

THE CONSTRUCTION OF THE GRIFFON COVE WRECK

A Thesis

by

Paul Fredric Hundley

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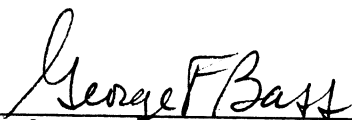
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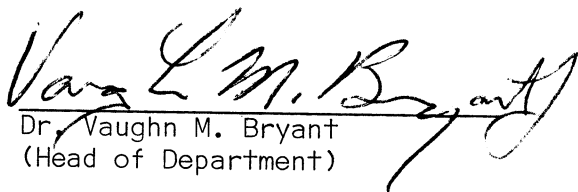
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ABSTRACT

The Construction of the Griffon Cove Wreck (December, 1980)

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During the summer of 1978, an archaeological investigation was undertaken to re-examine a shipwreck site in Lake Huron. The remains, found in 1955 by a local fisherman on Russel Island one mile northwest of Tobermory, Ontario, Canada, were raised and have since been acquired by the Ontario Ministry of Natural Resources. The field work centered on an in-depth examination of the ship's timbers and material from an excavation of the original recovery site.

The ship was believed by some to be the Griffon, built by René Robert Cavalier de la Salle in 1679. At the time of their recovery, the timbers were examined by two Canadian experts who were of the opinion that the material was from the Griffon. This fact has never been proven. The Russel Island ship is one of many vessels in the Great Lakes which have been claimed to have been the Griffon.

Research was undertaken to prove whether or not the Griffon Cove wreck was indeed the Griffon. The information gathered while in Canada was brought back to Texas A&M University for analysis. To aid in an understanding of the ship's construction, a 1:10 scale model was built duplicating the timbers exactly as they were recorded. Simultaneously, a set of hull lines was drafted from the frame shapes. The completed

hull lines offered a description of the ship which could be compared to lines of other vessels in order to identify parallels.

Evaluation of the hull remains, artifacts associated with the wreck, and contemporary historical records has led to the conclusion that the Griffon Cove wreck is not the Griffon. These remains are from a vessel, probably a local variation of a Mackinaw boat, approximately 45 ft. in length, used and abandoned in the mid-1800s.

ACKNOWLEDGMENTS

Many people have aided in the effort to complete this thesis. Without their help and guidance, this work could not have been accomplished. I am indebted to everyone who has provided assistance and believe that, through sharing in this project, life-long bonds have been established.

I would like to express my gratitude to the Ontario Ministry of Natural Resources and especially to Mr. W. J. Lovering, the District Manager, for granting permission to work with the ship remains in the care of his agency.

My deepest appreciation goes to Mr. Stan McClellan, Park Superintendent of Fathom Five Provincial Park, and his staff: Mr. Craig Adams, Mrs. Darla Campbell, and Mr. John Gibson. They, along with the 1978 Project Experience team consisting of Mr. Glenn Durham, Mr. Hugh Lee, and Ms. Connie Maske, carried out the survey and excavation of Griffon Cove. These people produced the information from which I have drawn much of my supporting evidence; without their efforts I could not have written this thesis.

I would like to extend special thanks to Mr. Patrick Folkes for the historical information he provided about the Bruce Peninsula and Tobermory area. His interest and knowledge provided many enjoyable moments.

Many thanks should go to Cypress Lake Provincial Park for providing housing for myself and those who helped me and to the 1978 Park staff for their warm friendship and genuine interest.

To Ms. Sheli Smith and Mr. Richard Swete I need to give special thanks for their assistance in recording the timbers of the Griffon Cove wreck.

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CHAPTER I

INTRODUCTION AND BACKGROUND

Introduction

In 1955 the remains of a ship, heralded as belonging to Rene Robert Chevalier de la Salle,¹ were discovered in a small cove on Russel Island in Lake Huron, Canada. This was not the first time the Griffon² was claimed to have been found; ten previous finds were alleged to be the remains of this famous and mysterious ship (Murphy, 1956a:38). In 1978, the author became involved with the 1955 discovery, intending to prove whether or not it was indeed the Griffon.

The identification of a wreck as that of the Griffon would be an important event in Great Lakes maritime history. It would provide first-hand knowledge of the earliest ship constructed on the upper Great Lakes. The amount of information that this type of discovery could add to the understanding of seventeenth century trade and technology is immense. The Griffon was built by a group of men, who after losing much of their raw materials in a shipwreck, were forced to use limited supplies to construct a vessel which was to sail uncharted waters in search of a sea route to China.

Since the Russel Island wreck has already been labeled as being that of the Griffon, a denial of this identity would be as important as a confirmation. It is, however, imperative that historians and naval architects not be misled by false identities. If this wreck is not what it was claimed to be in 1955, that fact should be made public. An

¹The style and format of this thesis are those followed by the International Journal of Nautical Archaeology and Underwater Exploration (1979), 8.2:121-142.

opportunity to study a shipwreck believed to be the Griffon lead me to further research.

A field investigation was conducted in Canada, during which time the ship's timbers recovered in 1955 were photographed, drawn and catalogued, and a visual search of the original wreck site in Russel Cove yielded additional material. Information gathered while in the field was brought back to Texas A&M University for analysis. This process resulted in the construction of a scale model, built to illustrate the timbers and to aid in understanding the ship's construction. Hull lines^{*3, 4} were developed from the frame shapes of the vessel. By comparing the lines of the Russel Island ship to those of other vessels, parallels were proposed.

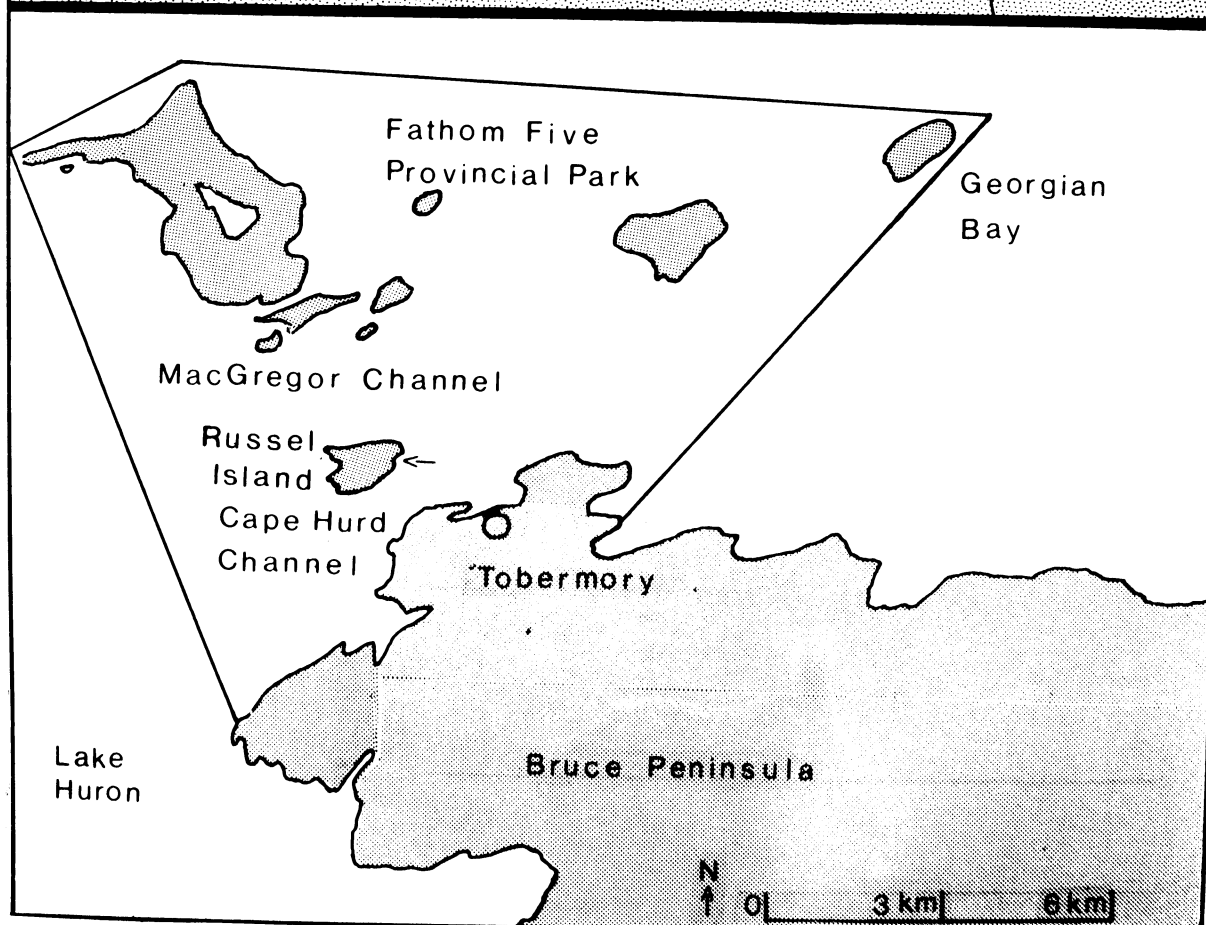
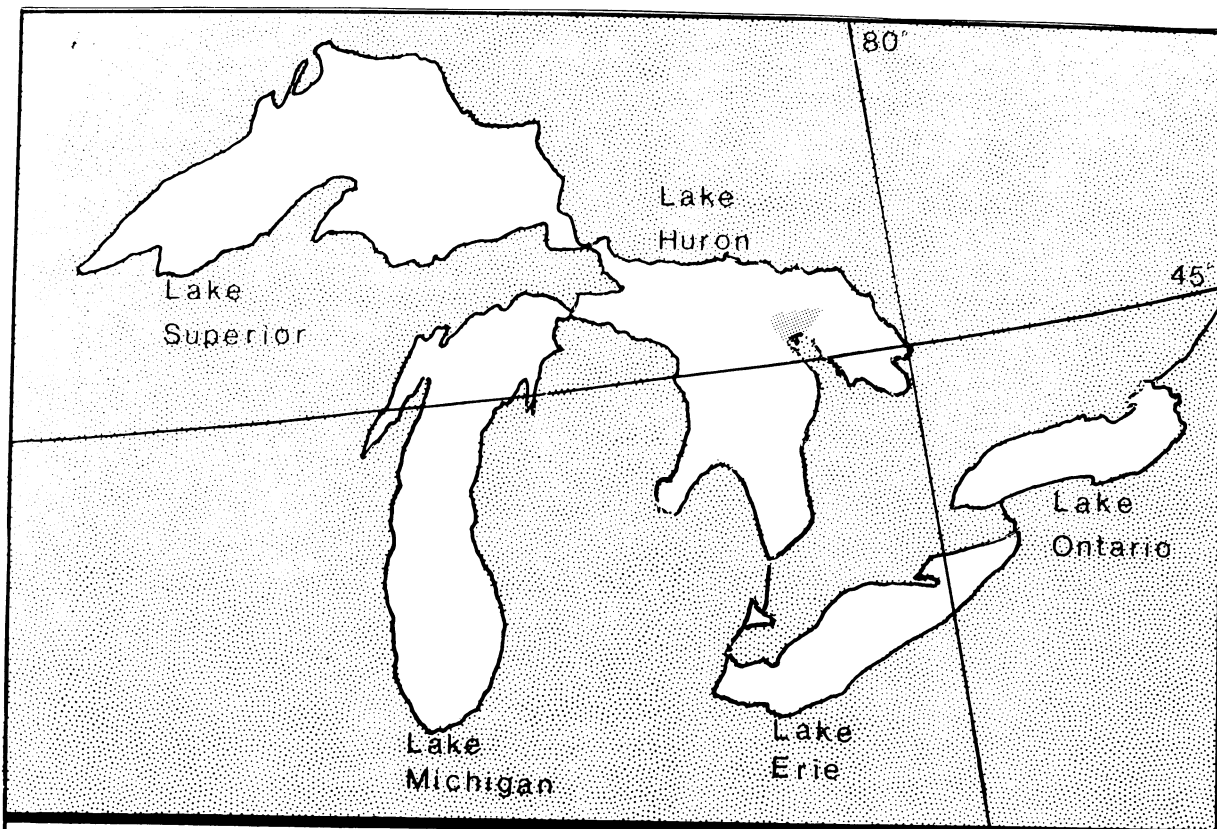
Location

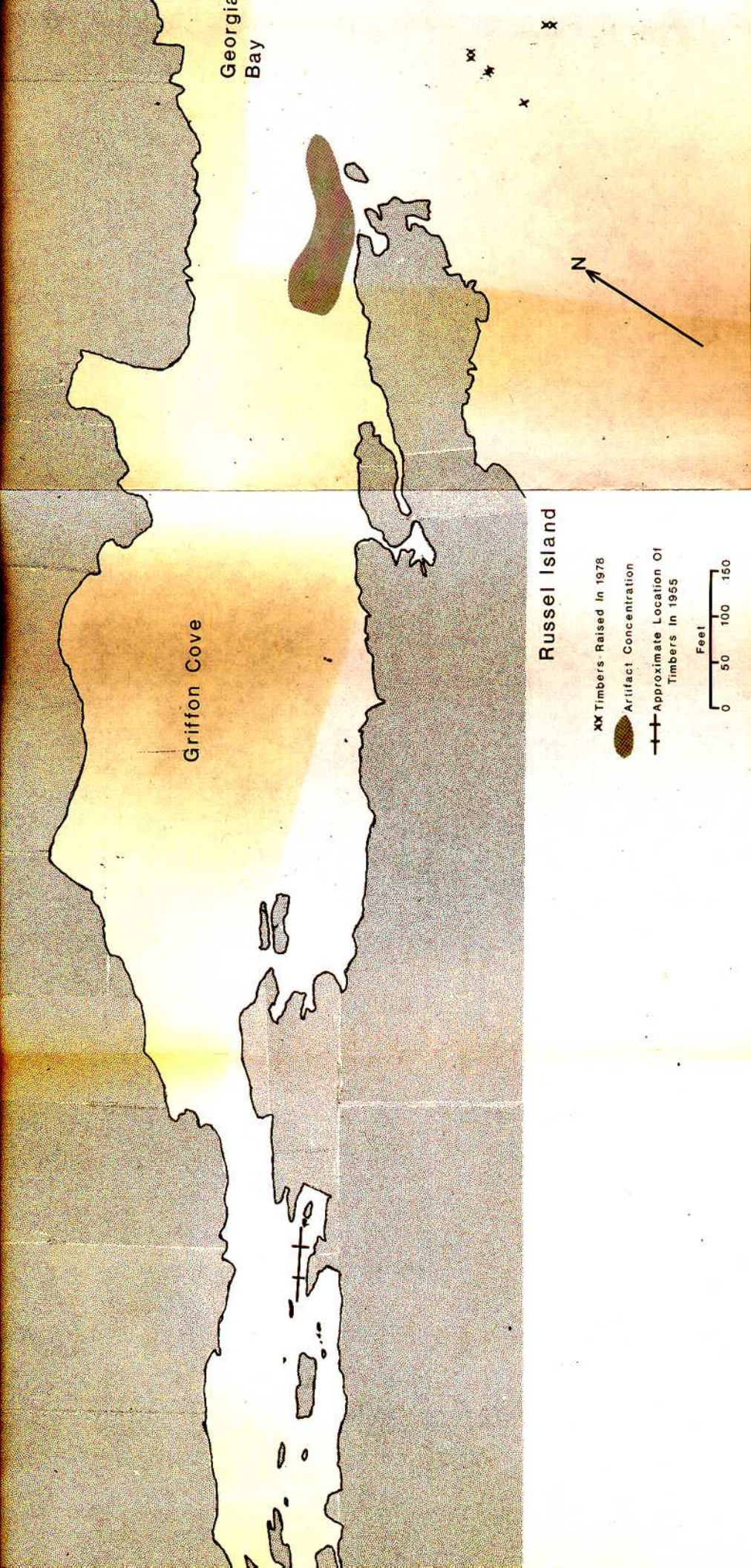
The remains of the Griffon Cove wreck were found in a shallow inlet on Russel Island in Lake Huron (fig. 1). Russel Island is located within the boundaries of Fathom Five Provincial Park (FFPP). Griffon Cove, one mile northwest of Tobermory, Ontario, was locally known as Mac Gregor Cove. The name of this harbor was changed at the suggestion of Murphy in 1956, after his examination of the wreck remains, at which time these timbers were said to be those of La Salle's Griffon (Murphy, 1956b: 237) (fig. 2).

The town of Tobermory is the northernmost town on the Bruce Peninsula, a limestone ridge dividing Lake Huron and Georgian Bay. The Niagara Escarpment, which forms the backbone of the Bruce Peninsula, submerges at Tobermory, resulting in the formation of the many islands and shoals which make this part of Lake Huron dangerous for ships.

1. The first part of the document is a list of the names of the persons who were present at the meeting.

Figure 1. The Great Lakes and Fathom Five Provincial Park





Georgia Bay

Griffon Cove

Russel Island

xx Timbers Raised In 1978

Artifact Concentration

Approximate Location Of Timbers In 1955

Feet
0 50 100 150

Established in 1972, the Park is an underwater site encompassing forty-five square miles of Lake Huron. The lake bed and all of its cultural resources over fifty years old are the property of the Province of Ontario and are administered by the Ministry of Natural Resources (MNR). Russel Island is privately owned, as are all of the islands in the Park. The fact that the Park has jurisdiction over the lake bed and all submerged cultural resources aided in the re-examination of the area where the timbers were found. It was possible to designate the cove a research area, thereby limiting its access to the public while work was underway.

Historical Background

The exploration of Canada took place as the result of European interest in finding a direct route to the Far East for gold, silk, and spices. During an early search for this route, John Cabot reached North America near Newfoundland in 1497. In the 16th century, explorers were thwarted in their search for a way to the Orient via North America but found rich fishing areas instead. Throughout the 16th and 17th centuries, investigators continued to probe the waterways of Canada for a route to Asia, drawing more and more ships to the abundant fishing areas of the New World (Brebner, 1960 : 15-18, 25).

As fishing of North American waters became a competitive industry, small villages were established in order to process the seasonal catch. This reduced the amount of salt needed to get the product back to market, thus increasing the profit of the ventures. Indians were attracted to these new settlements anxious to obtain metal utensils and tools and a trade in furs for these items began to develop. Due to a

greater demand for pelts created by European fashions, a market was established for the skins from the New World. By the end of the 16th century, small fishing and fur trading colonies had been established in Canada (Brebner, 1960: 26-27).

In the first half of the 17th century, the number of colonies in Canada had increased, as had the fur trade and fishing industries (Brebner, 1960: 33). In 1667, La Salle came to Canada from France with the same hope as many of those before him to find a passage to Asia. When he heard from local Indians the Ohio River flowed into the sea, he concluded that the Ohio must flow into the Gulf of California and thereby constitute the Western Passage to China and India. As La Salle explored the area of the Ohio and Illinois Rivers from 1667 to 1671, he became convinced that the Mississippi River flowed into the Gulf of Mexico and not the Gulf of California. La Salle beleived he could guard against Spanish and English intrusion into his monopoly on the fur trade by establishing a fortified post at the mouth of the Mississippi River.⁵

In the fall of 1674, La Salle went to France and obtained a grant for a wooden stronghold on Lake Ontario, Fort Frontenac. Rebuilt with stone, it became a major fur trading post. In the autumn of 1677, La Salle once again sailed for France, where he received permission to explore and lay claim to whatever he should find in the western parts of New France (Canada) within five years (Gaither, 1931: 91). As soon as he had received this grant, La Salle hired ship carpenters and purchased supplies for two vessels, the first to take him to Illinois, and the second down the Mississippi to the Gulf of Mexico, where he would es-

tablish his other fort (Gaither, 1931: 92). On July 14, 1678, La Salle sailed for Canada with his men and supplies.

La Salle arrived at Niagara Falls on January 21, 1679 and construction of his first vessel, which he named Griffon, was begun at the western entrance of Lake Erie. Father Louis Hennipen⁶ witnessed both the construction and last voyage of La Salle's Griffon. Letters and accounts concerning the voyage allow the events of her sinking to be partially reconstructed.

Unfortunately, the supply ship that brought La Salle to Niagara Falls was wrecked in a squall while her pilot and crew were asleep on shore. Accounts vary as to how much of the stores was salvaged (Cox, 1905: 3).

Heedless of the loss, on January 22 La Salle went two leagues beyond the Falls where he chose a site for the building of his ship (Cox, 1905: 72). It was the most convenient place he could find, being on a river, now called Cayuga Creek, which empties into the strait between Lake Erie and Niagara Falls.

La Salle's company of thirty-two men included a pilot named Luc, a master carpenter and a blacksmith (Beckwith, 1903: 44). On January 26, the keel^{*} was ready and La Salle asked Father Hennepin to drive the first bolt into the Griffon. The priest declined, and La Salle himself started the construction of the ship. Having to return to the east, La Salle then entrusted the building of the Griffon to his second in command, Tonty,⁷ and work on the ship continued through the winter of 1668. Father Hennepin relates: "All haste was made to get the ship afloat, though unfinished to prevent the Indians from burning it. She

9
was called the Griffon, about 60 tons* and carried five small guns. She was launched unfinished, the men hung their hammocks below the deck and the carpenters finished their work in some security." (Cox, 1905: 73).

Upon its completion, the vessel sailed toward Lake Erie. Father Hennepin left to bring La Salle from the east, writing that, "I left the ship riding at two anchors within a league and a half of the Lake." (Beckwith, 1903: 101). Tonty had stopped at that point due to the current and shallow water. When La Salle came to oversee the clearing of these rapids in August of 1679, he found the Griffon ready for sailing. The crew waited for a favorable wind and finally, with sails set and twelve men along the shore pulling, the ship cleared the rapids and sailed into Lake Erie (Beckwith, 1903: 105).

La Salle had planned originally to sail to the end of Lake Michigan, build a sister-ship to the Griffon, and continue down the Mississippi River, but creditors were pressing him for reimbursement of their investment. La Salle ordered Luc and five crewmen to sail the Griffon back to Niagara Falls with a load of furs to pay off his debts. The Griffon, carrying in its hold the tackle, rigging and anchors of the unbuilt sister-ship, set sail on September 18, 1679 and was never heard from again.

In 1722, author Charles LeRoy wrote that the Griffon had been driven into a small bay five or six leagues from its anchorage and then boarded by Indians, who killed the crew and burned the ship (Murphy, 1956b: 282). A letter from La Salle to a Canadian official in 1683 said an Indian had related to him that three years before a white man of a description similar to Luc was captured with four others on

the Mississippi with canoes laden with goods (Murphy, 1955: 50). This information caused La Salle to believe that the crew had planned to betray him, and to sail the Griffon to the west trading the goods with the Indians for their own gain, rather than to take the cargo to repay his debts (Quimby, 1966: 58).

The only available representation of the Griffon (fig. 3) was sketched by Hennepin during the construction of the vessel at Cayuga Creek and published as a woodcut in his 1697 edition of Nouvelle Decouverte d'un tres grand Pays situe' dans l'Amerique. It is not known who produced the woodcut for this publication or how accurate it is. However, it shows the building of the Griffon, identified by a stern quarter view showing a carving of the mythical bird on the transom.* Ten men are depicted working on the hull, which is lying on its port* side braced by numerous supports. They are in the process of adzing timbers, caulking planks,* sawing frames* and trimming the hull.

Development of the Great Lakes Maritime Trade

If the timbers found on Russel Island are not from the Griffon, one must look at the more recent history of the Great Lakes to find the type of vessel from which the timbers could have come.

The use of the lower Great Lakes as an alternate trading route increased after the ventures of La Salle. In 1749, the French built a small fort on Lake Ontario to control the passage between Georgian Bay and Lake Ontario (Barry, 1978: 22). In the late 18th century, canoes and bateaux* were the primary vessels used to transport cargo in Canadian waters; all of these were government vessels of the Provincial Marine until 1785, when a ban on private commercial ships was lifted

Figure 3. Woodcut of the Griffon under Construction



(Barry, 1978: 27).

The War of 1812 greatly increased the number of all types of vessels on the Great Lakes. The Naval Establishment at Penetanguishene was the center of the English effort in Georgian Bay, and for many years it was the only settlement in the Bay (Barry, 1978: 40). Eventually a village grew up near the inner end of Penetanguishene Bay. Until 1832, only a crude two mile trail connected the military establishment to the village inhabited by French Canadians and retired pensioners from the fort.

Other settlers had pushed westward around the southwestern shore of Georgian Bay. In about 1825, one settler, John A. Vail (great grandfather of Orrie Vail, who raised the timbers from Russel Island), had homesteaded at what is still called Vail's Point, at the outer end of Owen's Sound (Barry, 1978: 57). The Bruce Peninsula was opened for settlement in 1856 (Barry, 1978: 69).

There were many small schooners on the Bay by the mid-1800's. At a time when railroad lines were incomplete and eccentric, roads poor, and motor trucks unknown, schooners went anywhere and carried anything. They took Georgian Bay grain from small ports near where it grew and added it to the grain passing through Collingwood. They also carried other farm produce, supplies for isolated communities, fish and cedar posts (Barry, 1978: 100).

Strandings, wrecks and foundering were frequent and Georgian Bay earned the reputation of being the most dangerous port of the Lakes. Aids to navigation were few, unmarked rocks and shoals frequent, and searoom limited. Loss of vessels was so common that if a loss was

recorded at all, it might only be as a name on a chart (Barry, 1978: 102).

In 1858, a boatbuilder started building fishing vessels in Collingwood. They were about 20 feet long, sharp-sterned,^{*} and carried one or two sprit-sails^{*} (Barry, 1978: 105). As competition grew, fishermen needed larger boats to go out in the Bay. The largest Collingwood boat built was 35 feet long. The foremost ten feet were decked with a couple of bunks and a stove below. Rigged as a gaff ketch^{*} with a long bowsprit^{*} and unstayed masts, it had a deck along each side and a heavy centerboard^{*} (Barry, 1978: 106). When Collingwood boats went into the upper Lakes, only canoes and a few Huron boats - square-sterned^{*} vessels - were being used for fishing. By the 1870's, sharp-sterned vessels were being built on the shores of Lakes Michigan and Superior for the American fishermen who had moved into these areas. They were less standardized than were the boats of Georgian Bay, yet there were more similarities than were differences between the two types. The American boats were evidently a development of the Collingwood type, modified by the experience and ideas of the men who built and used them. All double-ended^{*} fishing boats soon came to be called Mackinaw boats (Barry, 1978: 108).

By 1890, the number of sailing vessels on the lakes had decreased and at the beginning of the 20th century only a few hundred schooners were left. They rapidly disappeared; by 1920 photographs taken of the Collingwood, Midland, and Owen Sound harbors show no sailing vessels (Barry, 1978: 103).

Literature Review

The events which took place in the 1950's have been recorded by three different authors, none of whom were alive at the time I undertook my research. The fact that they could not be consulted during the re-evaluation of the material with which they first worked is unfortunate. It is appropriate here to summarize the history of the Griffon Cove wreck.

In 1952, when H. John MacLean, a Toronto Telegram reporter, was in Tobermory working on an article, he met Orrie Vail, a local fisherman, who had already recovered some of the timbers. MacLean returned to Tobermory in 1954 and 1955, learning more about the wreckage on Russel Island during these visits (MacLean, 1974: 7). Vail recalled having first seen the wreck in 1900, when he was about ten years old (MacLean, 1974: 9). From his family's records, Vail deduced that they had known about the wreck since about 1835. Both Vail's father and grandfather had known of the remains (MacLean, 1974: 9).

In July 1955, MacLean began research into the history of the Griffon. Vail continued to recover timbers of the wreck, bringing them by boat to the mainland from Russel Island and storing them in his boatshed. Vail and MacLean went to the site to map the area and to photograph both the general area and the keel in situ under water. Tagging each piece, they raised the remaining wood. The keel broke in half during its recovery. Three trips were made to bring all of the wood to Vail's boatshed (MacLean, 1974: 50).

On August 16, 1955, MacLean published an article on the alleged "Griffon", which drew the attention of Rowley Murphy, a Toronto mari-

time historian, and C.H.J. Snider, a maritime artist. They, along with MacLean, drove to Tobermory to examine the remains of the "Griffon". Their analysis of the remains led them to conclude that the wreck was indeed the Griffon, and several articles were published to that effect.

In a two-part article, Murphy set forth in some detail the opinion that the remains from Russel Island were those of the Griffon. The same article, however, also suggested that those who had worked on the wreck had not positively stated that the timbers were from that ship (Murphy, 1955: 232). It continued:

While it seems unlikely that the builder's brass name plate from the engine room bulkhead will ever be found - for more than one reason - this evidence will perhaps be necessary to help convince some interested persons who may be in ignorance of ship building practice of the 17th century. So I hope that you will take my opinions on trust. (Murphy, 1955: 232).

Murphy argued that the way to identify this ship as the Griffon lay in a comparison of its construction features, stating that:

...every piece was marked and then taken in or under Mr. Vail's motor boat to his big boathouse on Vail's point. In this secure spot, everything recovered may be put together, where the wreckage is in shelter especially from the sun and where the timbers will not dry out too much. (Murphy, 1955: 237).

His description listed the material in the boathouse:

Here was the keel, part of the stem^{*} including the scarp;^{*} part of the stern-post;^{*} and about 2/3 of the apron^{*} tying it to the keel. There were parts of at least 13 frames, several planks, including about eight feet of the garboard^{*} strake^{*} right aft at the stern-post on the port side... There was also a knee^{*} which could possibly have tied together a side and lower timber of the transom; also a piece about 16 feet in length and about six inches wide which certainly appeared to be part of a bilge^{*} stringer^{*}. (Murphy, 1955: 237).

Murphy compared the "Griffon" to the Nonsuch, a Royal Navy ketch built in 1650 and used by the Hudson's Bay Company in 1688; Nonsuch had

a 36 ft. length on keel, 68 ft. length overall, 15 ft. beam*, 7 ft. depth of hold*, and a tonnage* of 43 tons*; the "Griffon", a 65 ft. length on deck, 15 ft. beam, 7 ft. draught*, a tonnage of 44.86 tons, and a deadweight capacity* of 60 tons (Murphy, 1955: 239). Additional evidence for a ketch rig is drawn by Murphy from Father Hennepin's woodcut (fig. 3, p. 12). The timbers lying on the ground are said to be masts and yards (including the flagstaff) which correspond to those of a ketch (Murphy, 1956a: 44).

In the second part of his article, Murphy wrote in greater detail about the timbers recovered from Griffon Cove.

The keel measures 40 ft in length, but was possibly a little longer, as it has been badly chafed on the rocks at each end, and may have been inches longer at the stern. The dimensions are 6-1/2 in. wide above the rabbet* and 7-1/2 at the lower edge of the rabbet, and is 10-1/4 to 10-1/2 in. deep. There are 32 mortices 2 in. deep and 6-1/2 to 8-1/2 in. fore and aft. The rabbet of the keel fits into the stem and sternpost.

Murphy stated that

...the chafing on the rocks has reduced the dimensions of the timbers by 1/2 to 1-1/2 in. and some pieces even more. Spikes left in the frames show the planking to have been 2 in. thick. The frames of the "Griffon", all white oak natural crooks, were 4 in x 4 in originally. All frames appear to have crossed the keel, fitting tightly into the mortices cut for them (Murphy, 1956: 43).

Murphy continued:

It is clearly obvious from the form of the frames which have been recovered that the "Griffon" had a perfectly normal bottom with stability given from firm bilges and inside ballast of rock and/or cargo. There have been no frames or parts of them found that would indicate she had a flat bottom, and even the parts of frames crossing the keel show that there was a slight hollow in her garboards amidships.* She was the work of a designer who knew his business and several features of her design and construction are in use today. The several pieces of the frames of the Griffon indicate that they were generally placed

on 12 in. centers with the exception of the cant frames* fore and aft which extended to the keel or lower part of the stem and which were not at right angles to the keel. (Murphy, 1956a: 44).

Murphy felt the construction of the remains indicated its identity. In his words,

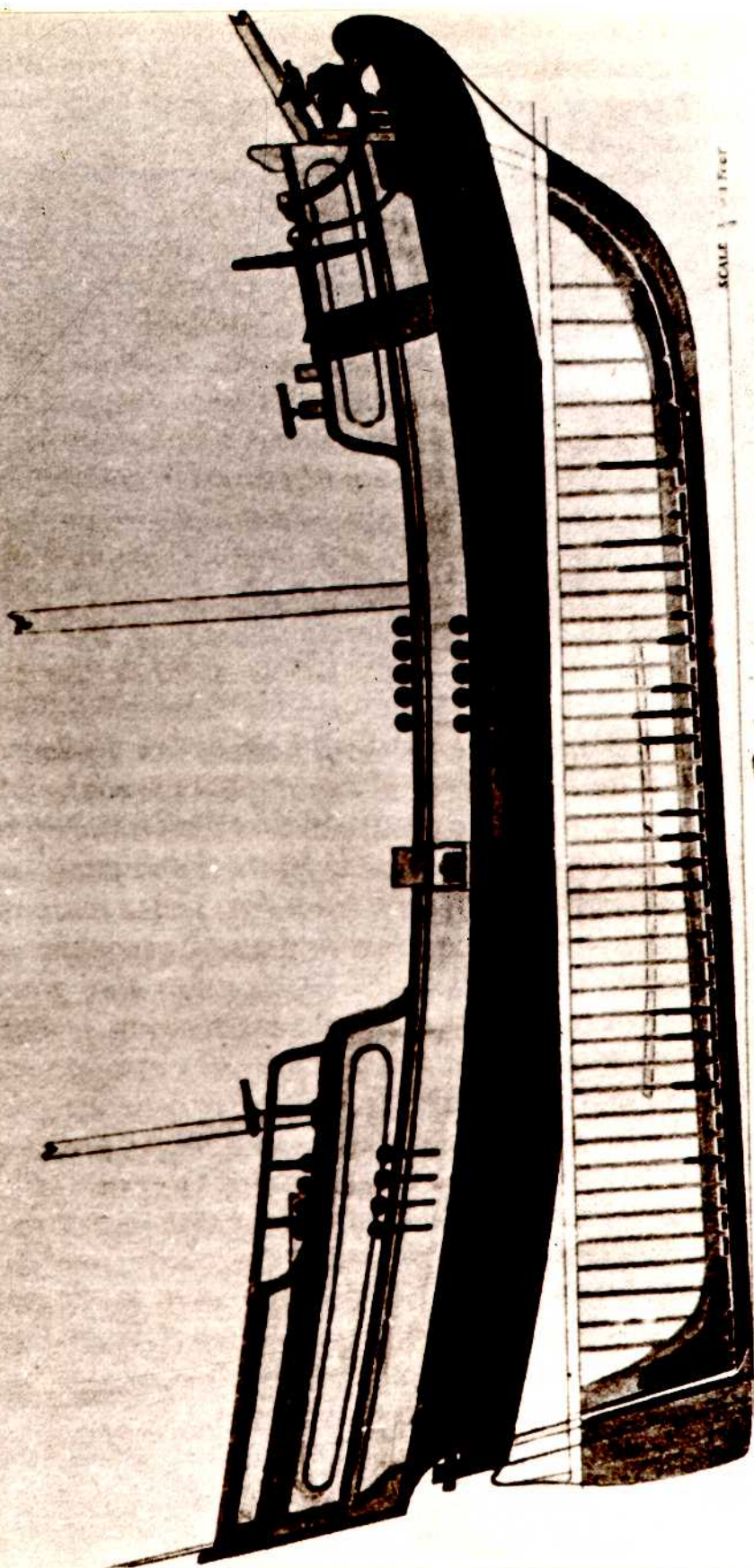
...and now for the feature which only one person of my acquaintance has noticed; and which I consider quite sufficient to establish her identity. This is the piece of the stem which is scarfed into the fore end of the keel ... the stem of the "Griffon" as shown on the plan, (fig. 4) scarfed into the keel, extended parallel to the keel and then swung up to the stemhead in the form of a quarter of a circle struck out with a compass. This form of stem was in use in the 17th century and earlier, but I think it likely that the Griffon was the last Lake vessel so designed. (Murphy, 1956a: 44).

The fastenings were of more than usual interest to Murphy. He noted that the diameters of 5/8 in. and 1 in., and lengths of 11.5 in. and 10 in. give a "queer flavor" to a French vessel. He suggested that they were dimensions of his time, not those of 276 years ago, inferring that it is only coincidence that these dimensions fitted into a modern English system of measurement.

He also stated that one of the bolts had been tested and proved to be of iron at least two hundred years old, and that no plank had more than two spikes per frame (Murphy, 1956a: 45).

Among the structural details noted by Murphy were the existence of a well-made rabbet in the keel (as well as in the stem and sternpost) and evidence of trunnelling* (Murphy, 1956a: 46). My own inspection of the remains revealed no evidence of a keel rabbet or trunnelling and there were more than two planking nails per frame.

Murphy also noted two holes in the forward end of the keel, one for the stem bolt key and the other to slip an iron bar in for



SCALE 1/2" = 1 FOOT

Rowley W. Murphy
1928

launching. This feature is still in use on Georgian Bay for hauling ships out of the water for the winter (Murphy, 1956a: 47). However, Murphy did not mention a similar hole amidships found by this author.

Murphy concluded by saying that he felt that the "Griffon" was sailed or towed into the cove where it was found in 1955. He then summarized the important evidence which he thought proved the Tobermory wreckage to be the Griffon (Murphy, 1956a: 52).

An article published in 1956 by C.H.J. Snider provided additional and sometimes conflicting information on the original analysis. The wreckage recovered was a bleached and weathered keel, sternpost, sternson*, and stemson* knee. The keel had 32 notches (mortices), 2 in. deep and 5 to 6 in. wide. The 3 notches in the middle were filled with the remaining floors*. The floortimbers extended into deeper water on the port side and were almost straight for several feet before curving upward (Snider, 1956: 3).

The wreck had fallen on its port side, raising the starboard* side high. That starboard side had been removed, either by saws, axes or the winter ice. Forward and aft of the remaining floors some of the notches were empty, some retained fragments of lost timbers. Toes of all protruded just beyond the starboard edge of the keel in a line straight as the keel itself, except where the starboard halves of 3 floors had splintered in being broken. There was no centerboard, and although generally round-built*, the hull lacked deadrise over the middle 1/3 of its length. Iron drift bolts* showed how the floors were held in place and clamped by a missing keelson* (Snider, 1956: 3).

Six planks, each about 10 in. wide and 16 ft. long or less,

were attached to the frames. All were worn thin, but spikes showed the original thicknesses to have been 1-1/2 and 2 inches. There were many loose planks and timbers, curved frames for the bilges, and hanging and dagger knees. There was nothing beyond a supposed piece of detached garboard belonging to the starboard side. A footnote to this states that William Vail, Orrie's grandfather born in 1838, told Orrie that he had cut up part of this wreck in his boyhood for firewood (Snider, 1956: 4).

The author stated that the quality of the iron work remains was very good. The frugality with which it had been used was seen to be consistent with the difficulty La Salle had in obtaining iron. Snider described the size of the iron fastenings in correct detail. He stated that analysis and examination showed all were "blacksmith's iron", such as had been used in Great Lakes shipbuilding from the earliest times.

The wood of the frames and planking remaining could be identified as white oak similar to that grown on the south shore of Lake Ontario and on the Niagara River, by comparison with the oak used in Lake schooners of the 18th and 19th centuries. So little data exists regarding Niagara oak that neither carbon tests or tree ring counting could fix the century in which the oak of the wreck was a growing tree. The number of wooden pins used as stopwaters* and treenails* in the timbers emphasized the economy in the expenditure of iron (Snider, 1956: 5).

Snider compared the remains of the Griffon Cove wreck to Hennepin's woodcut of the Griffon published in 1704. Using the figures as a scale, he estimated the vessel to be 40 ft on the keel, 15 to 16 ft

abeam, and 6 to 7 ft. deep. In addition he noted that the ship being built on the Illinois River was 42 ft. on the keel according to Hennepin (Snider, 1956: 5).

By using the approximate dimension for the Griffon and the Griffon Cove wreck, Snider arrived at a figure of 44 to 45 tons for either vessel. He then pointed out the difference between tun and ton and that 45 tuns is 60 tons dead weight carrying capacity (Snider, 1956: 6).

Snider believed that the keel was reduced in size due to abrasion and shrinkage from 12 x 8 to 10 x 6-1/2 in. He gave the dimensions of 5 to 6 in. for the floors and 3 to 4 in. for the frames and said there was no evidence of a shoe* or false keel*. In closing, Snider stated "until something uncontestably belonging to the Griffon is found elsewhere it will be very difficult to prove that the Tobermory remains are not her." (Snider, 1956: 6).

In 1956, after Murphy and Snider published their articles on the Griffon Cove Wreck, Mr. Frank A. Myers published an article incorporating opinions of a French historian and an archaeologist from the Musée de la Marine in Paris. Myers had sent photographs and all articles which had been published on the Tobermory wreck and a wreck on Manitoulin Island, so that the Museum could examine the material and submit an opinion on which ship was the Griffon.

The reply which Myers received was used to illustrate the arguments put forth in his article. Myers' finding was that there was no conclusive evidence to identify either wreck as the Griffon (Myers, 1956: 148).

The opinion of Mr. Vichot, Director of the Musée de la Marine, and

Mr. Denoix, an archaeologist specializing in French naval construction after the 16th century were:

1. "You cannot place any confidence in a drawing made to illustrate a book which was written a number of years after the event, by an artist who never had seen the ship in question." (Myers, 1956: 143).
2. "The ribs* are separated by spaces larger than the dimensions of the ribs which was not the custom in the 17th century. The floor timbers are notched into the keel. That is a technique that does not seem to have been employed before the second half of the 18th century." (Myers, 1956: 144).
3. "The bolts show that there was no keelson. It would be difficult to believe that the shipwright of an ocean-going vessel would have left out such an essential piece." (Myers, 1956: 144).
4. "The keel is weak for a ship constructed by marine shipwrights," (Myers, 1956: 144).
5. "The Tobermory wreck does not appear to be of French construction, and construction technique seems to correspond to the 18th century or later." (Myers, 1956: 148).

After the recovery and announcement of the "Griffon", very little was done with the material. Orrie Vail kept the wood in his shed and put it on display for the tourists who visited the area. Local residents say that Mr. Vail made lamps and other such objects from some of

the timbers (Mc Clellan: personal communication). In 1977, after Orrie Vail died, the material passed into the hands of the Ministry of Natural Resources and was placed in the care of Fathom Five Provincial Park. The ship remains (along with a collection of unrelated tools and artifacts) were placed in storage.

The author became involved in researching the "Griffon" in March 1978 during the preparation of a term paper at Texas A&M University, submitted to Mr. J. Richard Steffy. The paper dealt with the construction of the "Griffon" as determined from the writings of MacLean, Murphy and Snider. From this initial research, it was determined that a more in-depth analysis was warranted. In April 1978, the author contacted the Ministry of Natural Resources (MNR) asking permission to conduct a re-examination of the hull remains and a survey of the cove in which they were found. This research, the MNR was informed, would constitute the basis for a master's thesis; all new information would be turned over to them at the completion of the study.

In May 1978, permission was obtained from the MNR to conduct the first portion of the research, the examination of the hull remains. The author was informed that the MNR was planning a survey of the cove that would begin in June. The author was kindly invited to participate in that survey.

CHAPTER II

INVESTIGATIVE TECHNIQUES

Research Methodology

Since I was unable to confer with those who originally examined the wreck, there was no recourse but to compare what had previously been written with what was observed in the re-examination. Prior to arriving in Canada, I had decided to draw all timbers full-size on butcher paper, using colored sharp-tipped felt pens. Measurements would be taken from the timbers and noted on the drawings along with other important details, such as tool marks, fastenings, or fastening holes. In this way the measurements would override any errors in the drawings. In addition, a notebook was kept with the same information duplicated in a table of offsets as insurance against loss of data.

In June 1978, aided by Texas A&M University graduate student Richard Swete, I examined and photographed the keel, stem, stern knee, and floor timbers. The Park had already begun a catalog of the Vail collection; for the sake of consistency, their numbering system was adopted for this study and continued in the sequence they had established.⁸ They had also begun to record major dimensions in feet and decimals as a means of distinguishing the various pieces for their catalog, a system which I also continued.

Upon noting the conditions and number of timbers, I made slight modifications in recording strategies. Those major timbers that were easily identifiable were not numbered, but were measured, photographed and drawn. Once the major timbers were recorded, the smaller pieces were brought out. Initial work consisted of numbering each piece as it

was presented, without regard to size, condition, or structural importance. Each fragment was photographed, visually inspected, and evaluated. A decision was made, based on this evaluation, to draw only those timbers which I regarded as important because of the existence of fastenings, great size, or important curvature. For the lesser fragments, it was decided that a photographic record would suffice, thus allowing me to gather as much data in a four day time period as possible.

In August 1978, documentation of the remains was completed in seven days with the assistance of another graduate student, Sheli Smith. An additional week was spent by the author working with the MNR staff on the excavation of the original site. During this time more timbers were located and raised from the mouth of the cove.

Except for the initial recording done in 1978, all other reconstruction work was carried out at the Nautical Archaeology facilities at Texas A&M University. Full size tracings were reduced to 1:10 scale drawings by the use of a grid overlay. A preliminary set of hull lines were drawn, beginning with the body plan. The floor timber shapes were used to determine the hull shapes in this view. An attempt was then made to project the sheer and half breadth plans from this simple body plan. Difficulties arose at this point concerning the positions of some of the frames. I decided to proceed directly to a 1:10 scale model of the ship, built from the remains which had been examined and recorded. In this way the pieces could more easily be rearranged until a probable hull shape was achieved. Then a set of lines could be taken from the model itself and faired on the drafting table to the

approximate lines of the ship as it was built.

The model was built of inexpensive white pine because of the low cost and the good working characteristics of the wood. Patterns were cut from the reductions of the full-size tracings, glued to the wood, and the wooden pieces shaped with a bandsaw to their proper dimensions. The model's frames were assembled and set up on the keel.

By working back and forth between the model and the drawing table, a set of hull lines was developed which fit the evidence that had been collected and which would produce a seaworthy vessel.

The Ministry of Natural Resources Survey and Excavation

The excavation conducted by the Fathom Five Provincial Park staff took place from June 19 until September 1, 1978. The Griffon Cove site was designated BIHK-4 under the Borden system, Archaeological Survey of Canada.

The first phase of the project was a comprehensive site survey which included the inner and outer coves, plus the adjacent shoreline and deeper water at the entrance to the cove. Base elevations were established and tied to International Great Lakes datum. The survey, recorded in feet and decimals, was completed in two and one half weeks. Its results are illustrated in figure 2 (p. 5). Several scuba dives were made outside the cove into deeper water, where pieces of timbers were located, plotted and raised. The author participated in two of these dives during which a complete plank and gripe* were found.

The excavation phase of the site investigation occupied approximately seven weeks. During this time 244 artifacts were uncovered, plotted and raised. These were recovered from three separate locations:

an area in the inner cove, which was excavated by means of a water dredge, the mouth of the cove and the deeper water outside the cove entrance. There is valuable comparative material among the artifacts recovered or reportedly recovered from these areas by previous searchers, which include the timbers of the Vail collection, an iron padlock, and a small wooden keg.

At the cove entrance 131 artifacts were recorded and raised, including a piece of chain, thimbles, and a total of 93 European ceramic sherds. The sherds are consistent in their dating, ca. 1840-1860. Included in the sample are pieces of blue transferware, green transferware, blue edgware, and banded ware in a variety of patterns. A number of plain white pieces were also recovered (Mc Clellan, 1978: 12) (fig. 5a).

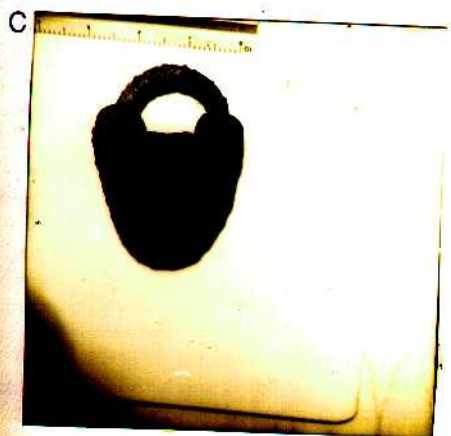
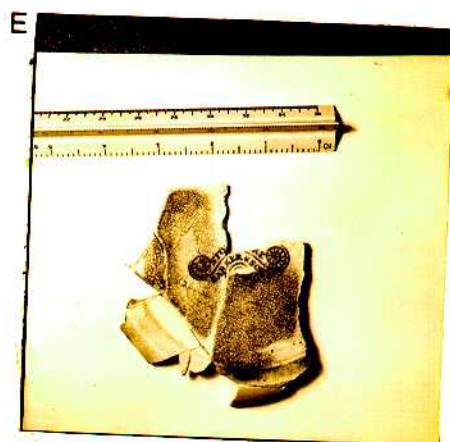
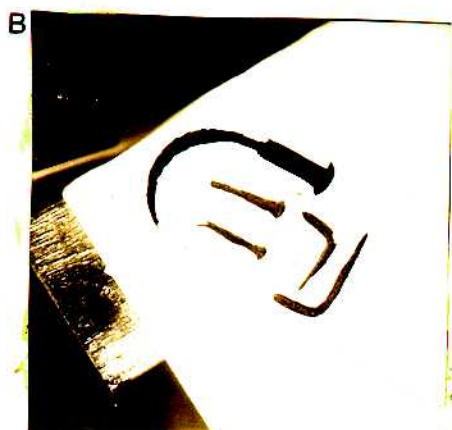
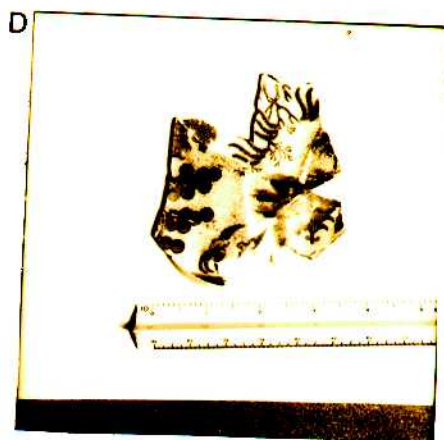
The deeper water area outside of the entrance yielded eight pieces of timber; only larger, more visible pieces were recovered. These included five frame timbers, two pieces of planking (one full plank, one short planking fragment), and the gripe. It should be noted that only a small area of the bottom was searched. It is likely that considerably more material may be found in future efforts.

The dredged area yielded 244 artifacts, 234 of which were iron nails and nail fragments (fig. 5b). Other artifacts included an iron bolt, two pieces of iron washers, part of a utensil handle, two European ceramic sherds (white earthenware and blue transferware in the Willow pattern), and four intrusive objects (Mc Clellan, 1978: 10).

In 1979 a short follow-up investigation was undertaken in Griffon Cove. A number of artifacts were recovered from the outer portion of

Figure 5. Artifacts from the Griffon Cove Excavation

- | | |
|------------------|------------------------------|
| A. Blue Transfer | D. Ceramic Sherd |
| B. Iron Nails | E. Maker's Mark |
| C. Iron Padlock | F. Surface Checking on Gripe |



the cove. These included a padlock similar to the one in the Vail collection (fig. 5c), more ceramic sherds, one with a maker's mark "Barker and Son" (figs. 5d, e) and a number of clay pipe stems.

The author spent three days in Tobermory in September 1979, taking additional photographs and measurements of the hull remains. A major concern was the effects of drying on the wood which had been raised in 1978. While completing the research in Canada, a brief study of other historic ship hulls on display in the area was undertaken. These vessels provided helpful information and parallels which aided in clarifying some of the enigmatic features of the Griffon Cove wreck seen the previous year.

Storage and Conservation

When the wood was removed from the water in 1955, no conservation measures had been taken. The importance of treatment and the techniques available were not commonly known. From the time the timbers were recovered from Russel Island until they were turned over to the MNR, they were kept in Vail's boatshed. After the change of ownership the timbers were moved to a more modern building. In both cases, the wood was protected from the elements, which could have caused severe deterioration. In neither case was there any attempt to provide humidity or temperature control, but it does not seem to have been necessary, since the wood has not suffered from this lack of regulation.

The wood was allowed to dry out naturally. In this process, the excess water is drawn off by evaporation to a point where the effects of surface tension must be overcome and the moisture pulled out of

the wood cells. It is at this point that the detrimental effects start to be seen. The extraction of the water causes the weakened wood cells to collapse due to the removal of what has become the supporting force within the cell. Shrinkage and warpage occur, as well as surface checking and cracking.

Measurements were taken of the timbers raised in 1978 as soon as they had been raised, with the express purpose of determining what the effects of the natural drying process would be. The results of this test could be directly applied to the timbers raised in 1955.

A representative sample of iron fastenings was brought back to Texas A&M University for conservation and photography (fig. 12). These artifacts were treated by electrolytic reduction. A polyethylene vat was set up using a mild steel mesh as an anode and a brass rod as a cathode, to which the artifacts were attached. A 2% solution of sodium hydroxide (NaOH) was mixed, using tap water as the solvent for the first bath of electrolyte. The electrolysis was run for one week at a low current density, approximately 3 amps/dc^2 , resulting in a slow evolution of hydrogen bubbles from the artifacts.

After one week the electrolyte was changed, and a new bath was made using deionized water. This process was continued for another week, and the electrolyte was changed again. All remaining corrosion was removed with a dental pick and stiff brush. The artifacts were rinsed in deionized water for one week to remove all electrolyte, dried in an acetone bath, and finally put into microcrystalline wax to seal them. The iron was left in the wax for five hours as the temperature lowered, and removed just as the wax began to solidify. The fastenings

were then wiped of all excess wax and allowed to cool completely.

Catalogue of Hull Remains

Keel

During the recovery of the remains in 1955, the keel separated into two pieces 18 ft. (5.40 m.) and 24 ft. 8 in. (8.27 m.) in length. The size of the building in which the hull remains were stored prohibited the joining of these pieces. The keel's maximum moulded* dimension (height) is 10.25 in. (0.2593 m.) and its maximum sided* dimension (width) is 6.25 in. (0.1581 m.).

The top of the keel is notched to receive 30 floor timbers. The notches vary from 1.3 to 2.5 in. (0.0328 - 0.0373 m.) in depth and 5.2 to 5.5 in (0.1315 - 0.1375 m.) in length. An iron bolt or a hole for a bolt no longer extant are still in place and occur in the center of each of these notches. There is also a bolt or a bolt hole on the top of the keel surface between each consecutive pair of notches (figs. 6 and 7e).

There does not appear to be a rabbet in the keel. However, there is a slight indentation at various points along the side of the keel where one would expect to find a rabbet.

There are three holes, approximately 2.5 in (0.0632 m.) in diameter, in the starboard side of the keel. Two are located under the stem scarf (fig. 7a), and the other is amidships (fig. 7d). The after hole under the stem scarf is cut only half way through the keel and intersects a vertical hole in the scarf (fig. 7b). The other two holes are cut completely through the keel.

The same type of scarf joint was used in the stem and stern of this

Figure 6. Bolting Pattern of the Griffon Cove Wreck

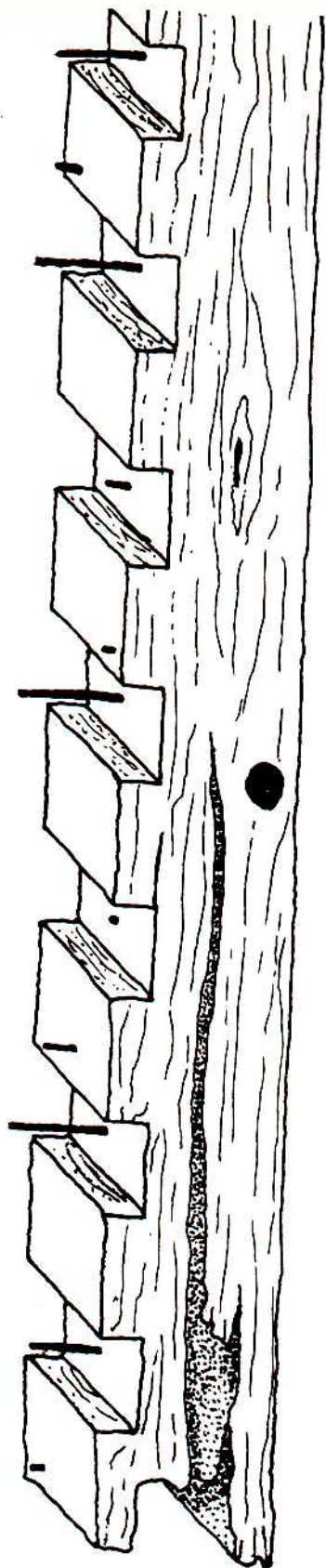
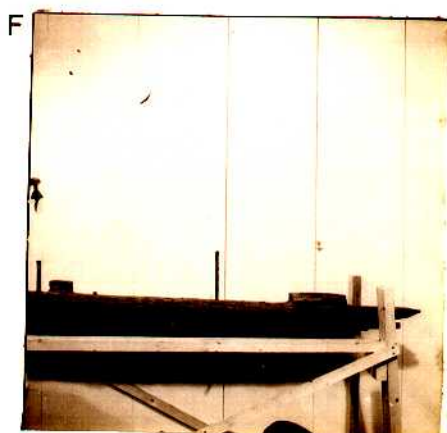
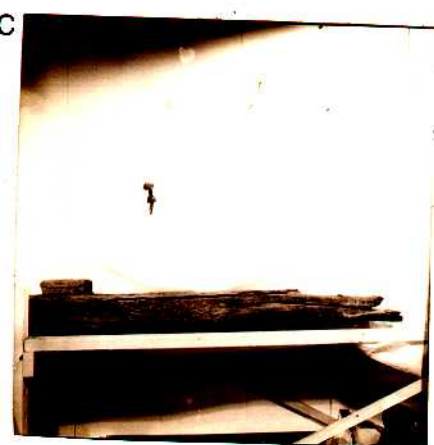
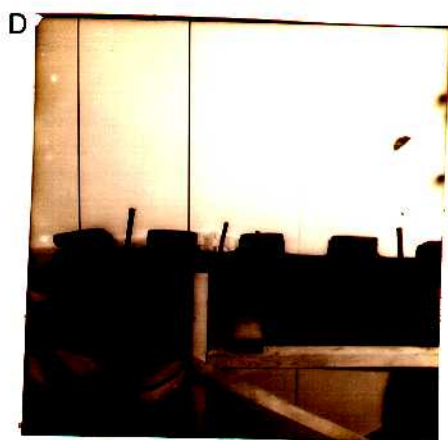
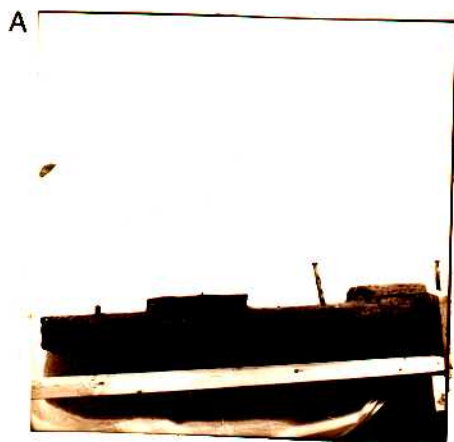


Figure 7. Construction Features of the Griffon Cove Keel

- | | |
|---|--|
| A. Stem Scarf, portside | D. Hole Admiships, Forward
End of After Keel Sec-
tion |
| B. Stem Scarf, starboard side | E. Notches in Keel |
| C. After End of Forward Keel
Section | |
| F. Stern Knee Scarf | |



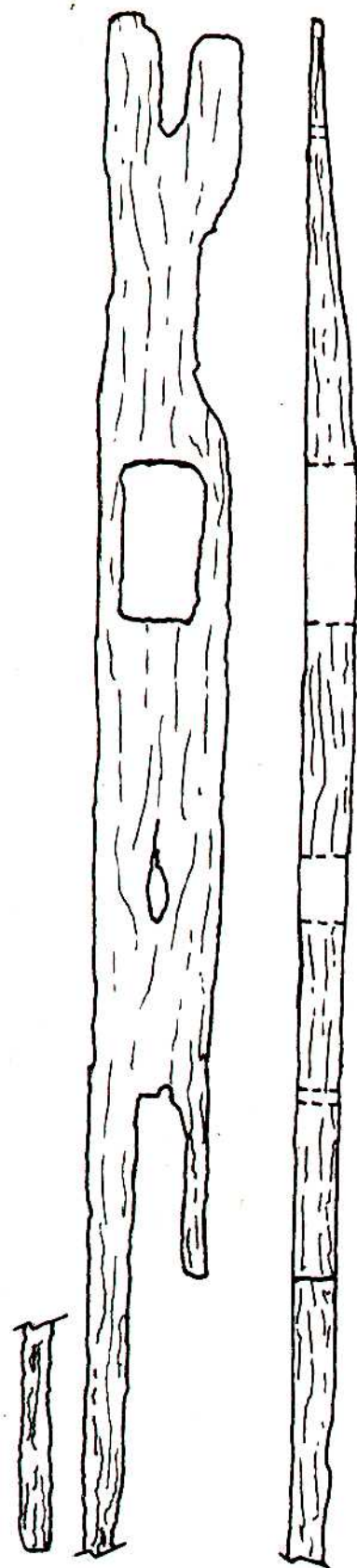
vessel (figs. 7a and f).

There are rectangular indentations at various points along the side of the keel (figs. 7a and f). Two occur on either side of the forward keel section. Both are 2.5 in. (0.0632 m.) wide and 0.5 in. (0.0126 m.) deep. The fastening holes within them are approximately 0.5 in. (0.0126 m.) and 0.25 in. (0.0063 m.) square. On the after keel section three depressions are visible on the port side and five on the starboard side. All except the aftermost depression on either side are approximately the same size as those on the forward keel section. The two aftermost depressions, one occurring aft of the stern knee scarf, on either side of the keel are the largest and have been partially lost due to abrasion (fig. 7f). Both of these depressions are 10.5 in (0.2655 m.) long, 4.0 in. (0.1012 m.) high, and 0.5 in. (0.0126 m.) deep. Three nail holes are visible in the starboard depression, while five nail holes can be seen in the port side depression.

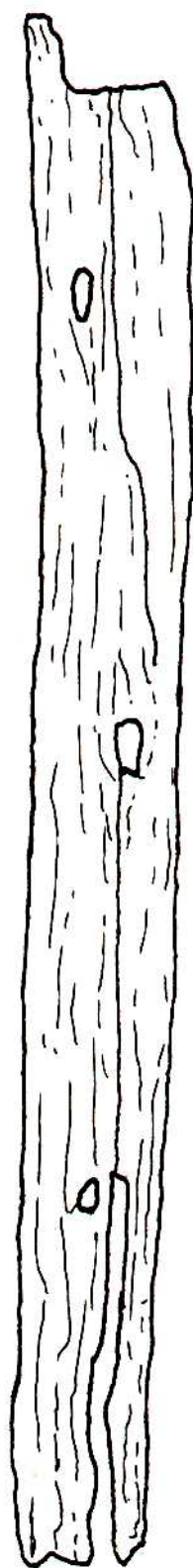
Only the aftermost depressions are directly opposite each other on the port and starboard side of the keel; none of the other depressions have such an alignment. In one instance, 14 ft. (4.2 m.) aft of the forward end of the after keel section, there is an impression on the port side that continues across the bottom of the keel, but there is no evidence that the depression extends to the starboard side. The significance of this variation is unknown (fig. 8).

In the bottom of the keel are six holes. Three contain remnants of iron bolts which are 0.75 in. (0.0189 m.) square. One of these bolts was removed for analysis and conservation. These fastenings were spaced approximately 4 to 5 ft. (1.20 to 1.50 m.) apart.

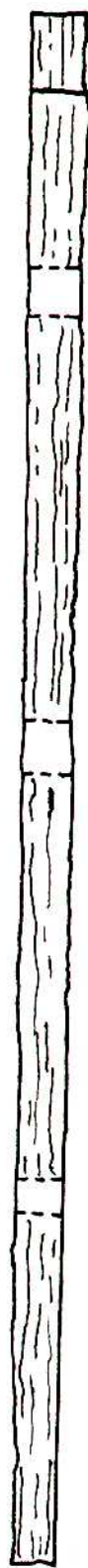
Figure 8. Keelson Fragments from the Griffon Cove Vessel



OCV-102



OCV-103



Two segments of the keelson were found and analyzed. One piece, OCV-77-01-102, is 8 ft. 5 in. (2.4265 m.) long, is moulded 7.5 in. (0.1897 m.) and is sided 3.0 in. (0.0759 m.) (fig. 8). This piece has a 4.5 in (0.1138 m.) by 9.0 in. (0.2277 m.) rectangular hole cut in it. There is evidence of three bolt holes along its length. The other piece, OCV-77-01-103, is 6 ft. 10 in. (2.0530 m.) long, has a maximum width of 8.5 in. (0.2150 m.) and a thickness of 3.0 in. (0.0759 m.). It also shows evidence of three bolts along its length.

Stem

The stem assembly consists of a stempost and a gripe. The stempost is 4 ft. 8 in. (1.4024 m.) long, moulded 10 in. (0.2530 m.), and sided 8 in. (0.2024 m.). There are four notches in either side of this piece, two of which have square nail holes indicating possible points of attachment for half frames*. A worn rabbet is evident sweeping up from the scarf notch. In this rabbet are six square nail holes.

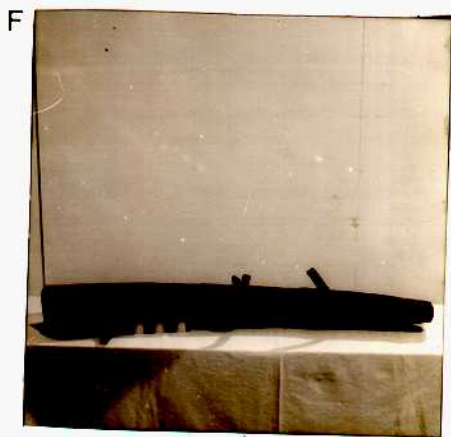
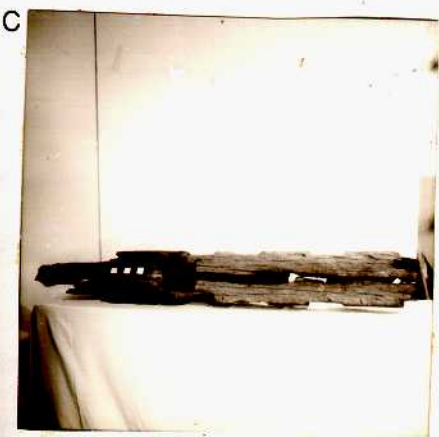
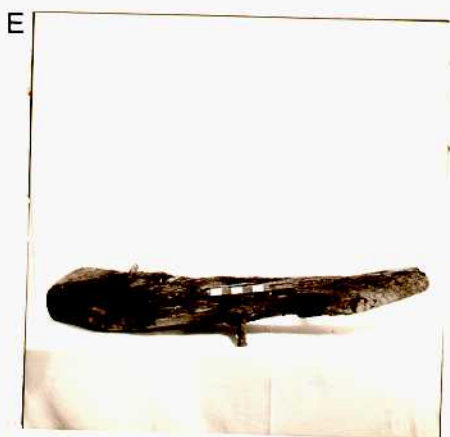
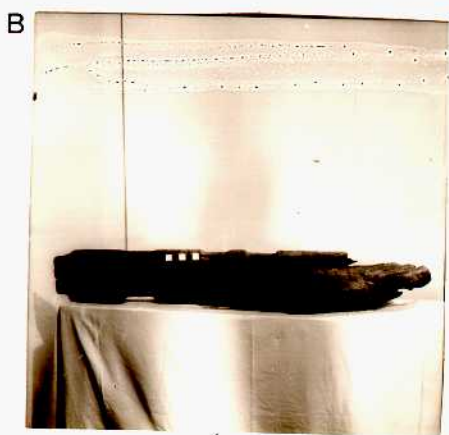
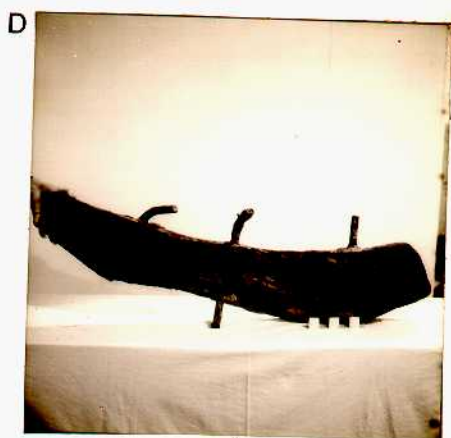
The stempost was scarfed onto the forward end of the keel. It was fastened to the top of the keel by four iron bolts: one forelocked bolt* 1.0 in. (0.0253 m.) in diameter and three drift bolts 0.5 in. (0.0126 m.) in diameter. It curves upward from the end of the keel to a point where erosion or breakage has destroyed all remaining evidence of its upper shape (fig. 9a).

There are three bolt holes in the leading face of the stempost (fig. 9b). The upper bolt hole is in the eroded area of the timber but is evident due to compressed grain which did not deteriorate as rapidly as the wood around it and by a rust stain in the bolt hole.

The top of the stempost contains a mortice 5 in. (0.1265 m.) long,

Figure 9. Timbers from Stem Construction of the Griffon Cove Vessel

- | | |
|-----------------------|--------------------|
| A. Stempost | D. Gripe |
| B. Bottom of Stempost | E. Bottom of Gripe |
| C. Top of Stempost | F. Top of Gripe |



4 in. (0.1012 m.) wide, and 3.5 in. (0.0885 m.) deep (fig. 9c). In the base of the mortice is a round impression and a shallow v-notch.

There is a crack which runs the entire length of the stem piece and the deteriorated condition of the wood is causing this crack to threaten the structural integrity of the piece. Careful handling was necessary to prevent further damage or splitting of this piece into two parts.

The gripe (figs. 9d, e, f) was recovered in 1978. This timber is 35 in. (0.8855 m.) long on the inside radius and 41 in. (1.0373 m.) long on the outside radius. The gripe is tapered both from head to heel and from the inside, which is against the stem knee, to the outside or leading edge. At the heel this piece is trapazoidal, moulded 4.6 in. (0.1163 m.) inside and 3.7 in. (0.0936 m.) outside, and sided 5.5 in. (0.1391 m.). At the head it is almost rectangular, moulded 2 in. (0.0506 m.) inside and 2.1 in. (0.0531 m.) outside, and sided 4.5 in. (0.1138 m.).

Three iron bolts are still firmly in place in the gripe. They are all 0.875 in. (0.0221 m.) in diameter and vary in length between 10 and 12 in. (0.2530 to 0.3036 m.). The middle bolt has been exposed due to a large piece of the gripe being split away (fig. 9e). The heads of the other two bolts are flush with the wood surface. The bolts nearest the head have been bent, both in the same direction as if they were twisted away from the stem by force.

The radius of the gripe on the inside face, where it butted against the stem, is a smooth curve. The outside radius has two distinct flat spots. One flat occurs at the keel where this piece butted. The gripe

extends straight for 8 in. (0.2024 m.) before it starts to curve upward. The first bolt was driven at the point where the flat stops and its curve begins. This same pattern occurs at the head of the gripe. The uppermost bolt is driven where the curve stops and the gripe extends 9 in. (0.2277 m.) straight up to the end of the piece (fig. 9d).

Stern

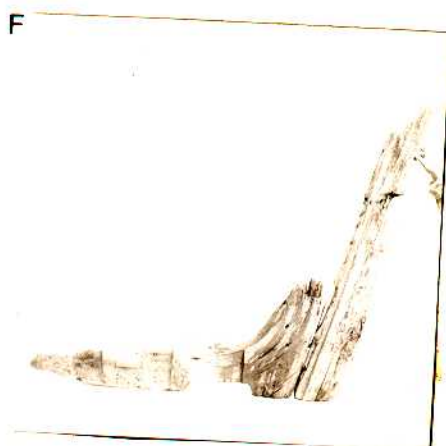
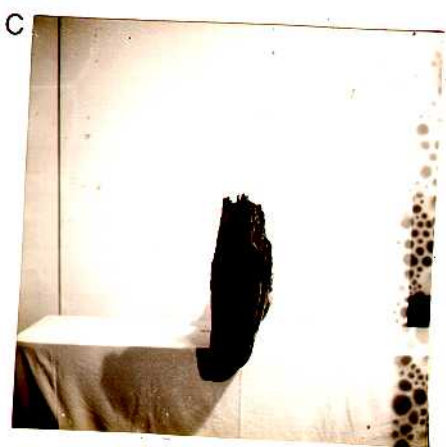
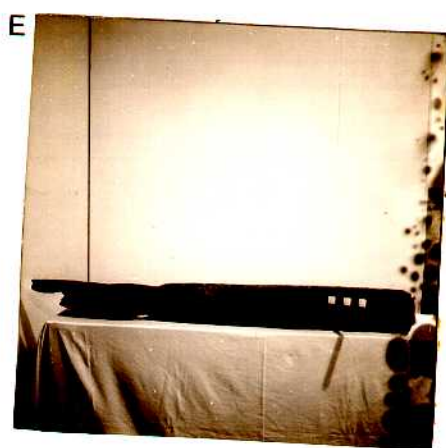
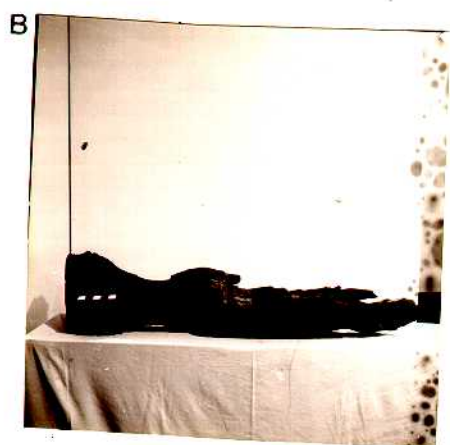
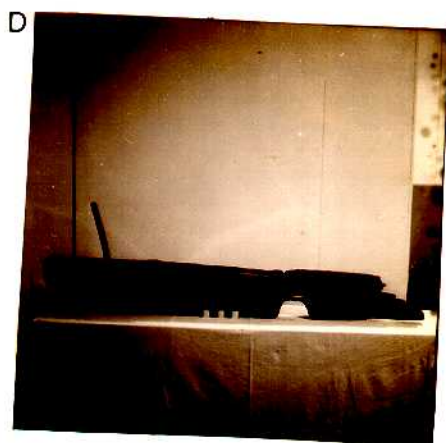
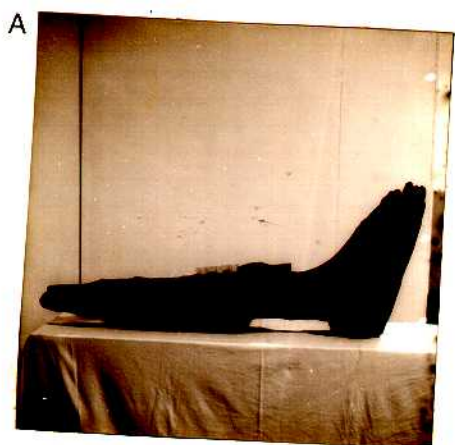
The stern assembly consisted of a stern knee* scarfed to the keel and a sternpost bolted to the knee (fig. 10f). There is no evidence that any other timbers were used in this portion of the vessel. The stern knee is 4 ft. 2 in. (1.2506 m.) long, and is moulded 8 in. (0.2024 m.). There are four notches visible on each side of the knee. Nail holes indicate where the half frames were attached. There is a row of nail holes that runs along the side of the knee near the bottom. Two nail holes are evident higher on the timber where the knee starts to curve upwards.

The stern knee (fig. 10a) was attached to the keel by a scarf similar to that used at the forward end of the keel (fig. 10b). There was a single bolt hole in the after side of the knee where the sternpost was attached (fig. 10c).

The surviving portion of the sternpost is 4 ft. 8 in. (1.4024 m.) high, is moulded 4.5 to 5.3 in. (0.1138 to 0.1340 m.) and is sided 5 to 10 in. (0.1255 to 0.2530 m.) (figs. 10d and e). There is a notch approximately 3 ft. (0.9 m.) above the top of the keel. The sternpost was fastened to the stern knee by a single drift bolt 1 in. (0.0253 m.) in diameter, still in place in the post. The bolt is discolored by an orange deposit for a distance of 1.2 in. (0.0303 m.) from the post.

Figure 10. Timbers from Stern Construction of the Griffon Cove Vessel

- | | |
|----------------------------|------------------------------|
| A. Stern Knee | D. Stern Post |
| B. Bottom of Stern Knee | E. Forward Face of Sternpost |
| C. Bolt Hole in Stern Knee | F. Stern Knee and Sternpost |



There is a rabbet in the sternpost. A line of nail holes is evident showing where the planking terminated. The rabbet is approximately 2 in. (0.0056 m.) deep, but varies due to the wood's deteriorated condition. The width of the sternpost between the rabbets ranges from 3.5 to 4.2 in. (0.0885 to 0.1062 m.).

Frames

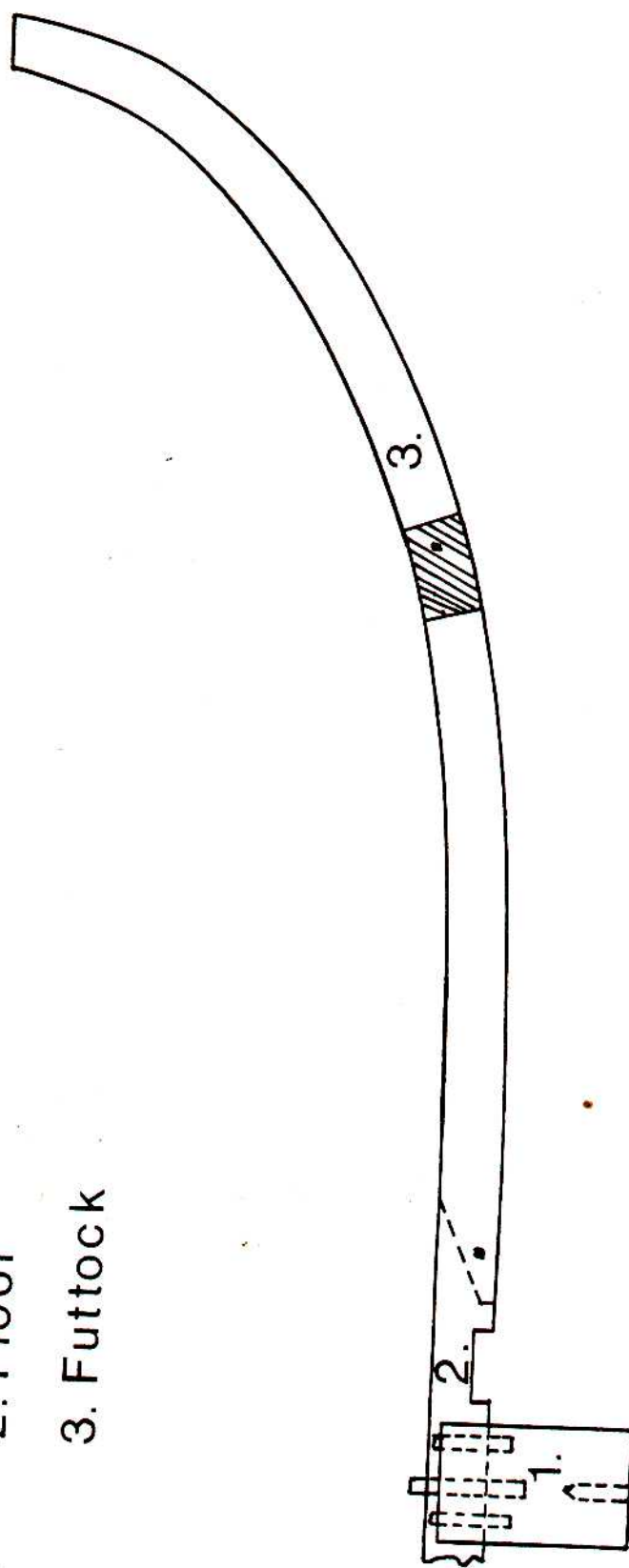
Square frames in this vessel consisted of an assembly of one floor timber and two futtocks.* Floor timbers were bolted to the keel, their arms extending to the turn of the bilge. The futtocks extended from a point quite close to the keel, around the curve of the bilge and up the side to the gunwale* (fig. 11). A total of 27 floor timbers, 37 futtocks and 5 broken frame ends have been recovered from the Griffon Cove wreck. All these timbers were moulded and sided 3.5 to 4.0 in. (0.0885 to 0.1012 m.).

The floor timbers were fastened to the keel by 0.5 in (0.0126 m.) iron drift bolts. On either side of the keel water courses* were cut into the outer face of the floors. The water courses were approximately 1 in. (0.0253 m.) deep and 4 in. (0.1012 m.) wide. The floors and futtocks were fastened together in at least one place, either near the water course at the keel or at the outer end of the floor in the middle of the futtock. In some cases the two timbers were joined in both places. Nails, 0.375 in. (0.0094 m.) square, were used to fasten the floors and futtocks.

Smaller nails, 0.25 in. (0.0063 m.) square, and nail holes were evident in the inner and outer faces of the frames. The nailing pattern on the outer face indicates the method used to fasten planking.

Figure 11. Typical Frame Section of the Griffon Cove Vessel

1. Keel
2. Floor
3. Futtock



Only a few floor timbers have nail holes on their inner faces. The reason for this was not clear.

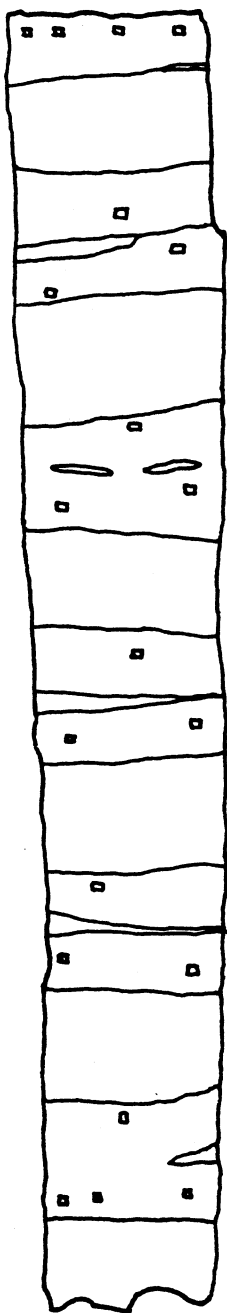
Planking

Fourteen planks or large planking fragments have been recovered from the Griffon Cove wreck. Intact nails in the planking indicate the original strake thickness was 1.5 in. (0.0379 m.). The planking widths vary from 5 in. to 12 in. (0.1265 to 0.3036 m.). The pattern of nails and nail holes often show the framing plan of the floors and futtocks which the plank crossed. In addition, collapse of wood grain on the planking faces has often left a slight frame impression on inside (fig. 12). This gives some indication of the framing plan of the ship.

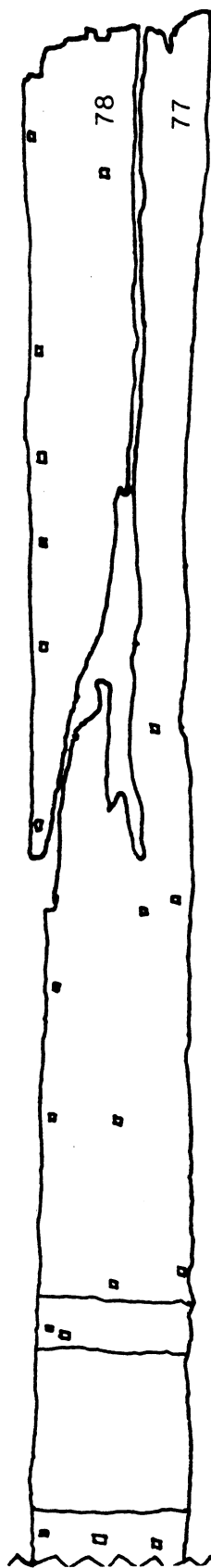
In addition to the planking fragments above, nine fragments of what is possibly a wale* were recovered. These pieces have a width of 5 in. (0.1265 m.) (fig. 12). Three fragments of garboard strake were identified (fig. 12). The planking edge which butted to the keel is beveled. There was no evidence of ceiling* planking.

Figure 12. Planking Fragments from the Griffon Cove Vessel

Planking	OCV-83
Garboard	OCV-77 and 78
Wale	OCV-89



OCV-83



OCV-77 & 78



OCV-89

CHAPTER III

INTERPRETATION AND ANALYSIS

Interpretation of Previous Studies

Since there are many discrepancies between the information and analysis presented in the literature review and the data presented in the last chapter, it is appropriate to offer an analysis of both. It is also important to keep in mind the emotional tone in which the authors wrote in 1955 and the perspective which this gave to their investigation.

In his "Discovery of the Wreckage of the Griffon", Murphy set forth his opinion that the remains of the Griffon Cove wreck were those of the Griffon. But he emphasized that, he and others had not stated (??) wreckage was undoubtedly from that ship. The way in which this statement is worded supports the hypothesis that they were not sure of the identity of the wreck, yet felt compelled to verify it as the Griffon. Murphy went on to state that the hard and fast evidence, a nameplate, often found on more modern vessels, would not or had not been found on this wreck and that it might be necessary to convince some people who were ignorant of ship-building practice of the 17th century (Murphy, 1955: 23). Murphy said, in other words, that the way to identify this ship as the Griffon lay in the construction features.

This is the same premise that the author tried to follow at the outset of this study and found that insufficient information did not allow conclusions to be drawn from construction features alone. As for the lack of a "brass nameplate", the recent work in 1978-1979 done by the FFPP staff has uncovered archaeological material, the "name

plates" of historical periods, which gives evidence to the fact that this ship is not the Griffon.

Murphy's comment, "It is difficult to think of a new discovery of greater importance to intelligent members of the Great Lakes communities than the one announced on August 16 by Mr. H. John MacLean of the Toronto Telegram." (Murphy, 1955: 232), illustrates the view of the time concerning the Griffon. It was the first ship built on the upper Great Lakes and because of its mysterious disappearance would be an important vessel to find both from a historical and a romantic perspective. This is evidenced by the fact that the Griffon Cove wreck is the eleventh alleged finding of the Griffon. As Snider noted (1956: 2), "Previous failures should not prejudice consideration of later finds." Both the historical and lay communities in the United States and Canada may have been prejudiced in favor of the Griffon Cove wreck. The fervor with which the announcement and confirmation of the remains of the "Griffon" were greeted may have blinded the public to the truth, although Snider (1956: 4) admitted that: "Not one indisputable piece of evidence had turned up in all of their work."

The earlier authors, in describing the timbers which they examined in 1955, occasionally offered conflicting statements about the remains. Furthermore, it is evident that many of the timbers that were recovered were not included in their analyses, while many of their observations are in error. For example, the size of the keel, floors and futtocks are all subject to some discussion. The observations made in 1978-1979 do not concur with all of the measurements made in 1955. This must cast suspicion on the validity of their conclusions which seem to be

based on partial evidence.

When discussing the iron fastenings of the ship, for example, Murphy and Snider stated that the scarcity of iron was consistent with La Salle's difficulty in obtaining the metal. Snider (1956: 5) stated the number of wooden pins used as stopwaters and treenails in the timbers emphasized the economy in the expenditure of iron. Murphy cited lack of rust around fastening holes as evidence of the use of treenails. Yet no evidence of treenails or stopwaters was found in the timbers of the Griffon Cove wreck by this author, and the lack of rust from the iron fastenings can be attributed to abrasion occurring as the planks separated from the frames. In another article, Murphy states that only two nails were used per plank per frame. This can be disproved by looking at any piece of planking or any frame.

Snider believed there was no evidence of a shoe or false keel on the Griffon Cove vessel. This is not the case. At six points along the bottom of the keel, bolt holes or intact iron bolts can be seen. The bolts were used to hold a shoe to the keel. One was removed for closer examination and conservation (fig. 15a, p. 76). It is 0.75 in. (0.0189 m.) square with a flat point. The edges of the bolt have been struck with a chisel to produce barbs. These added to the holding power of the fastener which was usually driven into a round hole, as it was in this case. The procedure was used to allow for easier replacement of the false keel should it become damaged or decayed.

In his last article, Murphy made a point of emphasizing that there was evidence of burning on the starboard frame ends. He felt this proved the missing starboard side had been destroyed entirely by fire

(Murphy, 1956b: 201). This is in direct contradiction to the statement by Vail that his father had removed frames of the ship with an ax and saw for firewood. It seems that the change in opinion was due to a new find by MacLean which detailed an Indian conspiracy which ended by the boarding of the Griffon, killing of the crew and burning of the ship. This vacillation in opinion is characteristic of the earlier authors' susceptibility to new information and often unproven speculation.

Murphy's reconstruction sheer plan was based on the timber remains and Father Hennepin's woodcut (fig. 3, p. 12). He qualified his use of some material by saying, "If there is nothing to be found of some particular vessel wanted, contemporary shipping of the same size, tonnage, rig, gun power, etc., is generally a safe guide if one knows enough of national differences and characteristics." (Murphy, 1956b: 238). This is a valid research method if, indeed, contemporaneous vessels are used. In this case, Murphy assumed that the Griffon Cove wreck was the Griffon. His reconstruction was based on a false assumption, and his reconstruction, therefore, is not valid.

Murphy compared the alleged "Griffon" to the Nonsuch, a Royal Navy ketch, built in 1650 and used by the Hudson's Bay company in 1688. Its particulars are: 36 ft. length on keel, 68 ft. length overall, 15 ft. beam, 7 ft. depth of hold, 43 tons, 6 guns, crew of 12 in peactime and 35 at war. The principle dimensions of "Griffon" he said were: 65 ft. length on deck, 15 ft. beam, 7 ft. depth (draught), 44.86 tons, 60 tuns deadweight, 6 guns, and 34 crew.

The size of the hull in the woodcut is difficult to determine, but it seems to be about 50 to 60 ft. in length, if one uses the human

figures as a scale. The beam is approximately 14 ft. and the depth near 7 ft. (Murphy, 1956b: 278). Once again Murphy based his arguments on what this author considers to be inaccurate evidence. There are palm trees and mountains seen in this woodcut, both of which have no relation to the actual area where the ship was built. Portions of this woodcut may be accurate but it seems best to concur with the statement by Viénot and Devoix of the Musée de la Marine, that "you cannot place any confidence in a drawing made to illustrate a book which was written a number of years after the event, by an artist who never had seen the ship in question." (Myers, 1956: 143).

In describing the rigging, Murphy (1956a: 47) stated with certainty that the Griffon was a ketch with square sails on the main mast and a lateen sail on the mizzen mast. In support of his statement, he cited the spars shown in Father Hennepin's woodcut and pointed to the "mizzen mast step" of the Griffon Cove vessel, thirteen feet ahead of the sternpost:

With the mizzen mast in this position and the main mast as shown in the plan (fig. 5, p. 31) it is possible to work out a sail plan from the center of lateral resistance [CLR] of the immersed portion of the hull which would place the center effort sufficiently ahead of the CLR so that the vessel would balance nicely without having too much weather helm which would allow her to sail well. (Murphy, 1956b: 279).

Whether or not the anomalous notch on top of the keel is a mast step has yet to be determined. Regardless of this fact there are other points in Murphy's argument which do not stand up under close scrutiny. The accuracy of the woodcut published by Father Hennepin cannot be trusted, especially when one relies on it for such details as the

number of spars which make up the masting and rigging of the ship under construction. I believe that the timbers shown in the woodcut are not spars, but rather rough stock from which the frames and plankings are being shaped.

Murphy referred to his construction plan of the "Griffon", to show that the physics behind the proposed rig was possible. The after mast is approximately in the location he proposed, but the foremast is not. In his article, Murphy stated the foremast was stepped into the mortice in the stem. In his reconstruction, this mast is shown well behind the stem. Had Murphy been able to prove that the positions of masts in his reconstruction allow for the ketch rig, this evidence still would have no relationship to the Griffon Cove vessel, because the positions of his masts are not the positions of the mast steps in the actual remains.

Murphy (1956b:240) supposedly used the "immersed portion of the hull" to calculate that the rig would "allow her to sail well". One must question how he calculated the immersed portion of the hull, when there is no evidence as to where the waterline on the Griffon Cove vessel was. The waterline, and thus the immersed portion of the hull, would be vastly different on the ship proposed by Murphy and the reconstruction offered by me. Murphy extended the evidence which was available beyond reasonable limits when he drew his reconstruction and reported his conclusions.

Murphy was of the opinion that the "Griffon's" length on deck was between 58 and 60 ft. He felt that the stem extended 11 ft. 4 in. ahead of the stem/keel scarf and the stern 7 ft. aft of the keel/stern-

post scarf. This is unfounded and totally impossible. As seen in his reconstruction (fig. 4, p. 20), the angle of the sternpost is 14 degrees. In order for the stern of the ship to terminate 7 ft. aft of the base of the sternpost, the deck would have to be 28 ft. above the keel. A similar extrapolation can be made following the curvature of the stem. In this case the deck would have to be 12 ft. above the keel for the stem at the foc's'sle head to be 11 ft. 4 in. ahead of the scarf. With new evidence from the recovery of the gripe, the curve described by these two pieces would never extend 11 ft. forward of the stem scaft.

Discrepancies of this magnitude would seem to call into question the validity of the conclusion reached by Snider and Murphy. A more accurate evaluation of articles written about the Griffon Cove material has come from Vichot and Denoix of the Musée de la Marine: "The Tobermory wreck does not appear to be of French construction, and its construction technique seems to correspond to the 18th century or later." (Myers, 1956: 148).

Analysis of Hull Construction

Every attempt was made in this reconstruction to rely upon physical evidence seen in the original timbers and not to rely on conjectural material, except when absolutely necessary and when this material supported by secondary evidence from literary sources.

Keel

The keel, which broke during its recovery, was stored in a building whose length prohibited the joining of the two pieces. The keel has been matched using drawings and photographs. It appears as though

it broke at a bolt hole. The keel was shaped from a single log of white oak to a length of approximately 42 ft. (12.60 m.).

The floor timbers were fastened at 1 ft. (0.30 m.) intervals with iron drift bolts. Centered in notches cut in the keel, all bolts which fastened the floor timbers are aligned along the centerline of the ship. A second pattern becomes clear when one looks at the bolts on the top of the keel between the notches. These bolts were used to fasten the keelson over the keel and floor timbers. Bolts were driven between every other floor. To avoid splitting the keel, the fastenings were driven successively on the port side, in the center, and on the starboard side of the keel (fig. 6, p. 36). Two pieces of keelson were identified from this bolting pattern.

One of the keel notches, 13 ft. ahead of the stern knee, has a mortice cut in the top of it (fig. 14a). The reason for this variation is unknown. Murphy (1956b:240) suggested that this was the position of the mainmast. There is, however, no evidence to support this claim. It would appear that the mortice is far aft in the vessel for the placement of a mast. The mortice may have been for a stanchion supporting a small after deck, or for a boom crutch supporting the sail yards. Without further evidence, it is impossible to positively identify this unique feature of the Griffon Cove vessel.

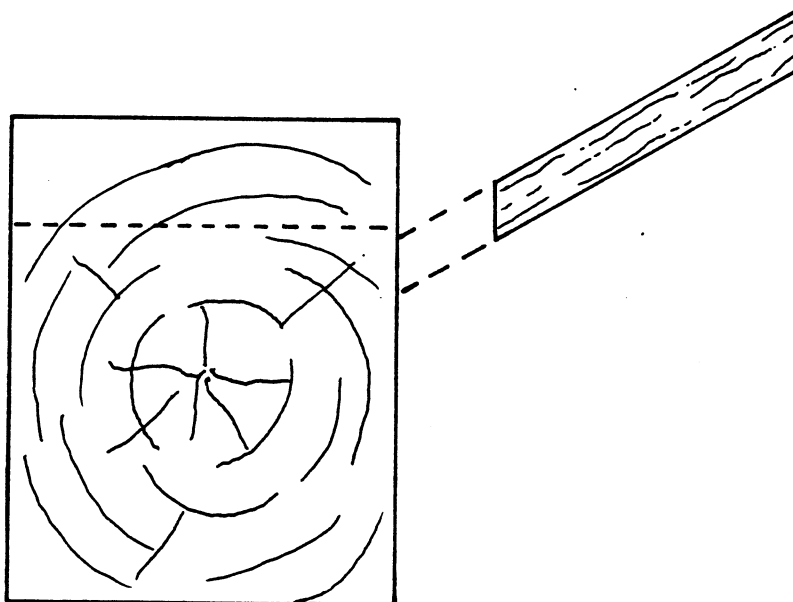
The keelson may have terminated 56 in. (1.4168 m.) or 5 frames forward of the stern knee, where a large crack is evident in the side of the keel. Had the vessel struck on the rocks, the impact might have caused the backbone of the ship to crack here, due to the lack of added strength that the keelson gave throughout the rest of the

keel's length.

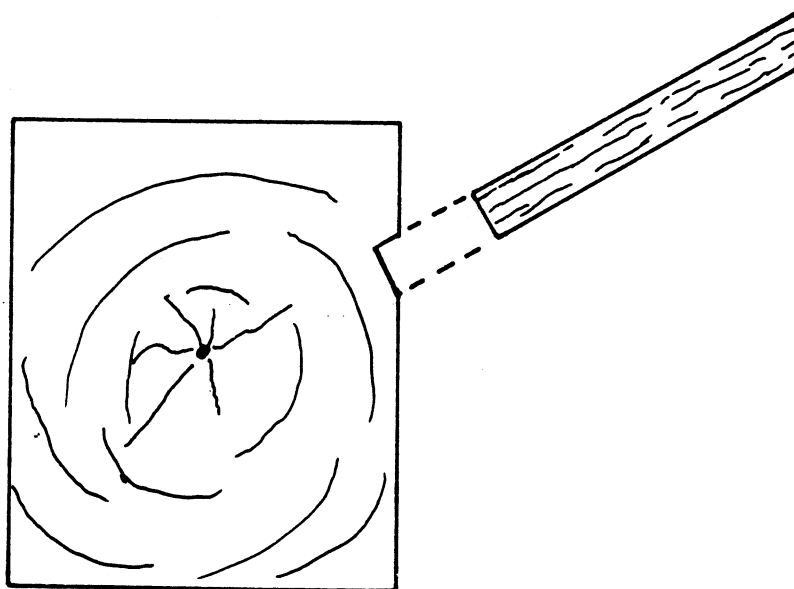
It is unknown whether or not a crack had developed where the keel parted in 1955. If it had, it may have been due to similar circumstances. It is possible that the additional strain produced by the mast had broken the keel prior to 1955 and movement then caused it to separate. The bolting pattern in the keelson defines the location of the mast step between 14 ft. 6 in. to 15 ft. 3 in. (4.3518 to 4.5759 m.) aft of the stem scarf. This is the only place where the pattern of bolts in the keel matches the pattern of holes in the keelson. The second portion of the keelson probably was located just forward of the first, between 5 ft. 10.5 in and 12 ft. 10.75 in. (1.7656 and 3.8719 m.) aft of the stem scarf.

There does not appear to be a rabbet in the keel, but only slight indentations at various points along its length where one would expect to find a rabbet. There are two possible explanations for this. The first is that these features are the remnant of a rabbet which was eroded through years of abrasion on the rocks of the cove. The second is that the ship was planked without a rabbet and normal movements between the keel and the planking wore the impressions in the keel during the life of the vessel. The second explanation is the more probable, due to features of the garboard and other major timbers. The edge of the garboard is beveled at an angle such that when it is held against the bottom of the floors as if it were fastened to them, the edge fits against the side of the keel exactly (fig. 13). If the keel had been rabbeted, the edge of the garboard would have been left square in order to set in the rabbet at the proper angle (fig. 13).

Figure 13. Keel-Garboard Construction of the Griffon Cove Vessel
and Construction of A Rabbeted Keel



Griffon Cove Keel And Garboard



Rabbeted Keel And Garboard

It is standard ship building practice to put a rabbet in the stem and sternpost even if one is not put in the keel. The end grain of the planks is, in this way, protected from rot and cracking.

The six holes in the bottom of the keel originally fastened the shoe, a piece designed to protect the keel from being damaged in case of grounding. The shoe was meant to be easily replacable and thus has not survived. It was standard practice for shipwrights to attach the shoe with square fastenings driven into round holes as on the Griffon Cove wreck.

There are three holes in the side of the keel. Two of these go completely through the keel. Iron bars were probably slid through these to facilitate the launching and hauling of the ship. Similar bars can be seen on the HMS Nancy and Tecumseh built during the War of 1812, and it is said that this technique continued to be used until recent times in the Tobermory area (Murphy, 1956a: 47). The third hole intersects one of the bolt holes for the stem and probably facilitated placement of the key in a forelocked bolt used there.

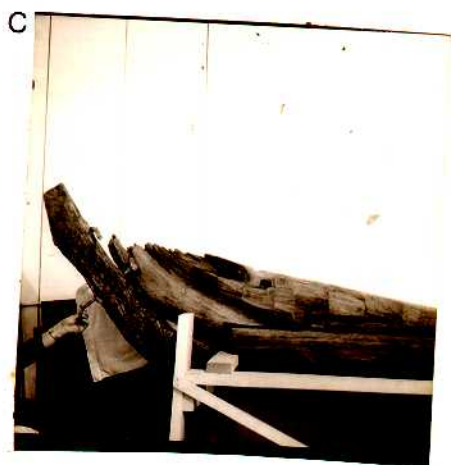
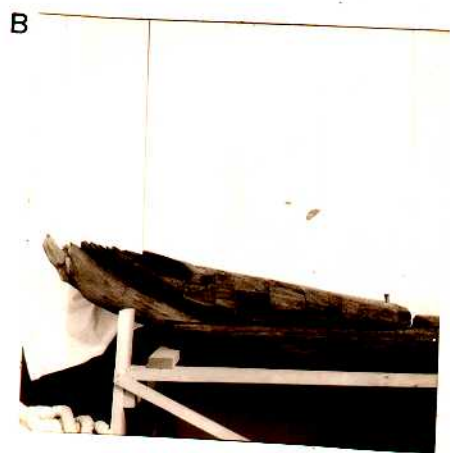
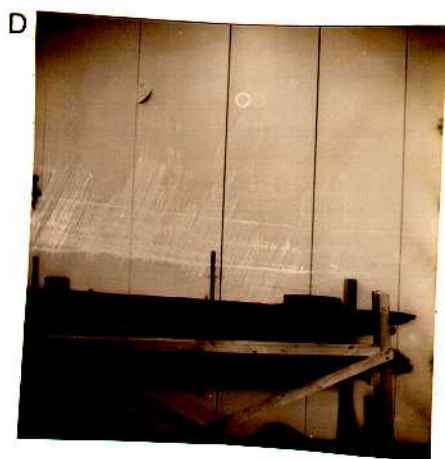
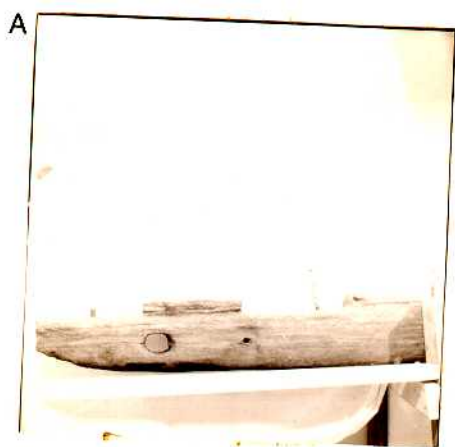
Stem

All major timbers associated with the construction of the stem have probably been recovered (figs. 14a, b, and c). Examination of the stem knee and gripe revealed no evidence that additional timbers were used. All bolts used to fasten the stempost to the keel appear to have been driven from the top of the stem into the keel. There are no bolt holes that would suggest an additional piece was fastened on top of the stempost.

The gripe was found in 80 ft. of water just off the large rock

Figure 14. Construction of the Griffon Cove Vessel's Stem and Stern

- | | |
|-------------------------------|--------------------------------|
| A. Stem Scarf on Keel | D. Stern Scarf on Keel |
| B. Stempost on Keel | E. Stern Knee on Keel |
| C. Complete Stem Construction | F. Complete Stern Construction |



protruding at the mouth of the cove. The piece was in excellent condition and was able to be accurately recorded at the time of its recovery. The grain pattern suggests that it was cut out of a straight piece of timber. The ship may have struck the rock causing a large area split away from the middle bolt. All of the bolts which held the gripe to the stem are twisted in the same direction as if the piece was wrenched with some force. This piece is believed to be the outermost timber of the bow construction. The narrowing of the leading edge and the flat area above the upper bolt support this hypothesis.

The three bolts which fasten the gripe to the stempost illustrate this point as well. The heads of these fastenings are or would have been flush with the forward face of the gripe, indicating that this was the outermost surface of the stem construction. Standard ship construction would have required the fastening of these pieces with fewer bolts, had other timbers been subsequently attached. Other bolts would then have been driven through the additional timbers into the inner ones.

The stempost has probably lost some of its shape due to erosion. This may be seen more clearly when the gripe is held in position (fig. 14c, p. 68). The bottom of the gripe should be even with the bottom of the keel shoe. With the gripe in this position, there is a significant gap between it and the stempost at the forward end of the keel.

The locations of the half frames, the location and curvature of the planking rabbet and the method of fastening the stem onto the keel is clearly evident. The forward face of the stempost and the outer face of the gripe seem to follow the same curve. Reconstruction of the

stempost required that it be extended at least as high as the gripe. This could best be done by following the same curve indicated by the outer face of the stempost and gripe. If one were to swing an arm of a compass from a point one foot aft of the end of the keel and three feet above the keel, three arcs could be produced describing the curvature of the planking rabbet, the seam formed by the stempost and gripe, and the outer face of the gripe. This might have been the method used by the builder of the Griffon Cove vessel. A second possibility also exists. The curves which make up the stem match the curve used in the body of the boat at amidships, thus the shipwright may have used a single mould to produce all three curves.

The only other feature on the stempost is a mortice. It is possible that this could have been the step for a stanchion, bitt, or foremast. There is literary and pictorial evidence supporting all of these possibilities, but the closest parallels show the placement of the foremast in this position.

Stern

The stern assembly consisted of the knee and post; no evidence of additional timbers were found (figs. 14d, e, and f, p.70). This would indicate that the entire stern construction was recovered intact in 1955. The construction features of these pieces indicate a small vessel of simple construction. The sternpost was fastened to the knee with a single drift bolt. It was not morticed into the keel as was common on larger ships. There was no intricate assembly of deadwoods*, typical of larger ships as suggested by Snider and Murphy.

The rabbet in the post offers evidence for the method of planking

used in the stern. The planking ends terminated at the sternpost. All planks were set into the rabbet and fastened to protect the endgrain from rot. A row of nail holes is still evident here. It is possible to show that the original width of the rabbet was 3 in. (0.0759 m.). Rust discoloration on the drift bolt indicates that the rabbet has lost 1.5 in. (0.0379 m.) of its width.

The notch on the after side of the sternpost would appear to be one of the points of attachment for the rudder hardware. Two gudgeons would have been used on a vessel the size of the Griffon Cove vessel, one in the approximate location of the notch and the other lower on the post just above or on the keel. There is no evidence for fastenings on the lower portion of the post. It is therefore likely that the depression at the end of the keel is for the lower gudgeon.

The stern knee is a single timber hewn from the natural crook of a white oak tree. The curvature of the grain gives greater strength to the construction of the stern. On the knee are four notches for half frames, not three as stated by Murphy and Snider. Nail holes seen on the side of the knee match those on the garboard.

Frames

It is from the frames that the majority of information was gathered and the shape of the vessel finally determined. It was also the most difficult part of the ship to analyze. When the floors and futtocks were first examined, there seemed to be an almost infinite combination of timbers that could be joined to form frames. By careful observation of the angle of bolt holes, length of futtocks, and angles at which floors rose from the keel, the shape of the hull

became clear. Once the sequence of floor timbers was established the space between them needed to be determined. This was determined from the draft of the hull lines. With the aid of this technique, it was possible to see what shape the hull would take if different frames were spaced at various intervals.

It was advantageous to extend the hull lines in order to determine the shape of the half frames in the bow and stern. These timbers were not canted, a process frequently used to bring frames more perpendicular to the runs of the planking. In fact, there would be no need to cant frames on a vessel of the Griffon Cove design. Half frames were usually added after the shape of the hull had been determined by the use of control frames* and battens. This point is confirmed in the Griffon Cove vessel by the fact that the half frames were fastened to the stem and stern by a single nail.

Once the sequence of floor timbers in the keel notches had been determined and the hull lines corrected, the shape of the futtocks were added to the body plan. Lack of recording by previous investigators did not allow floor timbers and futtocks to be matched with any degree of certainty. Nail holes, visible either near the water courses or the outboard end of floor timbers^{were} used to match futtocks to floor timbers. After more careful examination, it was noticed that some floor timbers had nail holes at both locations, a possible indication of pre-erected frames.

Many floors and futtocks were matched by shape alone, using the hull lines as a guide. In some instances where timbers fit the drawing, fastening holes were slightly out of alignment. This may

be explained by the lack of excavation records or notations of locations after they were recovered. Details such as the order in which timbers were joined or even from which side of the ship they were taken from were not recorded by Vail. Had more information been available from previous work, timbers could have been more accurately matched. This would have allowed the hull lines to be more easily and accurately drawn.

Because the analysis of the frames and the development of hull lines lead directly to the conclusions which were reached about this vessel, this material will be dealt with in greater detail in the following chapter.

Planking

Due to the distortion of the planking caused by drying, little additional information was gained from an examination of these pieces. All intact fastenings were 0.25 in. (0.0063 m.) square nails. The nailing pattern used throughout the planks was erratic. Planking fastened to each frame by one to four nails. The greatest number of fastenings was used at butt joints.

It is presumed that all of the surviving planking comes from the lower portion of the hull. Of all the planking, only a small fragment of the garboard, OCV-01-78, could be definitely placed in its original location. The longer fragment, OCV 77-01-77, was tentatively placed in association with OCV 77-01-78. The position of this piece depends upon the sequence of floor timbers which match the frame impressions found on the garboard, hence the placement is tentative.

The fragments of what was possibly a wale could not be assigned

a place within the hull, due to deterioration of the fastening holes. There are two logical locations for the timber involved. The first is in the lower portion of the hull, near the ends of the floor timbers. In this position, the timber would be called a footwale or bilge stringer. There is some inconsistent evidence that may support this location for the piece. A few of the floor timbers had fastening holes in their upper faces, in the approximate position that one would expect to find a bilge stringer. This evidence, however, is insufficient to allow the placement of the fragments in the reconstruction.

The second possibility for the placement of the fragments is at the ship's sheerline. Normal shipbuilding practice would dictate the attachment of a wale on the outside frame faces along the futtock tops and a clamp on the inside. Heavy fastening would be driven through these pieces.

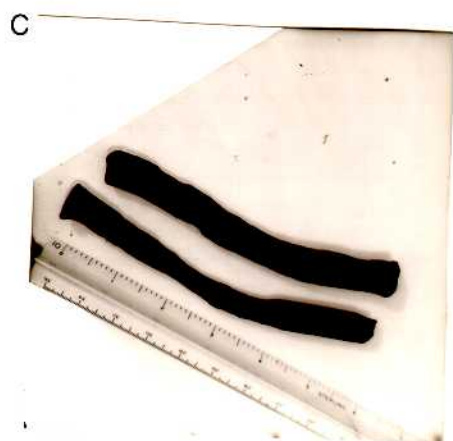
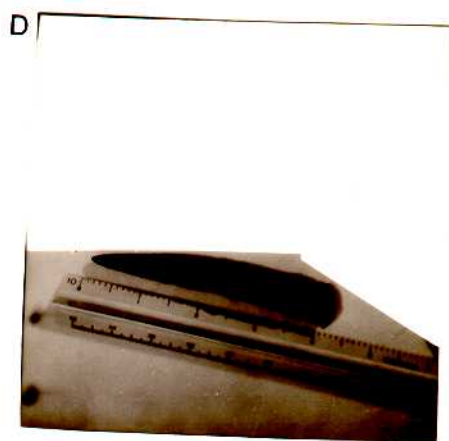
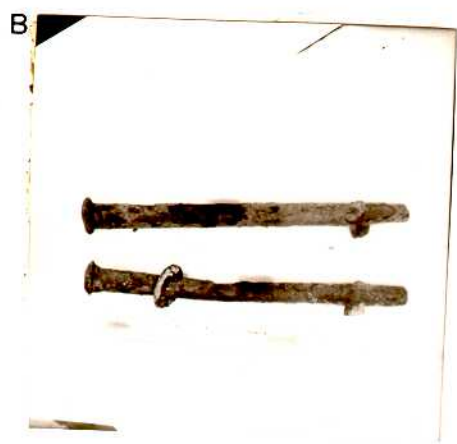
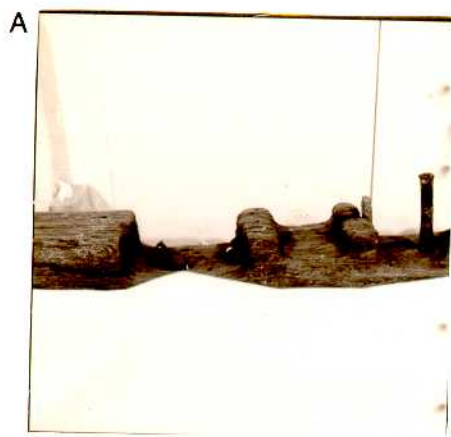
Fastenings

All fastenings found in timbers of this wreck were made of iron. There have been two types of fastenings found in association with the remains and wreck site: these are bolts and nails. A wide variety of fastenings have been catalogued within each of these types (fig. 15a-e).

Drift bolts were used to fasten the floors and keelson to the keel, as well as to attach the gripe to stem and sternpost to stern knee. Drift bolts are round in cross section. They are driven into a hole drilled slightly smaller than the diameter of the fastening. Their holding power comes from their snug fit within the hole. The bolts used in fastening the floors were 0.625 in. (0.0158 m.) in diameter; those for the keelson, 0.5 in. (0.0126 m.) in diameter; and

Figure 15. Iron Fastenings from the Griffon Cove Vessel

- | | |
|-------------------------|-----------------------------|
| A. Notch in top of Keel | D. False Keel Bolt |
| B. Forelocked Bolts | E. Nails and Nail Fragments |
| C. Drift Bolts | |



those used for the gripe and sternpost, 0.75 in. (0.0189 m.) in diameter.

Forelocked bolts were used to fasten the stem and stern knee to the keel (fig. 15, p.76). A wedge or key, driven into a slot in the end of these bolts, prevented their loosening. No bolts of this type have been found intact, but a number are in the collection associated with the timbers, and others have been found during the course of excavation by the Canadians. These bolts have diameters of .75 in. (0.0189 m.).

A third type of bolt, (fig. 15, p.76) found in the underside of the keel, has been discussed thoroughly in the catalogue. They are of two sizes, their shanks measuring either .625 in. (0.0158 m.) or .75 in. (0.0189 m.) square in section.

A wide assortment of nails and nail fragments have been found in the timbers of this vessel and recovered from the original wreck site (fig. 15e, p.76). The majority of nails used in the construction of this ship were 4.25 to 4.50 in. (0.1075 to 0.1138 m.) long and .25 in. (0.0063 m.) square. They appear to be hand wrought, although cut nails have also been found on the site (McClellan, 1978: 10).

CHAPTER IV

CONCLUSIONS

Conclusions

The prime intention of this study was to prove whether or not the Tobermory wreck was the Griffon. Evaluation of all of the evidence presented in this thesis suggests that the Tobermory wreck is not that of La Salle's Griffon. Disproving the identification of the wreck material as that of the Griffon requires that this thesis include suggestions for the wreck's proper identification. The accumulated evidence presented here proves that the wreckage found in Griffon Cove on Russel Island is that of a large open boat and not that of a decked sailing ship belonging to La Salle as previously reported.

Historical references written by Father Hennepin at the time the Griffon was built reveals that the vessel was decked (Cox, 1905: 73). There were no remains recovered from the Griffon Cove vessel indicating that there was a deck on this ship.

Much heavier scantlings would be found in a ship of French construction built during the late 1600s. Specific characteristics such as notched floor timbers rather than a notched keel, heavier deadwood in the bow and stern, and more closely spaced framing tend to indicate a ship of earlier construction (Myers, 1956: 143-144). These features are not seen in the Griffon Cove wreck.

A ship of the size and type of the original Griffon probably would have had a much greater length than the Griffon Cove vessel. Typically, a ship of this period would have had a keel two-thirds the total length of the vessel. The stem and stern construction would have been scarfed onto the keel and extended for some distance fore and aft of the keel

before terminating. Murphy's approximation of sixty-five feet on deck for the length of the Griffon may be correct but his application of this length to the remains found on Russel Island is not.

The opinions of Vichot and Deniox from the Musée de la Marine must be given a great deal of consideration. From their knowledge of the period we may receive the most impartial evaluation of the Griffon Cove timbers as they relate to La Salle's Griffon. All of the arguments of MacLean, Murphy and Snider can be proven false or inconclusive by the evidence presented by Vichot, Deniox, or by this author.

I believe^d at the beginning of this study that a ship could be classified by time period and nationality through the analysis of certain construction features. However, such a classification is in fact only possible for well-documented periods and hull types. The reason for this became clear in the course of researching the Griffon Cove wreck. There is sparse documentary evidence of the techniques used by local builders of small craft, and most of that comes from naval records rather than civilian merchant craft records. Relatively few ships in North America have been excavated in a scientific manner with the results fully reported; little data have been collected from recovered hulls or published from collections of early American ship models. Hopefully, examination and publication of more vessels will make it possible to define more closely the construction techniques used by various nations at different times in their maritime histories.

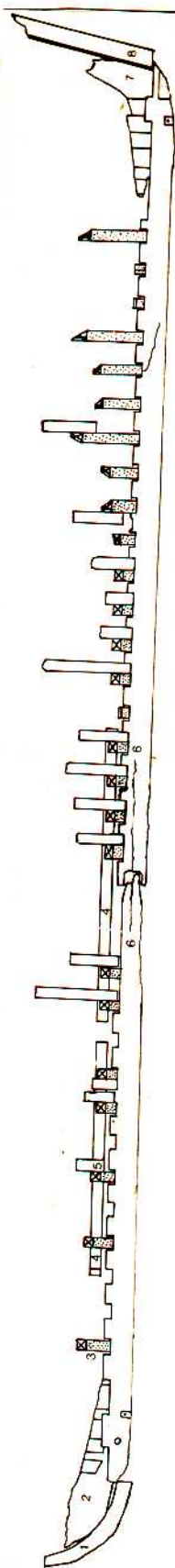
What information is available suggests a very slow, traditional modification of Old World hull-types, brought over by the first settlers, into forms more distinctly North American. Yet similar techniques and

materials were used over a long period of time, and methods used by early European inhabitants of the New World, for example, were still being used by the Great Lakes' shipbuilders until a short time ago. While it is therefore impossible on the basis of an analysis of only timber remains, to make a definitive statement concerning the origin of the Griffon Cove wreck, the archaeological material recovered by the FFPP staff in 1978 and 1979 does make it possible to set a time range in which the vessel was used and abandoned.

Archaeological remains collected from the cove indicate a date, based on the ceramic types, of 1840-1860. One piece bore a maker's mark, Barker & Son, a British kiln producing only from 1850 to 1860. The only other datable artifact was a lock identical in shape and dimensions to a lock found on the site by Vail. The Vail lock bore a mark of a crowned "GR" and the word "Patent" on the keyhole cover. The escutcheon refers to George III or George IV in whose reign the patent was granted. This gives a date range of 1790-1830 for the date of first manufacture.⁹ The lock found by FFPP was identical to this except it was missing the keyhole cover.

The timbers found on Russel Island have been reconstructed to the greatest extent for which there was physical evidence (fig. 16). With the aid of a model (fig. 17), the individual timbers were placed in positions which would yield a fair hull shape. Working from the frame shapes recorded in Canada and modeled at Texas A&M University, a set of hull lines was developed (figs. 18 and 19). The use of these ship lines played a major role in drawing conclusions from the remaining timbers of the Griffon Cove Wreck.

Figure 16. Plan and Profile of the Griffon Cove Timbers



1. Gripe 2. Stem Knee 3. Floor 4. Keelson 5. Futtock 6. Keel 7. Stern Knee 8. Stern Post

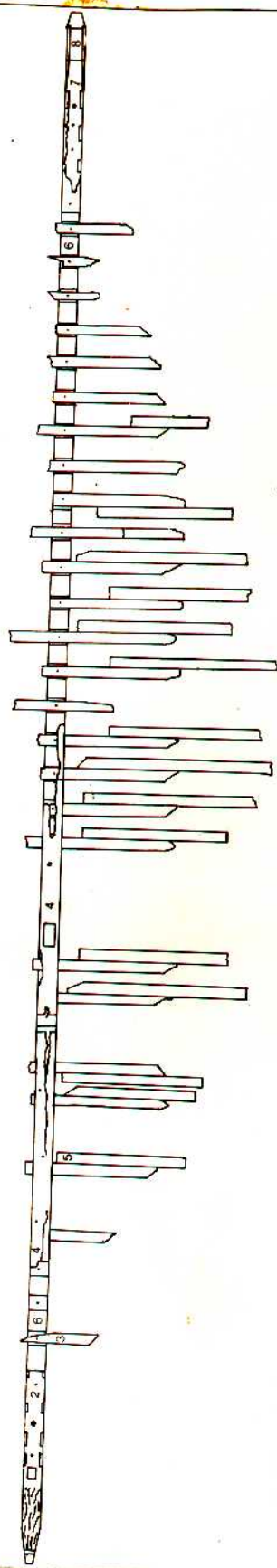


Figure 17. Model of the Griffon Cove Timbers

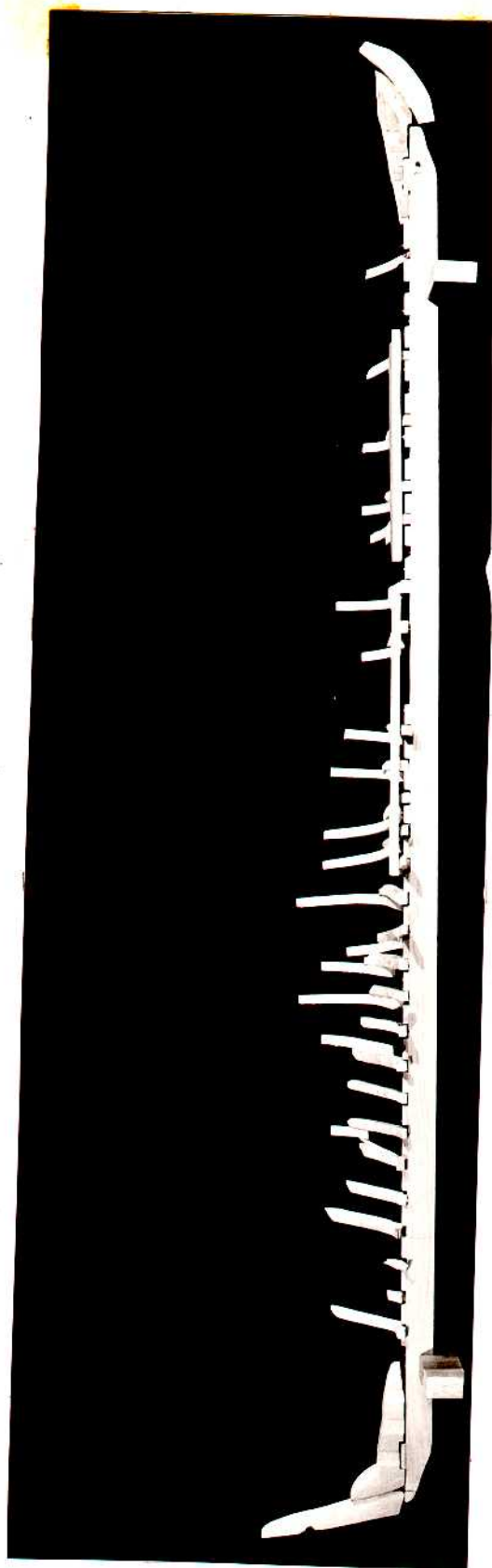


Figure 18. Body Plan of the Griffon Cove Vessel's Hull Lines

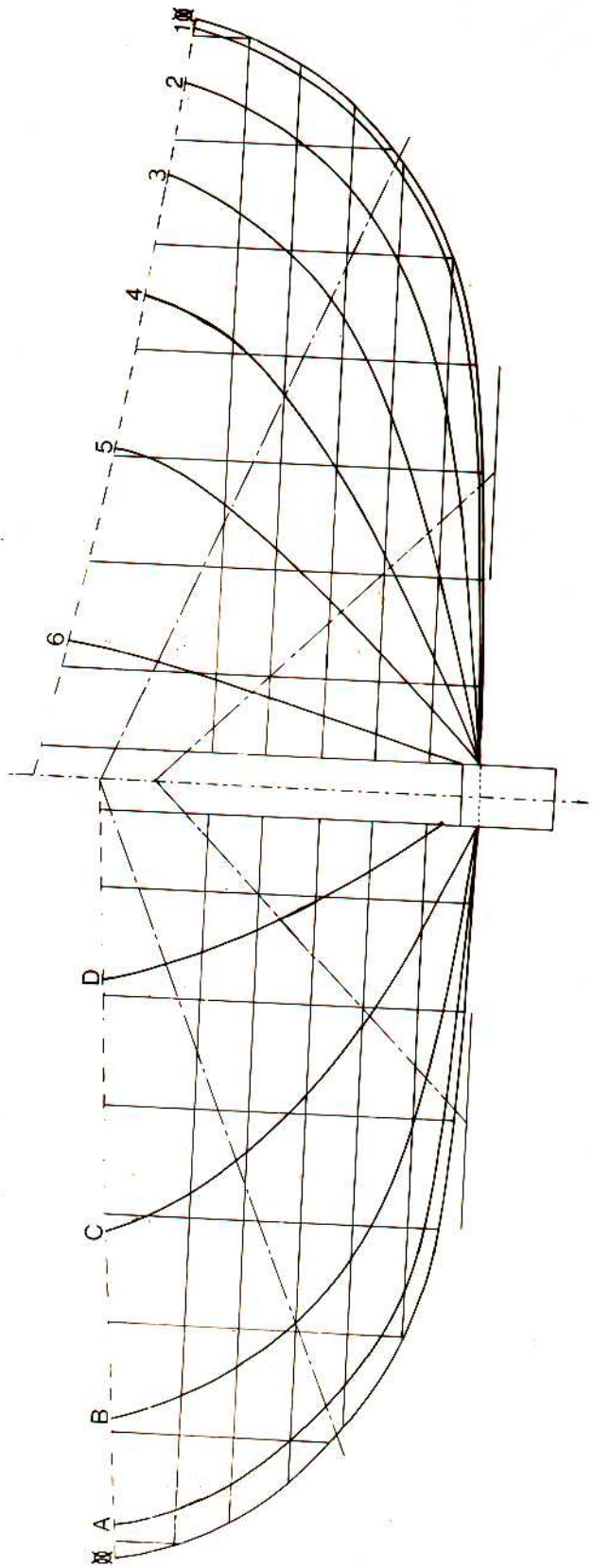
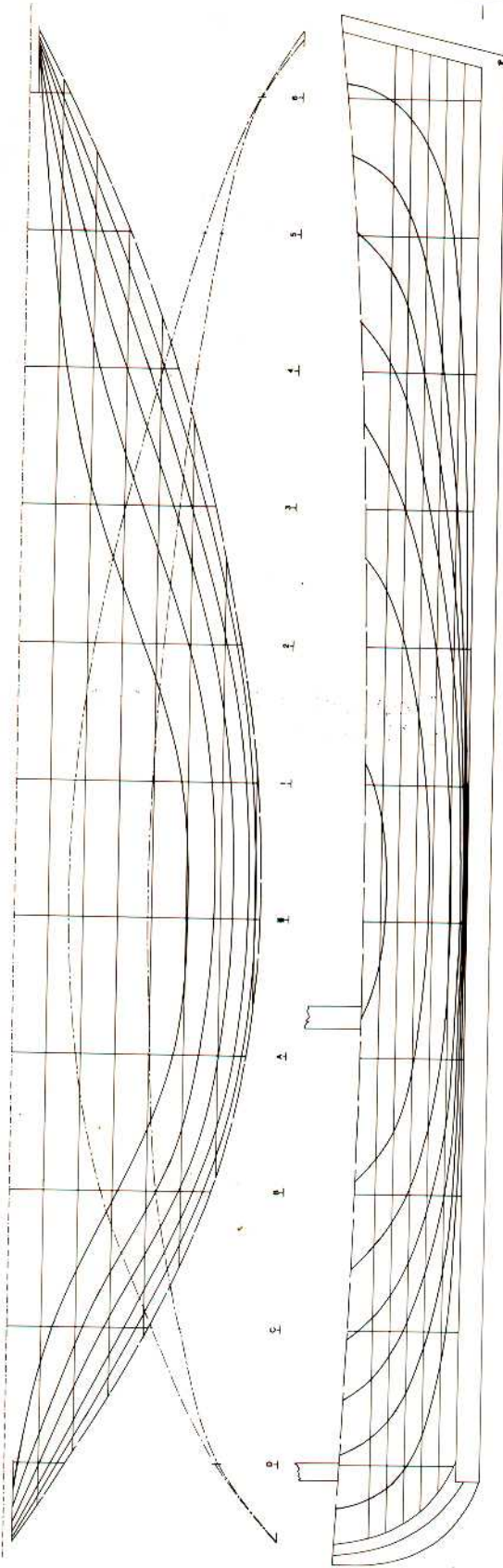


Figure 19. Sheer and Half Breadth Plans of the Griffon Cove Vessel's
Hull Lines



It must be remembered that a set of hull lines is an ideal plan from which a ship can be built. Few vessels ever duplicate their lines drafts precisely. Many factors including availability of timber, quality of workmanship, education and experience of the shipwright, and quality of design contribute to variations between the actual hull construction and hull drafts. No hull is as smooth as the hull lines from which it was built would indicate. Almost invariably there are humps and hollows left by the shipwright's adze. Furthermore, when a vessel is put into service, a number of additional forces act upon the hull; gravity, buoyancy, uneven distribution of weight, sagging, hogging all act to change the shape of a ship once it has been working in its trade.

Once a ship has wrecked, additional forces come to play on the timbers which distort the hull even further from that ideal for which the architect was striving. Wreck damage and the deterioration of wood in water can totally change the appearance of the timbers. One must keep all of these possible distortions in mind when attempting to determine the original hull shape.

The surviving timbers underwent some additional distortion due to the effects of drying. Measurements were taken of the gripe in 1978 with the express purpose of determining what the effect of the natural drying process would be. The results of this test would be directly applicable to the timbers raised in 1955 and would help in determining what, if any, effect the drying had had on their dimensions. After one year, the timber had completely dried and there was no shrinkage or warpage. Furthermore, there were no overall changes in the dimen-

sions of the timber, although there was evidence of surface checking and a few radial cracks (fig. 5f, p. 31). Should the checking process continue due to seasonal changes in the humidity and moisture content of the wood, the effect may be a loss of the outer 0.0625 to 0.125 in. (0.0015 to 0.0031 m.) of the wood's surface. This would yield a net loss of 0.125 to 0.25 in. (0.0031 to 0.0063 m.) of the wood's surface in overall dimensions. These figures show a maximum loss of about 6-1/2% in the timbers' moulded dimension. This is an acceptable loss when one considers that the shrinkage rates for some processes, such as acetone-rosin, can vary between 3 and 5 percent while air dried timber can shrink up to 25% tangentially and 17.9% radially (Bryce, 1975: 39). Normal shrinkage for freshly cut oak is about 8% tangentially and 4% radially (Barkman, 1975: 68). This is slightly more than the loss by surface checking in these timbers.

A plank, with dimensions of 1.5 in. (0.0373 m.) thick x 11.3 in. (0.2858 m.) wide x 12 ft 3.5 in. (3.6885 m.) long (GC-78-01-26), which was raised by the FFPP staff, offers a second look at what effects drying has had on the remains of the Griffon Cove wreck. When it was examined on the bottom and drawn after it had been recovered, this plank showed no signs of deterioration or warpage. In September 1979, when the plank was re-examined, severe warpage and surface checking had occurred. The natural drying process had drastically effected this piece. Shrinkage had reduced its size by 0.25 in. (0.0063 m.) in overall length and 0.15 in. (0.0037 m.) in width and thickness. However, the major effect was not dimensional change but warpage. This plank had warped 2.5 in. (0.0632 m.) over its length and 1.5 in. (0.0379 m.)

in its width; it had also twisted and cupped.

The effect that such distortion has on the reconstruction is significant. The shrinkage is slight but it is enough to move the position of nail holes. This fact, coupled with the possible shifting of nail holes in the frames, could move some matching holes completely out of alignment. Warpage can further aggravate this problem of nail hole alignment. It can alter the angle of nail holes and their angle of entrance into the floors and futtocks. Such problems make the task of matching the placement of the planking on the frames extremely difficult, sometimes impossible. The theoretical placement of floor timbers on the keel would have been one factor which could have been checked had it been possible to match the frames and planking by aligning nail holes.

There may be many reasons why the gripe did not undergo more radical changes when allowed to dry out. The size alone may be the largest contributing factor. The extent to which this piece was waterlogged is unknown. In comparison to the other timbers which were raised in 1955, it seems to have suffered greatly. The additional time that it was submerged could account for this. There is a possibility that once the wood was recovered it was conserved by accident, by the natural processes brought about by winter. Recent research has shown that freeze-drying of wood takes place under the conditions found during Canadian winters (Gratten, 1978: 157). By freeze drying, the waterlogged wood is kept frozen and water is removed through sublimation. This process preserves the dimensions and structure of the timber by removing moisture without the damaging effects of surface tension. It will remain unknown whether or not this process actually took place in the Griffon

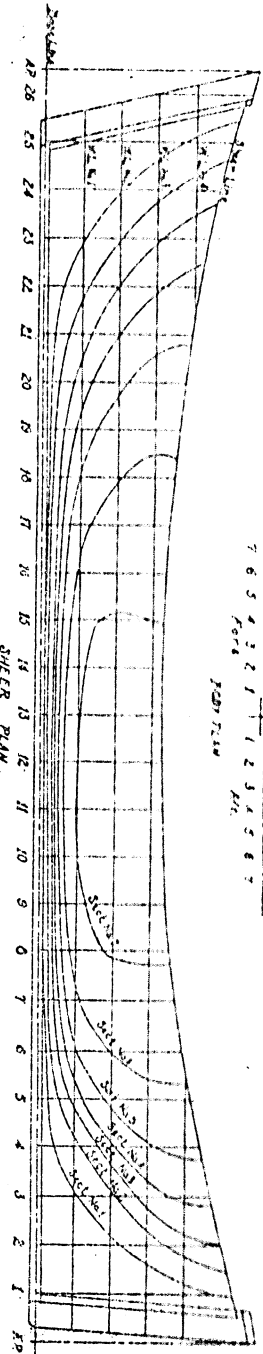
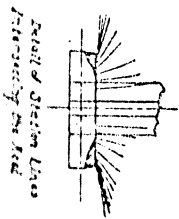
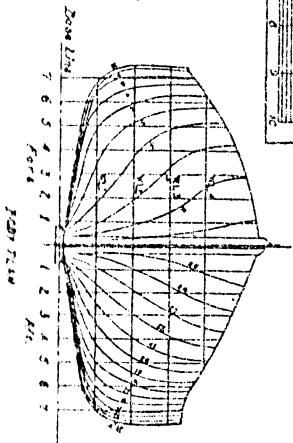
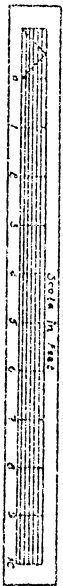
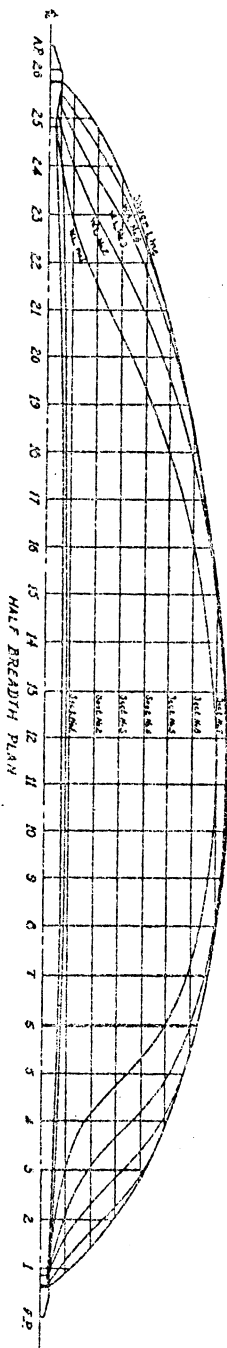
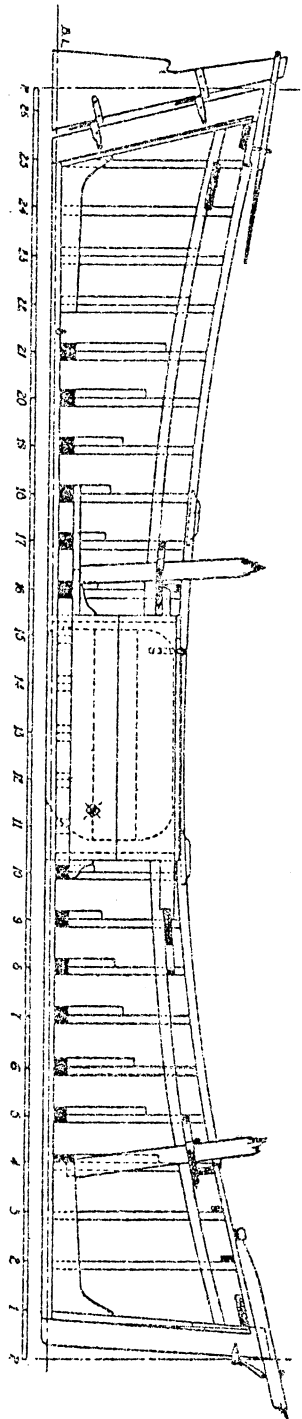
Cove timbers, but it is possible that all of the proper conditions were attained the winter after these remains were recovered and a process of natural freeze-drying helped to preserve them.

The possibility also exists that the conditions under which the gripe was kept were completely different than the conditions under which the other timbers were kept. The number of variables was so great that it would have been difficult to duplicate the circumstances exactly. The importance of the test was that it indicated the major timbers - the keel, stem, stern knee, and sternpost - have most likely not undergone any great dimensional changes in the process of drying.

The hull lines developed from the timbers of the Griffon Cove wreck suggest a variation of a Mackinaw boat, consistent with the type of vessels used on the Great Lakes during the mid-1800s (fig. 20) (Telescope 4:8, 1955, p. 8). The journal of Captain Jesse Wells Church,¹⁰ for example, offers a comprehensive look at a local naval architect and the operation of a small shipyard. Other Canadian and United States shipwrights would have been using similar designs and techniques.

One construction method used at this time according to the journal was that of whole moulding.¹¹ Using this technique, a shipwright would have determined the hull shapes with one or two large fabricated wooden curves. Usually the keel was laid and the stem and stern construction completed before any frames were erected. The midships frame* was the first to be fashioned and attached to the keel. Control frames were erected every third or fourth frame from midships towards the bow and the stern. Wooden battens, which served to describe the shape of the hull to which the other frames were cut, were attached across the control

Figure 20. Hull Lines of A Mackinaw Boat



frames. This method worked well in the middle of the ship but could not be used to determine the shape of frames at the extreme ends of the ship. To remedy this problem, the builder usually planked the ship and then returned to shape and attach the last frames.

Hull lines did not have to be drafted before a ship was built by the whole moulding techniques, although this was often done anyway. A builder using the whole moulding method could build "by eye", following no formal lines drawings. The construction features seen in the Griffon Cove vessel do not indicate whether or not drafts were made before it was built. In any case, the form of construction reflects the work of an experienced shipwright.

The technique of whole moulding was primarily used for boats somewhat smaller than the Griffon Cove vessel, approximately 30 to 35 feet (9.0 to 10.5 m.) in length. It had been thought that this was a method which was used in the 1700s and into the early 1800s. The significance of the Griffon Cove vessel is that it suggests that this construction technique was used for larger vessels and more recently than had been suspected. The journal of Captain Church contains a reference to a sharp-sterned Mackinaw built in August of 1864 and sold for \$100.00. This source confirms that boats of this type and size were being built in the upper Great Lakes at the same time the Griffon Cove vessel appears to have been built and used. The journal also includes descriptions of many construction features that are seen in the Griffon Cove vessel.

The construction features of the Griffon Cove wreck indicate that a method of whole moulding was used to determine the shape of the ship.

All futtocks used in the framing of this ship had the same curvature that was used in the midship frame. This curvature never changed; only the angle between the floor timber and the horizontal base line, and the distance between the keel centerline and curve of the frames varied. This same curvature occurs three times in the stem construction. The curve of the stem rabbet, forward face of the stempost, and forward face of the gripe all display the curvature of the midship frame, which is then the single mould used to construct this vessel.

Additional evidence of whole moulding is seen in the fastening of the floor timbers and futtocks. Certain frames were fastened in two places, suggesting pre-erected frames which would have been used as control frames. The fastening of the half frames to the stempost and stern knee also supports the use of whole moulding. These frames were fastened with a single nail suggesting they were put in after the other framing was complete and the planking in place. Such construction was typical in vessels built by this technique.

The difficulty that was encountered with the failure of timbers to produce fair hull line in the first attempt to arrange them was remedied by the discovery that this vessel may have been constructed using the whole moulding technique. The reconstruction then proceeded under the hypothesis that the similarity of curvatures among the futtocks allowed their placement in the hull based on whole moulding principles.

In development of the hull lines the floor timbers and futtocks were the most numerous and easily identifiable parts of the ship which made the body plan the most helpful perspective in this reconstruction.

The angle and shape of the floors were rough indications of the relationship of one frame to another. If the plan was to indicate a seaworthy vessel, there would be a smooth progression in the lines from one frame to another. It was the body plan which first indicated the order of the frames on the keel. The enlarged bolt holes in the floor timbers also had to be taken into account, causing a margin of error which was unavoidable. Their exact angle off the keel is unknown, but the frames were arranged in a "best fit" order within the tolerance dictated by the bolt holes.

Waterlines were used to draft a half breadth plan. This "top view" showed errors in the sequence or angles of the floor timbers, as shown in the body plan. The body plan, sequence of floor timbers, or their angle off the keel was corrected to obtain fair lines on the half breadth plan. Once these two plans had been corrected for the elevations of floor timbers, the futtocks were added to the body plan and the process of fairing the hull lines was repeated.

The third view, the sheer plan, acted as a check of all of the work done thus far since it introduced a new dimension. Minor adjustments were needed in the angle of some of the half frames in the bow and stern and in the hypothetical curvatures of futtocks which had been extended beyond the actual remains.

Finally the diagonals were added. These form a separate set of control lines which, when combined with the three views in the body, half breadth and sheer plans of the hull, act as a geometric proof that the hull lines are correct. The diagonals, to be most effective as a check, should cross the stations of the body plan as nearly perpendicu-

far as possible. For such a small and shallow hull as this one, only two diagonals are needed.

This process resulted in a set of hull lines which described the Griffon Cove vessel as reconstructed. It satisfied the shapes and angles dictated by the timbers which were examined. Within a reasonable margin of error, a hull could be built from this set of lines and all of the timbers raised in 1955 and 1978 would fit or match those used in the construction of the replica.

The Griffon Cove vessel had an extreme length overall of 44 ft. 9 in. (13.4277 m.), a beam of 14 ft. 7 in. (4.3771 m.) and a reconstructed depth at the sheer of 3 ft. (0.9 m.) at midships, 3 ft. 5 in. (0.9126 m.) in the bow, and 4 ft. 9 in. (1.4277 m.) in the stern (Appendix B). The calculated tonnage of the vessel could range from 12 to 17 tons. Church's journal notes the rule which was used for obtaining tonnage at that time:

? → To get government tonnage of a model before built from the extreme length (exclusive of posts and planks in all cases) overall deduct the extreme breadth - the product of the sum then obtained into the extreme breadth and depth from the underside of plank sheer to the upperside of keel divided by 100 will be the Government tonnage very nearly (usually within a few fraction) (Church, ca 1850: 4).

Using this rule with the dimensions of the Griffon Cove vessel noted above, one obtains the formula $(43 - 15) \times 15 \times 3/100$. This equals 12.6 tons. Had the sheer been higher than reconstructed, the breadth would not change significantly; the maximum possible sheer height would change the equation to $(43 - 15) \times 15 \times 4/100$. This would yield a maximum government tonnage of 16.8 tons.

The journal of Captain Church also gives the formula used to obtain the carpenter's tonnage:

To get carpenters tonnage on a model before being built from _____ from the extreme length (as above) [exclusive of posts and plank in all cases] deduct (1/2) one half the beam and all the depth from the underside of plank sheer to upper side of keel - This product into the beam and depth as above divided by 100 will give the carpenters tonnage very nearly. (Church, ca. 1850: 4).

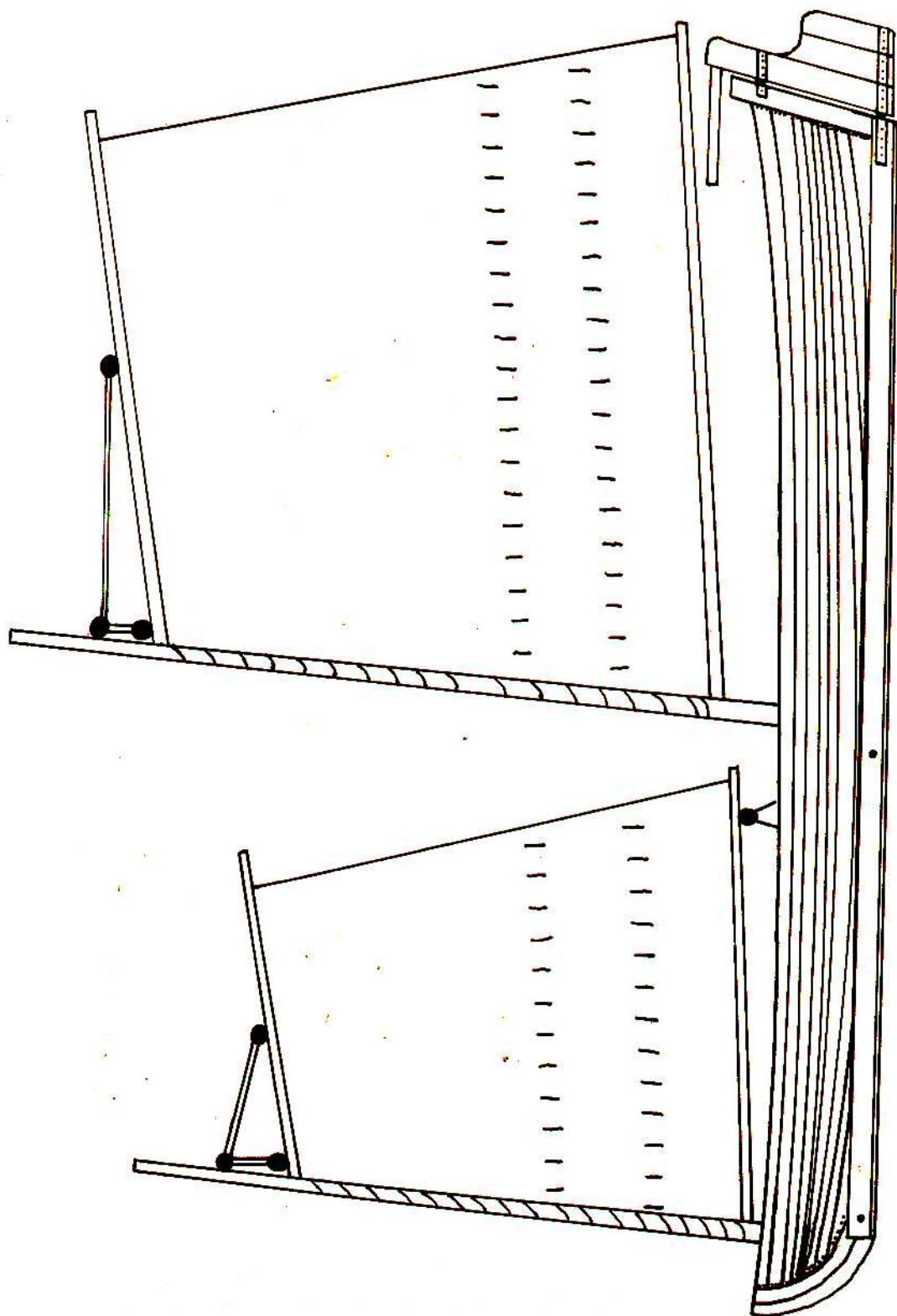
This equation shows the carpenters tonnage of the Griffon Cove vessel as $(43 - 7.5 - 3) \times 15 \times 3/100 = 14.625$ tons, or if the sheer were 4 ft. above the keel, $(43 - 7.5 - 4) \times 15 \times 4/100 = 18.9$ tons.

A graphic reconstruction of the Griffon Cove vessel was drawn, complete with sails and rigging, based on contemporary plans and publications (fig. 21). The hull remains found on Russel Island gave no information about the rig which may have been used, except for the placement of the two masts. The rig shown in the drawing is compatible with the reconstructed hull lines and will allow one to better visualize the Griffon Cove vessel while it was afloat.

Recommendations

From these conclusions, it is clear that the Griffon Cove wreck is typical of a boat type common to the Lake Huron - Georgian Bay area in the mid 1800s. It is important to preserve relics of the past that are indicative of a way of life that is all but forgotten. There were no records to be found on this exact hull type or the technology used to build it. The Griffon Cove wreck was most probably the result of an individual who built or had this vessel built for his own subsistence on the Great Lakes.

Figure 21. Griffon Cove Vessel as Reconstructed



Fathom Five Provincial Park has an excellent opportunity to use its facilities and the artifacts in the Vail collection to educate those interested in the history of this area. Material in the Vail collection includes tools and other items used in the logging, fishing and boat-building industries which were thriving on the Bruce Peninsula and waters of that area at the time when the Griffon Cove wreck was sailing on those waters.

I would suggest that an interpretive display be planned and set up at the Park's land base. This exhibit should include a representative display of the artifacts from the Vail collection. This display could depict with graphic and written information the activities which took place in the building of a ship. Included should be the logging of the timber, sawing of the planks, the remains of the Griffon Cove wreck could be displayed using the major structural timbers set up as though the ship were being built, i.e., on stocks with the keel, stem, stern and control frames. I do not feel that all of the timbers should be used. Activities such as adding of frames, lofting of the futtocks and the stretching of battens could be depicted with graphics in a background scene. Additionally, a model should be made of the Griffon Cove wreck using the lines developed in this thesis. This type of reconstruction would give a view of the completed ship in contrast to the actual remains displayed as if being built.

This type of interpretive center could be constructed in the facilities already available to FFPP. With forethought and planning the display could be built in such a way as to require a minimum amount of material and could utilize park staff, not necessitating additional

employees. Minimum security would be needed and the excellent condition of many of the pieces may allow for a "touch and feel" display where visitors could handle or possibly use the tool of the trades. With the continuing support of the FFPP by government programs such as Project Experience, the talent of student artists or those in college museology courses could be elected to provide the expertise needed to prepare such an exhibit while gaining valuable educational and work experience.

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NOTES

1. René Robert Chevalier, Sieur de la Salle, was born November 21, 1643 to a family of wealthy merchants. La Salle entered the Jesuit order at age 15 and at age 22 asked to be released. His oldest brother, a priest in Montreal, told him of the adventures to be found in Canada. In the spring of 1666 la Salle sailed to Canada and obtained a land grant about nine miles from Montreal, on the shores of Lake St. Louis. It was here that la Salle learned from local Indians of the lands to the west and the Mississippi River, which flowed to the sea. For more information see: Abbott, John S.C., The Adventures of Chevalier de la Salle and his Companions, Dodd, Mead, and Company, New York, 1875.; Cox, Isaac Joslin, ed., The Journeys of René Robert Chevalier Sieur de la Salle, vol. 1, A.S. Varnes and Company, New York, 1905.; Terrell, John Upton, La Salle: The Life and Times of an Explorer, Weylright and Talley, New York, 1974.

2. A distinction should be made between Griffon and "Griffon" as they are used throughout this work; Griffon refers to the ship built by Robert La Salle and any historical references to it, whereas "Griffon" refers to the timbers, found on Russel Island, which are the subject of this thesis.

3. For the lay reader a glossary appears as an appendix to this work. The first use of a word which appears in the glossary will be designated by an *.

4. For a more complete description of hull lines see: Chapelle, H. I., History of American Sailing Ships, 1951, 19-23.

5. For more details of La Salle's travels see the references listed in note 1.

6. Louis Hennepin was born in Belgium about 1640. Little is known of his early life, but it seems that he was still quite young when he entered a Recollect convent in France. Young Hennepin yearned to travel. Early in his life he journeyed through Italy and Germany visiting the churches and convents of the Order. Hennepin was set on a mission to Calais where he was first exposed to sailors and stories of their voyages. In 1675 Hennepin was sent to Quebec where he met la Salle. In his earliest writings Hennepin says that he and la Salle were friendly. After la Salle's death, Hennepin's writings take on a different tone, stating that la Salle harbored a hatred of the friar and that it was not la Salle but Hennepin who actually planned and explored the Mississippi.

Hennepin was appointed by his superiors to accompany la Salle on his exploration of the continental interior. His mission was to preach to the isolated groups of settlers and convert the Indians.

Much of what is written by Hennepin is contradicted by others. It seems that Hennepin was driven by an enlarged ego to claim more credit than he deserved for his contributions to the expedition. For more information see: Thwaites, Reuben Gold, ed., Father Louis Hennepin's A New Discovery of a Vast Country in America, A.C. McClurg & Co., Chicago, 1903.; Chesnel, Paul, History of Chevelier de la Salle, G.P. Putnam's Sons, New York, 1932.

7. Henry de Tonty was born in 1649-50, somewhere in France, possibly Paris or Naples, but was Italian by parentage. He entered the army as a cadet in 1668. He transferred into naval service and in one battle lost his right hand. In 1678, Tonty was appointed la Salle's lieutenant on this venture to the Mississippi. Further details may be found in Murphy, Edmund Robert, Henry de Tonty, Fur Trader of the Mississippi, The Johns Hopkins Press, Baltimore, 1941 and Shea, John Gilmory, Discovery and Explorations of the Mississippi Valley, Joseph McDonough, Albany, 1903.

8. The Ontario Ministry of Natural Resources accession number designates each timber as part of the Vail collection (OCV) or Griffon Cove Survey (GC), the year of acquisition (-77 -78 -79), and the individual artifact number (-01, -02, 03,...).

9. The first English lock was patented in 1774, thus the word would not appear on a lock prior to this date. In addition, locks prior to 1790 had no escutcheons and keyhole covers were made of iron. The brass keyhole cover came into being in 1790. The inscription "GR" indicates that this design was patented during the reign of King George III or IV. This gives a date range for manufacture of the lock ca. 1790-1830. If the shelf life and use life of the lock are taken into account, it could well be from a wreck dated ca. 1850 (McClellan, 1978: appendix E).

10. The Journal of Captain Jesse Wells Church, a resident of Sault Ste. Marie, Michigan, was a physician and boatbuilder. He engaged in the latter activity at Church's Landing, on Sugar Island, for about forty years, from the 1850s through the 1890s. Most of the vessels Captain Church built were small shifts or sailing vessels of the fifty-foot category, although he did produce some steam vessels.

This journal, covering the period ca. 1854-1892, includes descriptions of the vessels Captain Church built, their specifications, and such related information as equipment lists, sail plans, and drawings. Mrs. Sally Landreville of Drummond Island, Michigan, loaned the original to the Center for Archival Collections for microfilming.

11. For a more detailed description of whole moulding see: Chapelle, American Small Sailing Craft, W. W. Norton & Co., Inc., New York, 1951.

APPENDIX A

Glossary of Ship Terminology

Amidships - the middle of the ship half way between the bow and stern

Apron - an internal timber attached to the stempost to strengthen it

Bateau - a flat-bottomed, double-ended boat

Beam - the width of a ship

Bilge - the curve of the hull below the waterline

Bowsprit - a heavy spar projecting forward of a vessel from which the headsails are set

Cant frame - a frame in the bow or stern which is not perpendicular to the keel

Ceiling - the inside planking of a vessel

Centerboard - a keel-like device which is capable of being raised and lowered in a well for the purpose of adding keel area to a vessel

Clamp - a heavy ceiling timber behind a wale on which deck beams rest

Control frames - pre-erected frames used in whole moulded construction to describe the shape of a vessel and guide in the shaping of other frames

Dead rise - the angle of a floor timber above the horizontal baseline

Dead weight capacity - the carrying capacity of a vessel beyond its own weight

Deadwood - solid timbers bolted on top of the keel in the stern of a vessel

Depth of hold - the distance from the top of the floors amidship to the top of the deck beams

Double-ended - a vessel having a similar bow and stern, a sharp entrance and exit to the water

Draft/draught - the depth of water necessary to float a vessel

Drift bolt - an iron fastening which is driven into a hole drilled slightly smaller than the bolt diameter and which holds by pressure alone.

False keel - a timber added to the bottom of the keel to protect it from damage

Floor - the lower portion of a frame which crosses the keel and is bolted to it

Forefoot - see gripe

Forelocked bolt - an iron drift bolt which is slotted for a key to be inserted to secure the fastening

Frame - the skeleton structure of a vessel, rising from the keel and made up of a floor timber and futtocks

Futtock - the upper portion of a frame; a wooden frame is often made up of several futtocks attached to a floor timber

Gaff ketch - a vessel with square mainsail and gaff rigged sail on mizzen

Garboard - the first strake of planking which is next to the keel

Gripe - the outermost timber at the point where the stem joins the hull

Gunwale - the uppermost wale of a vessel; the rail of a boat

Half frame - a frame which does not cross the keel, but extends up from the side of it

Hull lines - a set of three drawings showing lines which describe the shape of a vessel

Keel - the backbone of a ship from which the frames rise and to which the stem and stern are attached

Keelson - a longitudinal timber on top of the keel for reinforcement

Knee - a right angle strengthening and support piece

Midship frame - the frame at the broadest portion of the hull

Moulded - the measurement across the outer frame face or longitudinal dimension of a timber

Plank - an individual timber attached to the outer frame faces

Port - the left hand side of a ship when one is on board facing forward

Rabbit - a groove cut into the keel, stem, and sternpost in which the planking lies

Ribs - see frame

Round-built - see double-ended

Scarph - a joint used to fasten two timbers together

Sharp-sterned - see double-ended

Shoe - see false keel

Sided - the measurement of height or width as seen in the body plan of a ship

Spritsail - a sail held up by a diagonal spar

Starboard - the right hand side of a ship when one is on board facing forward

Stem - the foremost timber in a vessel

Stemson - an inner stem for additional support

Stern knee - a knee which strengthens the stern construction and to which the sternpost is attached

Sternpost - a perpendicular timber erected on the after end of the keel

Sternson - an inner sternpost for additional support

Stopwater - a treenail driven through the stem and keel where they join at the gripe

Strake - a continuous line of planks which run from bow to stern

Stringer - a fore and aft strengthening timber, often named for the area which it supports

Square-sterned - a vessel with a transom

Ton - a unit of measuring tonnage, 1 ton equals 100 cubic feet

Tonnage - the cubical content of a ship divided by 100

Transom - a flat vertical stern of a ship which usually overhangs the keel

Treenail/Trunnel - a wooden fastening used to secure timbers

Tun - also measurement ton, 1 tun equals 40 cubic feet

Wale - a thick planking strake which strengthens and protects the side of a vessel

Water courses - holes cut in the outer face of floor timbers to allow free passage of bilge water to the lowest point in the vessel

VITA

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Experience:

Summer 1980 - Co-director, Texas A&M Field School

A five week project undertaken with the Virginia Research Center for Archaeology (VRCA). The school provided an opportunity for eight graduate students to participate in a short-term underwater excavation. Responsibilities as co-director included organization of the students prior to their departure from Texas, site preparation before starting excavation, administration of the budget, and coordination of the daily dive activities. Responsibility for evaluation and presentation of data will be shared by the three co-directors.

Spring 1979 - Assistant Director, Cayman Island Survey

An archaeological survey using proton magnetometer and radar positioning. This work resulted in a cultural resources inventory of shipwreck sites and recommendations on the basis of which the government may enact a comprehensive antiquities law governing submerged sites. Responsibilities on this project included equipment acquisition, and administration of the budget. Field duties included assisting in the coordination of the personnel and logistics, as well as collection and evaluation of survey data.