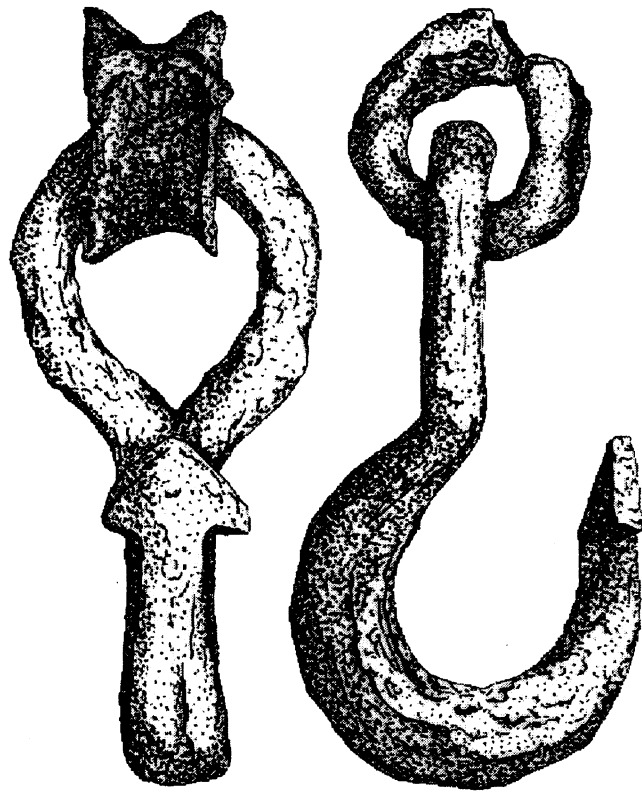


Figure B-39. Hook and Thimble 03-471 (TS).

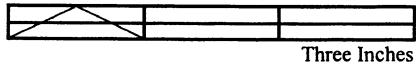
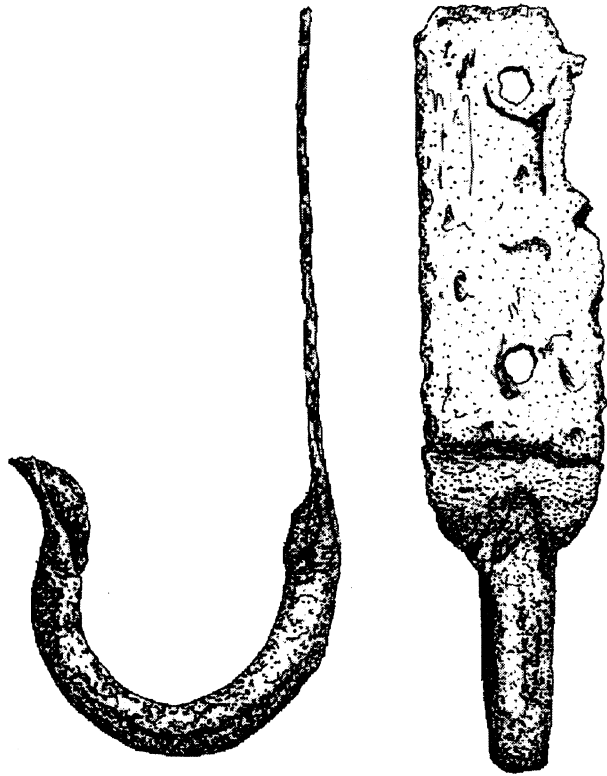


Figure B-40. Hook 03-510 (TS).

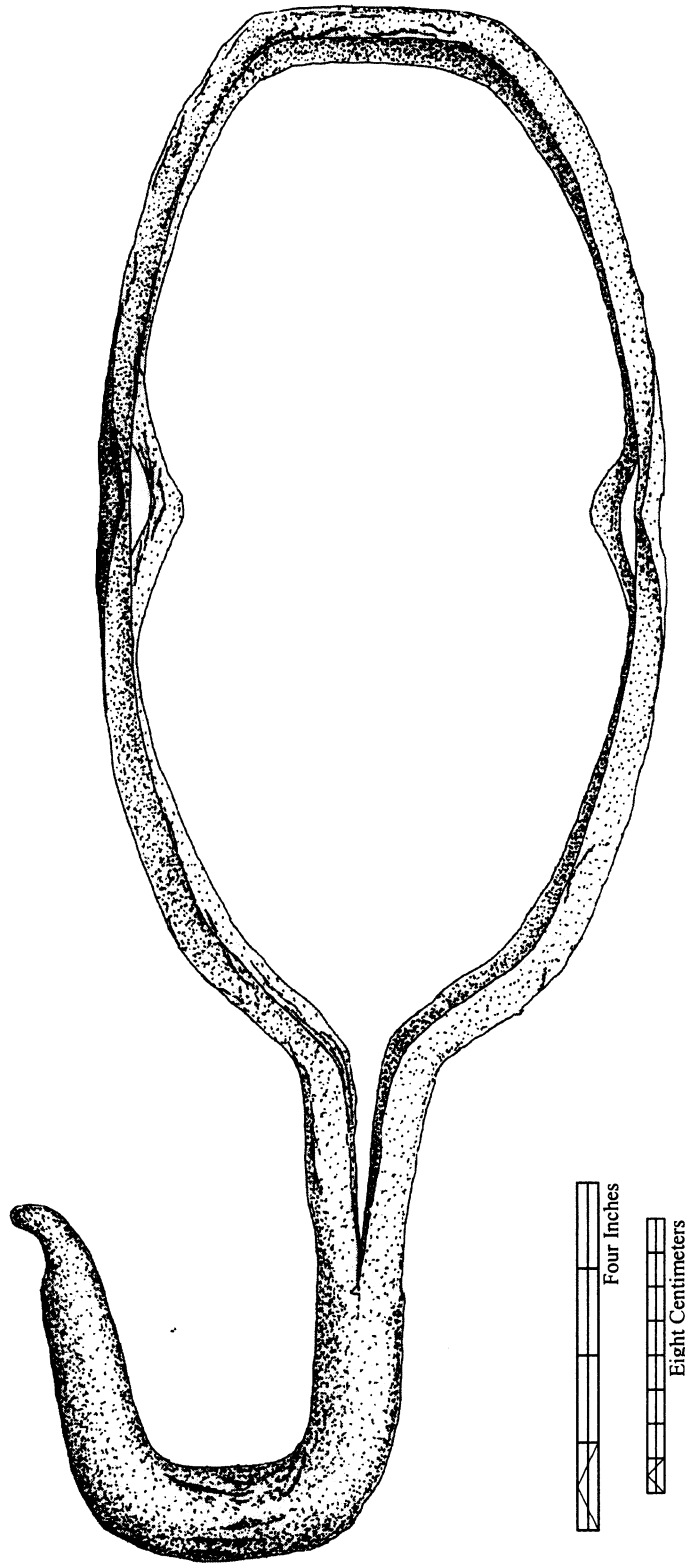
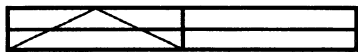


Figure B-41. Strap Hook 03-009 (TS).

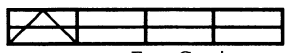
(a)



(b)



Two Inches



Four Centimeters

Figure B-42. Parcelling (a) 04-014 and (b) 04-018.

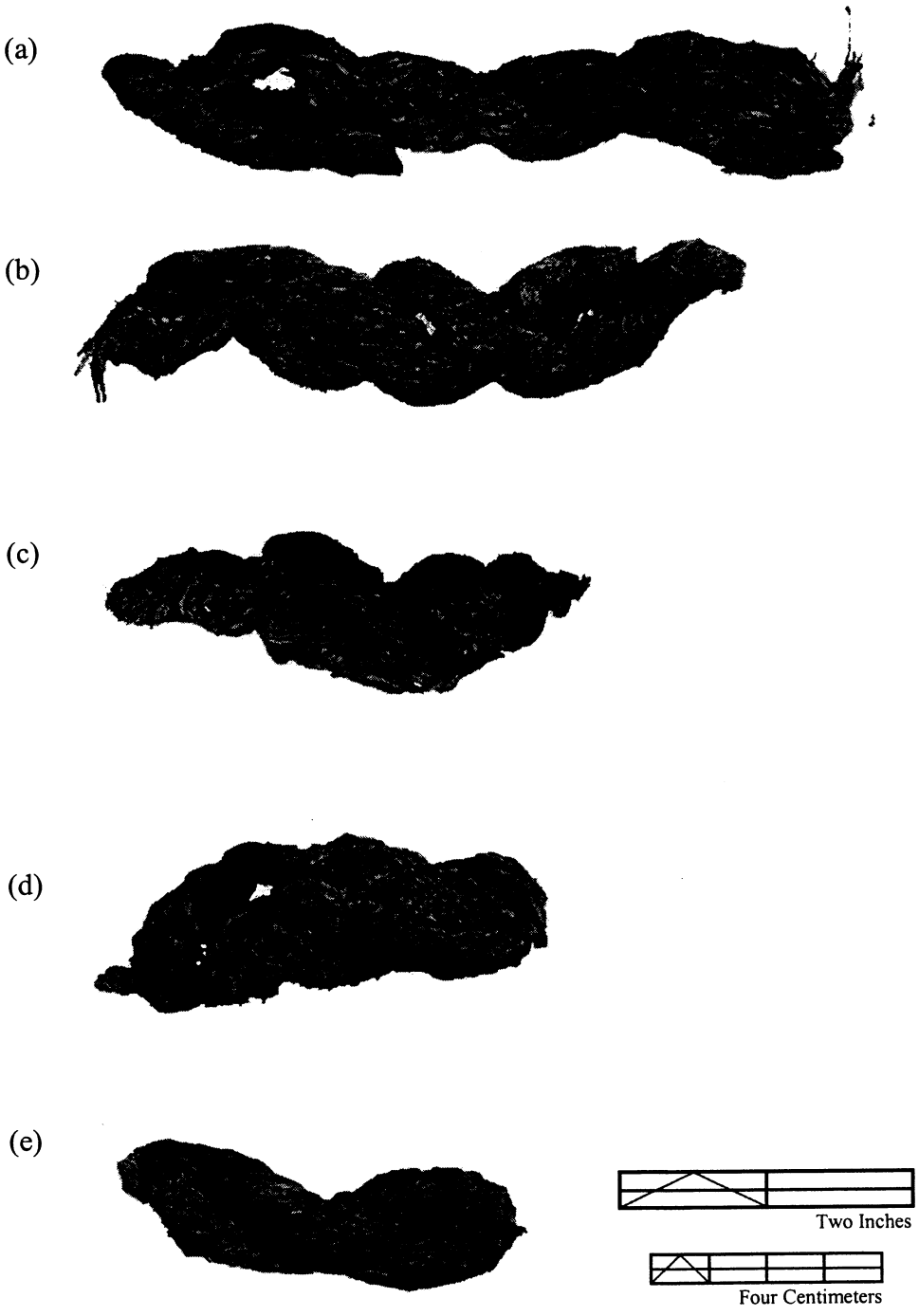


Figure B-43. Rope Fragments 06-009

(a)



(b)



(c)

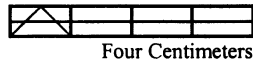
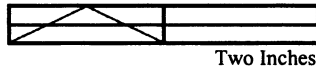
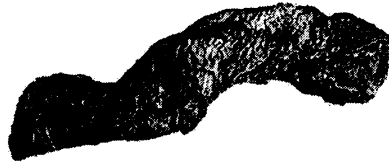


Figure B-44. Rope Fragments (a) 06-016, (b) 06-017, and (c) 06-019.

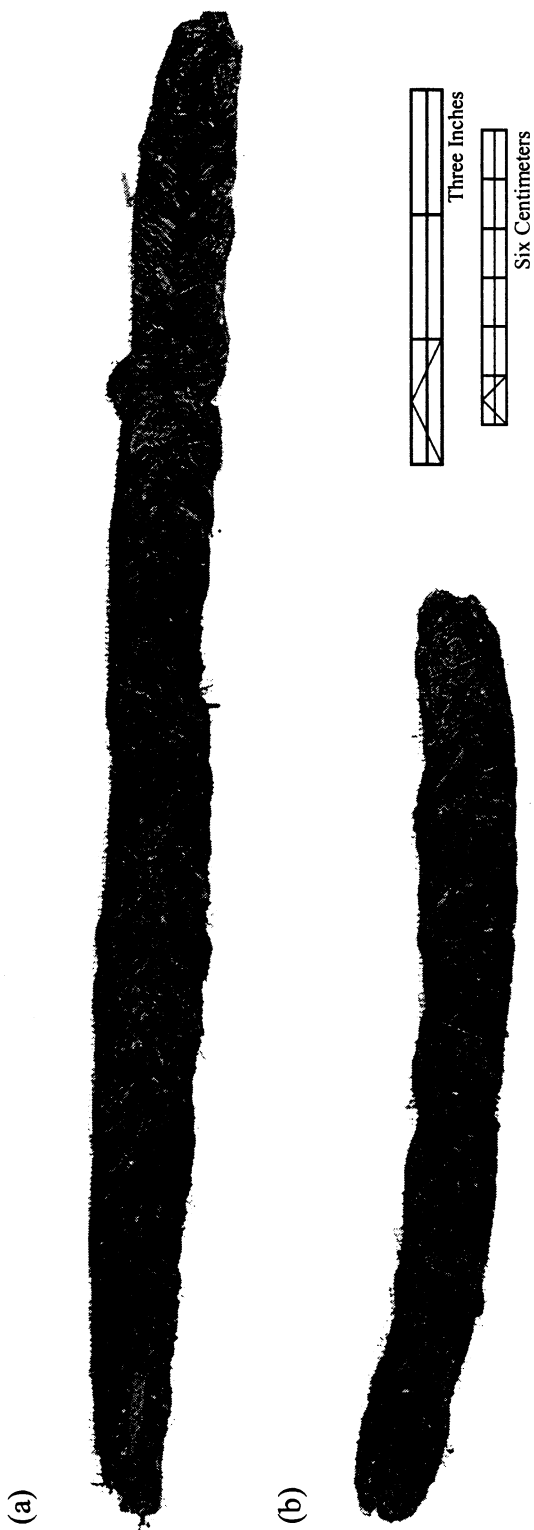


Figure B-45. Rope Fragments 06-037.

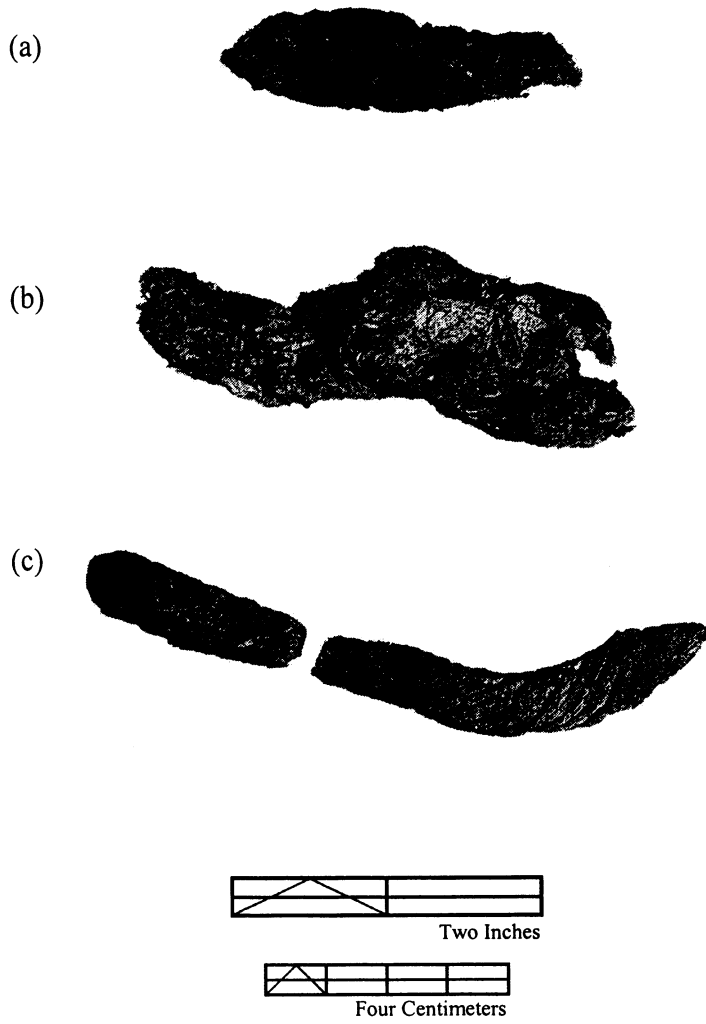


Figure B-46. Rope Fragments (a & b) 06-039 and (c) 06-041.

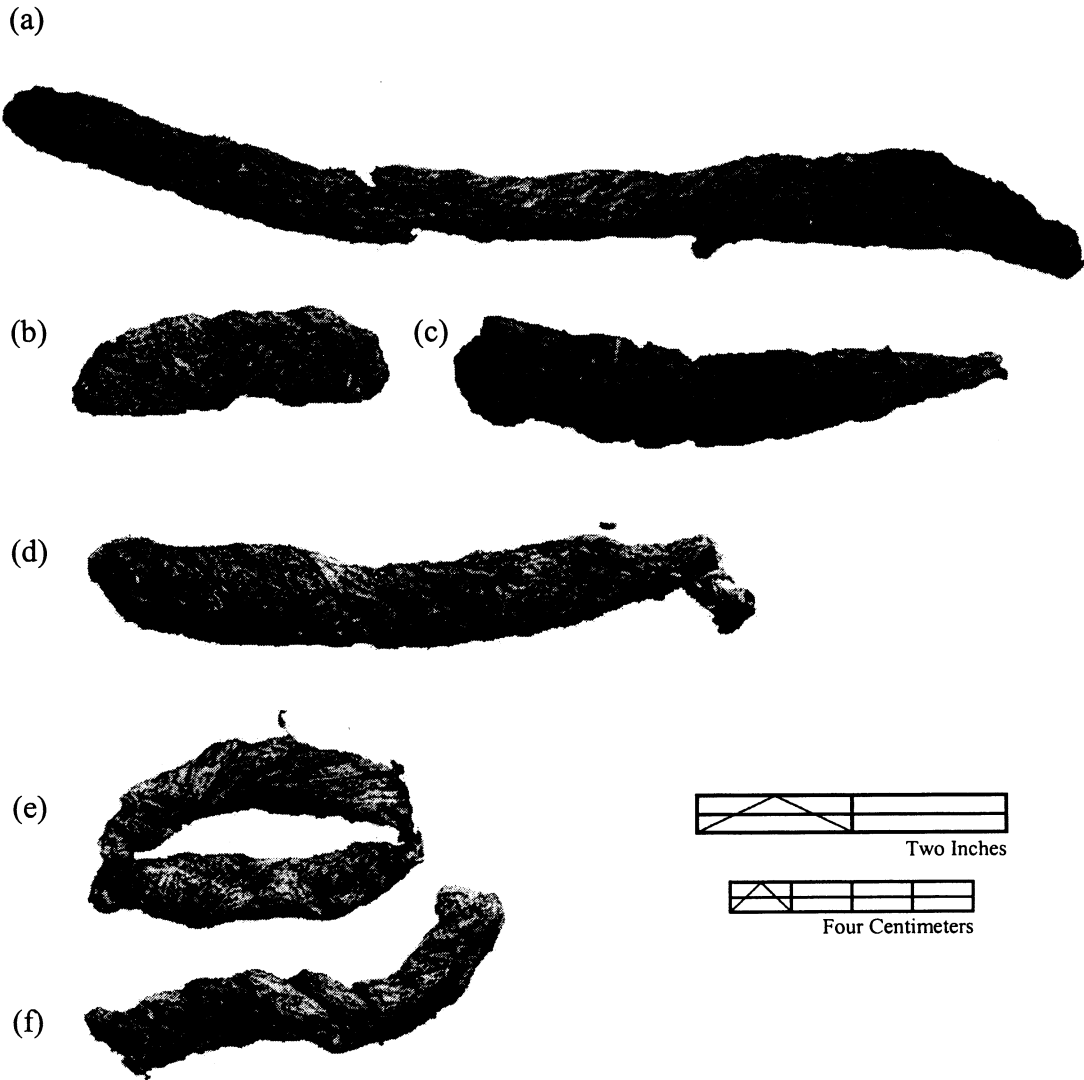


Figure B-47. Rope Fragments 06-067.

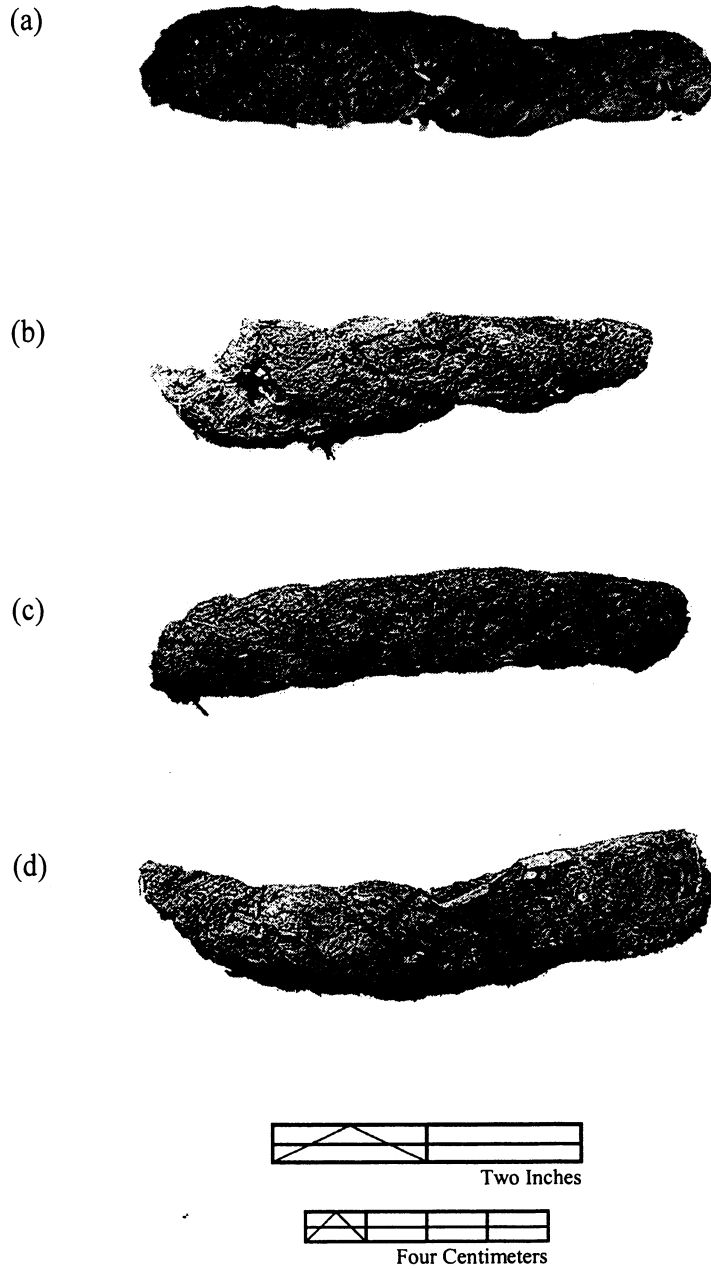


Figure B-48. Rope Fragments (a) 06-066 and (b, c & d) 06-068.



Figure B-49. Rope Fragments 06-069.

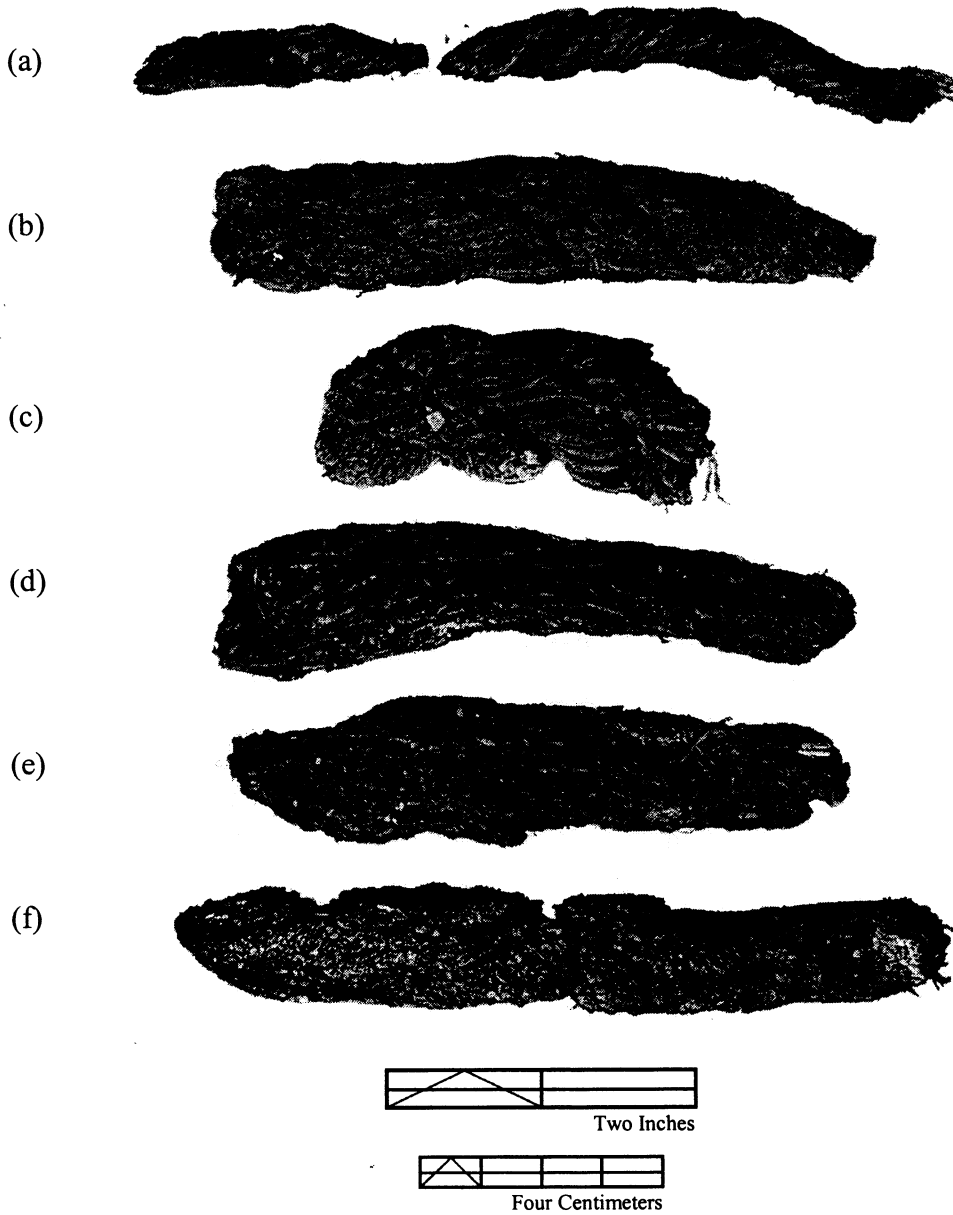


Figure B-50. Rope Fragments 06-098.

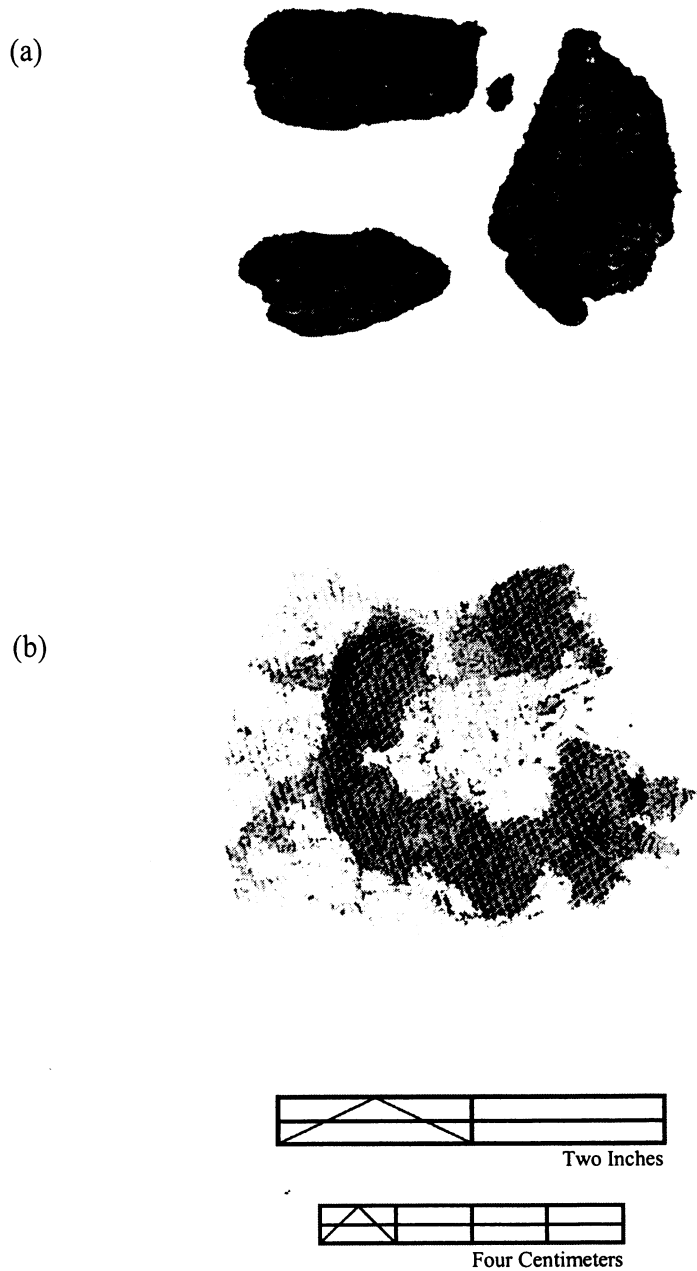


Figure B-51. Rope Fragments (a) 06-106 and (b) 06-123.

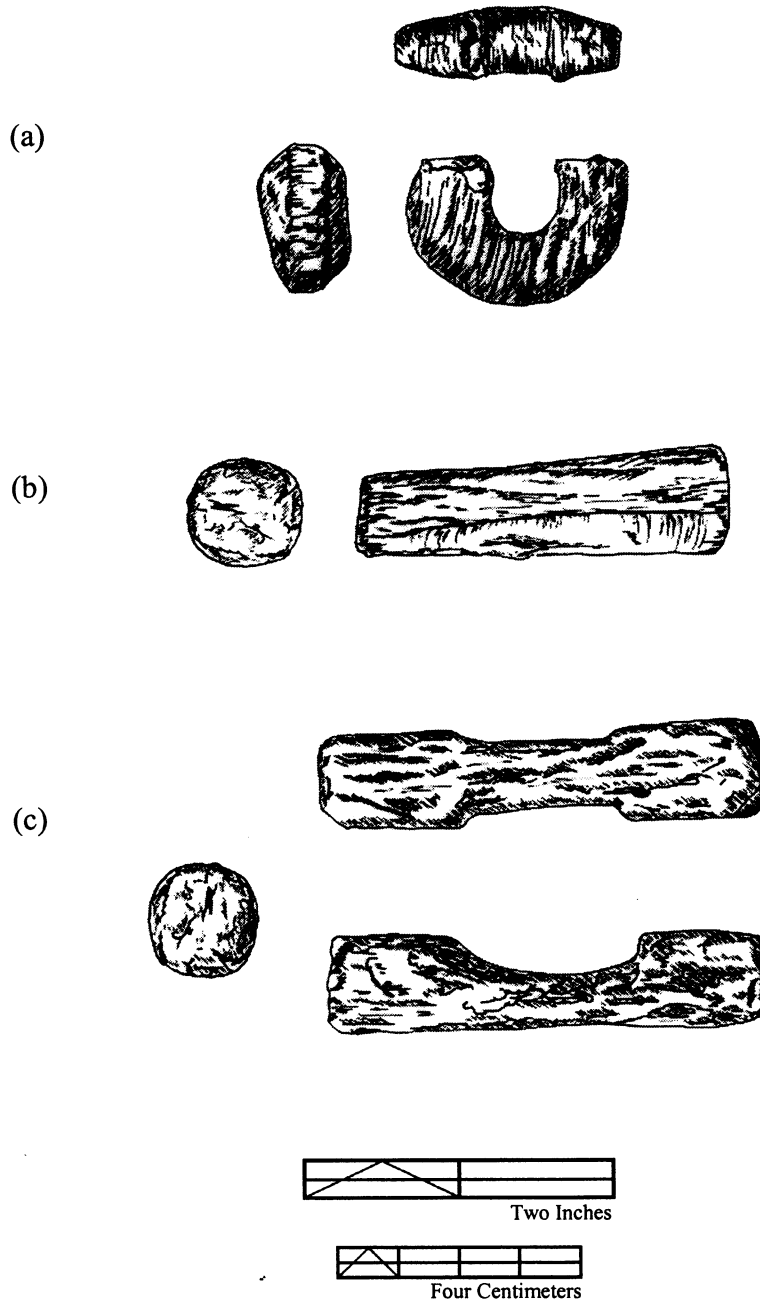


Figure B-52. Wooden Ring Fragment (a) 02-056 (TS), Sheave Pin (b) 02-062 (TS), and Toggle or Block Pin (c) 02-063 (TS).

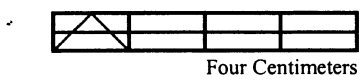
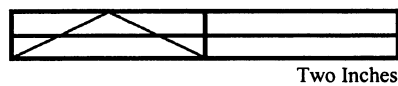


Figure B-53. Wood Toggles or Block Pins (a) 02-063, (b) 02-099, and (c) 02-182.

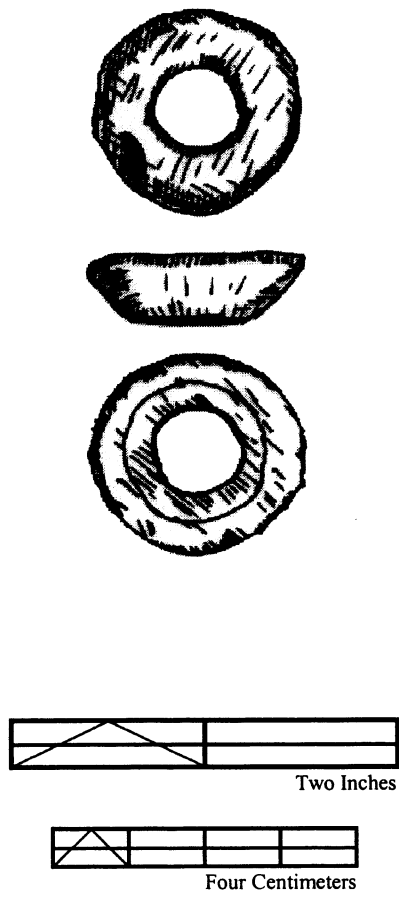


Figure B-54. Wooden Ring 02-163 (PZ).

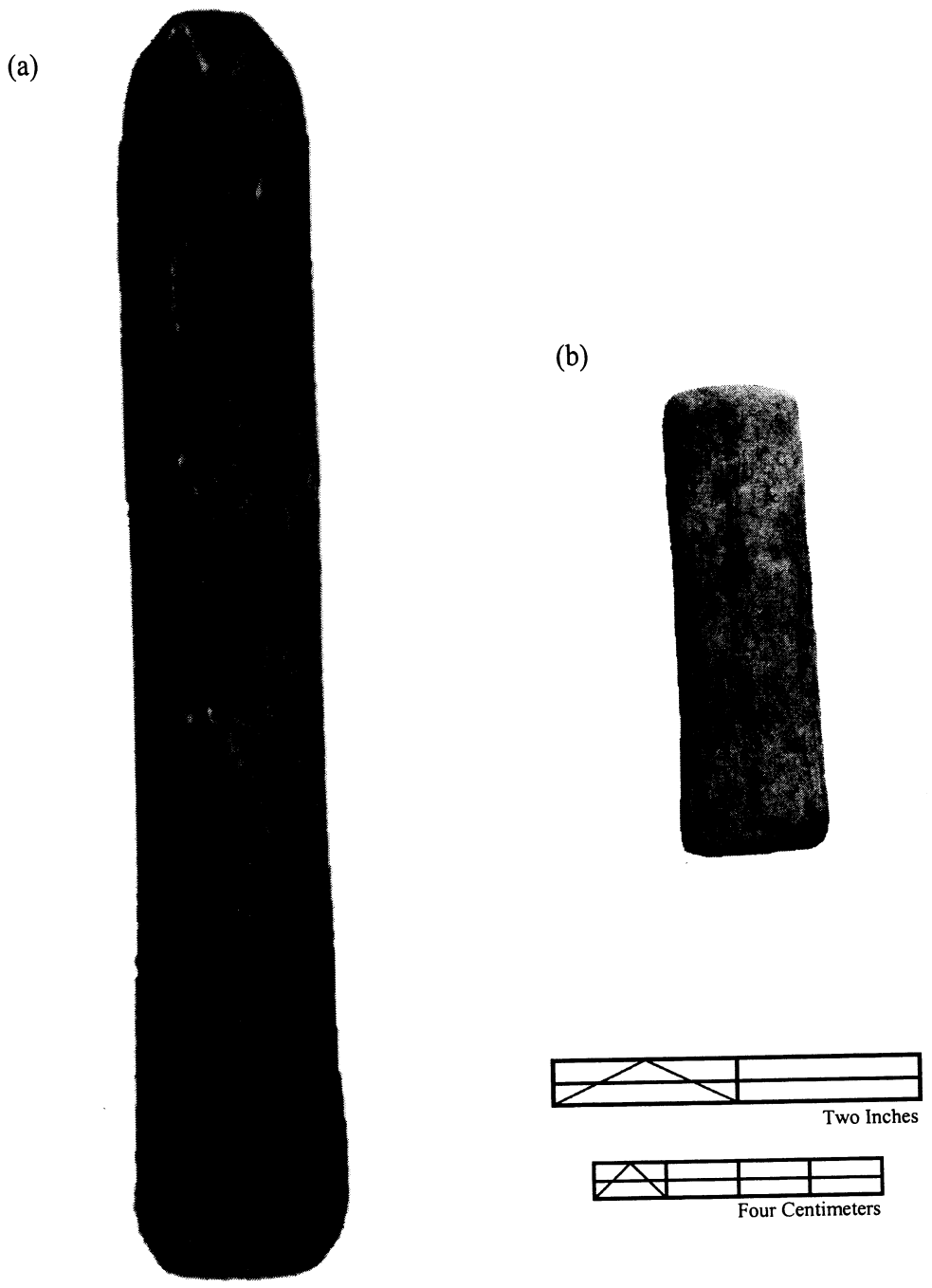


Figure B-55. Wooden Spindle (a) 02-173 and Sheave Pin (b) 02-322.

VITA

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Education

August 1998-present	Doctor of Medicine-in progress Medical College of Virginia, Richmond, VA.
June 1990-present	Master of Arts in Anthropology Texas A&M University, College Station, TX.
Sept. 1986-May 1990	Bachelor of Arts in History, Tufts University, Medford, MA.

Employment

April 1998-August 1998	Clinical Operation Manager, Western Hyperbarics, LLC., Chico, CA
Dec. 1993-April 1998	Senior Hyperbaric Technician. Texas A&M University, College Station, TX.
July 1996-Aug. 1996	Project Medic and Photographer. Institute of Nautical Archaeology-Albania Survey
May 1995-Aug. 1995	Project Medic and Photographer. Institute of Nautical Archaeology-Egypt.

Field Experience

July-Aug. 1996	INA Albania shipwreck survey. Tirana, Albania
May-Aug. 1995	INA-Egypt Sadana Island Excavation. Hurghada, Egypt.
June-July 1993	Lake Champlain Field School. Burlington, VT.
May-June 1993	Smithsonian Institution <i>Indiana</i> project. Lake Superior.
Aug. 1992	Smithsonian Institution <i>Indiana</i> project. Lake Superior.
June-July 1992	Lake Champlain Field School. Burlington, VT.
June-Aug. 1990	Field School Port Royal Project. Port Royal, Jamaica.

Presentations

Application of Hyperbaric Oxygen Therapy for the Treatment of Lyme Disease—Preliminary Findings. American Association for the Advancement of Science, May 1997. Texas A&M University, College Station, TX.

Photograph Publications

National Geographic Society
Lake Champlain Maritime Museum Quarterly
Archaeology Magazine
INA Quarterly
International Journal of Nautical Archaeology