

Technology and Empire: Comparing the Dutch and British Maritime Technologies during the Napoleonic Era (1792–1815)

By

Ivor Mollema

December, 2015

Director of Thesis: Dr. Lynn Harris

Major Department: History

The two ships, *Bato* (1806) and *Brunswick* (1805) wrecked in Simons Bay, South Africa, provide an opportunity to compare British and Dutch maritime technologies during the Napoleonic Era (1792–1815). The former was a Dutch 74-gun ship of the line and the latter a British East Indiaman. Their remains reveal pertinent information about the maritime technologies available to each European power. Industrial capacity and advanced metal working played a significant role in ship construction initiatives of that period, while the dwindling timber supplies forced invention of new technologies. Imperial efforts during the Napoleonic Era relied on naval power. Maritime technologies dictated imperial strategy as ships were deployed to expand or maintain colonial empires. Naval theorists place the strategy into a wider spectrum and the analysis of the material culture complements further understanding of sea power. The study also recommends management options to preserve the archaeological sites for future study and to showcase for heritage tourism.

TECHNOLOGY AND EMPIRE:
Comparing Dutch and British Maritime Technologies
During the Napoleonic Era (1792–1815)

A Thesis

Presented To
The Faculty of the Department of History
East Carolina University

In Partial Fulfillment
Of the Requirements for the Degree
Master of Arts, Program in Maritime Studies

by

Ivor Mollema

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Ivor Mollema

APPROVED BY:

DIRECTOR OF THESIS: _____
Dr. Lynn Harris, Ph.D.

COMMITTEE MEMBER: _____
Dr. Wade Dudley, Ph.D.

COMMITTEE MEMBER: _____
Dr. Bradley Rodgers, Ph.D.

COMMITTEE MEMBER: _____
Mr. Jaco Boshoff, B.A. Hons

CHAIR OF THE DEPARTMENT OF HISTORY:

Dr. Christopher Oakley, Ph.D.

DEAN OF THE GRADUATE SCHOOL:

Dr. Paul Gemperline, Ph.D.

Acknowledgements

Completion of this work would not have been possible without the help of several individuals and organizations. Dr. Lynn Harris, thesis advisor, assisted in the field, with research, and editing. Dr. Wade Dudley provided excellent feedback on historical sources and thesis writing. Dr. Bradley Rodgers assisted with insight into ship construction techniques and the conservation of underwater artifacts. I would also like to thank East Carolina University's (ECU) Program in Maritime Studies for allowing me to complete my research and pursue my goals. The program also embedded a dedication to scholarly excellence and an ambitious pursuit of knowledge. The efforts of the staff of Joyner Library at ECU greatly assisted my efforts. Fellow Maritime Studies students provided continued support and assistance throughout the entire process. Jaco Boshoff and Jake Harding of the Iziko Museums were extremely helpful in assisting my research. They were very welcoming, allowing me access to their artifact collection and provided additional information on previous archaeological work. The South African Heritage Resources Agency (SAHRA) provided archival and archaeological background. SAHRA employees Tara van Niekerk, Sophie Winton, and Stephanie-Anne Barnardt also assisted in research and during archaeological investigations. Staff at the Netherlands National Archives offered every aid while consulting their collections for primary historical information. The Western Cape Provincial Archives and Records Service supplied local historical sources and data for a complete historical picture. The Simons Town Museum also provided access to their collections for research. Pisces Divers Cape Town allowed for the use of their shop as a launching pad for our diving operations while Simons Town Backpackers provided food and accommodation during our stay. Clive de Bruyne and the staff of the Cape Town Tour Guide Company organized our itineraries and some of our further stays.

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Chapter 1: Introduction

Bato was a Dutch 74-gun, or third rate, ship of the line that served in European and Southern African waters. *Brunswick* was a British East Indiaman that completed six voyages to the Far East before being captured by the French. Both vessels wrecked in Simons Bay, South Africa and present a unique opportunity to compare the maritime shipbuilding technologies available during the Napoleonic Era (1792-1815). Maritime technologies influenced the outcome of imperial efforts and require close examination and comparison. Placing archaeological data in a framework of historical trends forms a fuller picture of notable trends and events.

Bato was constructed in 1784 in Rotterdam while *Brunswick* was constructed in 1792 in London. Both vessels wrecked within six months of each other: *Brunswick* in September 1805 and *Bato* in January 1806. The remains are located within 200 meters of each other. Due to their contemporary construction and wrecking dates, they provide an opportunity to juxtapose the technologies available to British and Dutch maritime organizations and analyze the role any disparity played in the success of the British in empire building and the loss of most of the Dutch colonial possessions. Specific research questions for this project include:

Primary

- What shipbuilding technologies were utilized by British and Dutch government fleets in the early 1800s and did any of these technologies provide an imperial advantage, or sea power, to either nation?
- How does the archaeological record of the two shipwreck case studies, *Bato* and *Brunswick*, and associated primary source documents reflect these advantages or disadvantages?

Secondary

- Why did nations develop, or not develop, different technologies?
- To what extent did the two nations use the technology of copper?
- How and why did British and Dutch use iron knees?
- What is the origin and use of different wood types the two nations used to build the two ships?
- Comparatively, what was the style of construction used for *Bato* and *Brunswick*?

Tertiary

- What are the options to showcase and manage the shipwreck sites of *Bato* and *Brunswick* taking into consideration their historical context as sea power icons, the archaeological integrity on the seabed, and their place within the naval landscape today?

A Short Overview

The Cape Peninsula in South Africa served as one of the most strategic military bases in the world during the 18th and 19th centuries (Rippon 1970:303-309). Controlling the Cape placed a stranglehold on trade between Europe and Asia. The area also served as a base for naval actions and commerce raiding (Marcus 1971:56–58). The case studies of two shipwrecks, *Bato* (1806) and *Brunswick* (1805), are iconic representatives of Simons Town Bay, in the Cape Peninsula, serving as a smaller arena for global politics.

For much of modern history, global imperial efforts focused on the capture of the Cape. The Dutch first settled the region in 1652 as a victualing station for ships of the *Verenigde Oostindische Compagnie* (VOC) voyaging to the Far East. Colonists established a hospital, several farms, basic dockyard facilities, and a colonial administration. Rival European powers saw the strategic value of the colony and did everything possible to undermine its value or capture

it (Turner 1966). The English used the small island of St. Helena in the South Atlantic as their strategic base in the area, while the Portuguese established a foothold in Mozambique, and the French utilized the island of Mauritius. Despite the creation of these strategic European bases, a force based in the Cape still had the potential to strangle any East-West trade that travelled from other colonies (Rippon 1970:303).

Dutch possessions at the Cape of Good Hope soon became embroiled in Napoleonic conflicts originating in Europe. The British captured the colony in 1795 and 1806 to prevent its use as an enemy naval base. During this time, the Dutch and French launched naval expeditions to recapture the colony which were repulsed by British naval might at Saldanha Bay ((Turner 1966:186). Privateers and naval vessels used the colony as a base for commerce raiding expeditions in the Indian Ocean. Naval strategy, aided by the arrival of new technology, dictated the strategic importance of the Cape of the Good Hope during the Napoleonic Era.

Theory analysis focused on naval theory in combination with historically documented naval policies. Castex, Corbett, and Mahan were designated as key naval theorists. Each one presents different views on the use of naval power. Comparative analysis already exists for historical policies, which are placed within the theoretical framework. Technology factors into both the strategic thinking and historic policies. The importance of its influence is analyzed and presented to the success of one imperial power of the other.

Methodology

ECU students and faculty conducted a Phase I pre-disturbance survey of the shipwreck sites. Methodology was designed to supplement previous research and provide the archaeological data required for final analysis. The following, undertaken by the ECU team, included:

- Creating a preliminary not-to-scale reconnaissance map, or mud map

The mud map allowed for an initial orientation and assist in further mapping and data gathering exercises. It was not drawn to scale and showed the basic layout of the site. The locations of key features were noted.

- Tagging timbers for organizational mapping purposes

Team members documented all tagged timbers. Timber samples were also removed from tagged diagnostics timbers.

- Scantling measurements

Labeled timbers were measured for molded, sided, and length dimensions. These included frames ceiling planking, and hull planking.

- Wood sampling

Samples were removed using a saw, hammer, and chisel. Bagged samples were sent to a lab for further analysis.

- Measuring iron knees

Brunswick's iron knees were measured for comparison and identification within the larger framework of a British East Indiaman.

- Measuring an Anchor

An anchor identified on *Bato* was recorded for identification. Historical treatises were used to classify the anchor.

- Photography and videography

All activities were documented using a GoPro Hero3+ camera and an underwater photo camera.

- Cannon Measurements

Cannons located on the Simons Town Jetty were salvaged from *Bato*. Measured analysis revealed the artillery carried by *Bato* and, by extension, other Dutch naval ships. Historical sources are used for comparison with British naval armaments.

➤ Documentation of *Bato* and *Brunswick* artifacts held at the Iziko Maritime Center Artifacts were photographed and selected objects were measured for comparison. Special attention was paid to fasteners and copper sheathing.

➤ Historical Research

Primary sources featured heavily in historical analysis, especially logbooks and local newspapers. Secondary sources provided a wider outlook to help correctly place details obtained from historical sources.

Literature Review

A gap analysis was undertaken in order to guide further research efforts. Several journals, theses collections, and conference proceedings were examined for references to British and Dutch maritime archaeological sites. Major journals include the *International Journal of Nautical Archaeology* (IJNA) and the *Journal of Maritime Archaeology* (JMA). The two publications focus on different aspects of maritime archaeological thought and allow for the investigation of varying site types. A more complete academic picture is formed as a result. Theses collections include those published by East Carolina University (ECUT), Texas A&M University (TAMUT), and the University of West Florida (UWFT). *Proceedings of the Society for Historical Archaeology* (SHA) and the *Australian Institute for Maritime Archaeology* (AIMA) were examined as well. The collected academic publications examine different aspects of the field and cover a large portion of the globe, providing as complete a picture as possible.

All site types are included in the gap analysis results. After determining the nationality of the archaeological remains, a single addition was made to the relevant time period. For example, any mention of the shipwreck *Batavia*, wrecked in 1629, adds to column of 17th century Dutch maritime archaeology sites. This process continued until all sites were placed in the appropriate columns. In the case of chronological overviews, an addition was made to each century covered in the scholarly work. Some articles provided overviews of the Honourable East India Company (HEIC) and the VOC for the time period 1600–1800. As such, they increase totals in the 17th and 18th century columns.

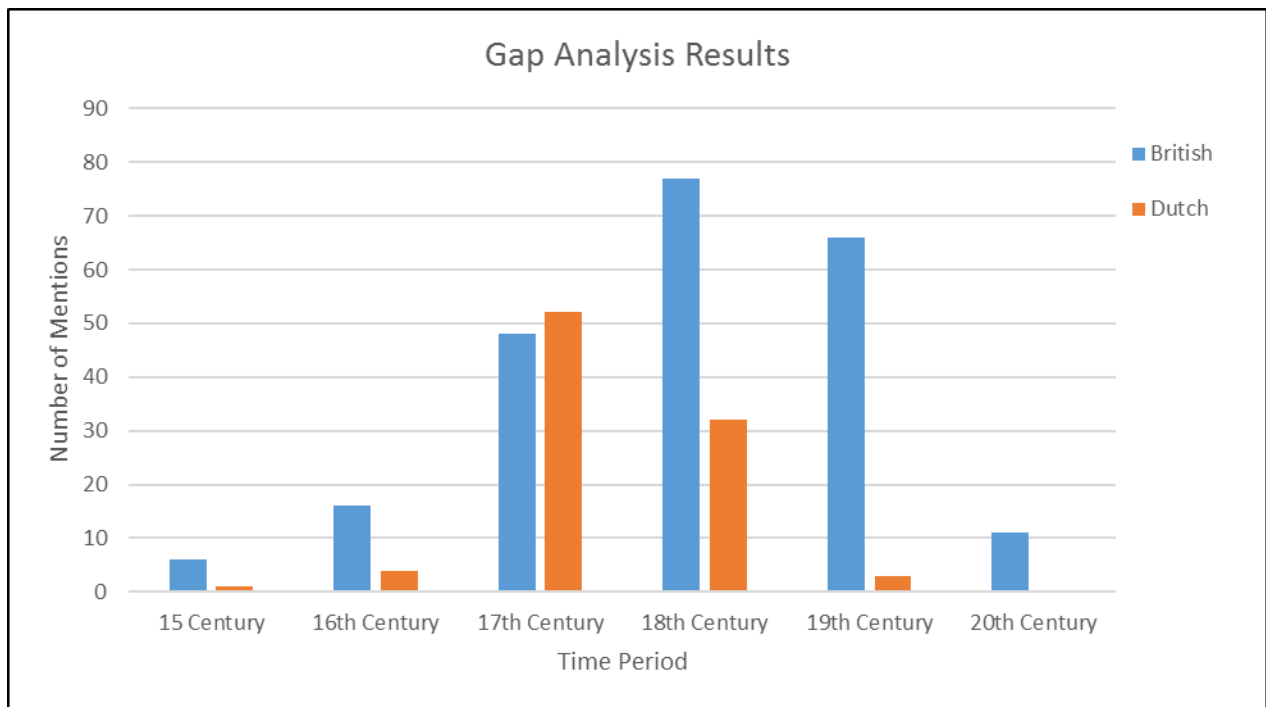


FIGURE 1. Gap Analysis Results (Author, 2015).

There is a lack of archaeological work on late 18th century and early 19th century Dutch shipwrecks (FIGURE 1). The latest confirmed date of a Dutch shipwreck is 1749 with the Dutch East Indiaman *Amsterdam*. A possible identification accompanies a shipwreck found during the expansion of the Cape Town V&A Wharf. The remains indicate a ship of Dutch design from the

late 18th century, but no ‘smoking gun’ has been located yet. British sites are extensively covered in the published archaeological record. Only 17th century sites are covered in anything approaching equal distribution. Eighteenth and Nineteenth century sites are overwhelmingly British. Sites dated to the 15th, 16th, and 20th centuries are barely covered when compared to other time periods for both nations.

Work on *Bato* and *Brunswick* is justified by the paucity in work on contemporary Dutch shipwrecks. Dutch shipwrecks are severely underrepresented in the archaeological record of the late 18th and early 19th centuries. Remains of the Dutch warship in Simons Town present an excellent opportunity to start closing this gap. Future inclusion of other sites in South Africa, including terrestrial ones, would allow for continued studies that further closes the gap in the archaeological record. Extensive work does exist for British ships, but most of the studied East Indiaman are dated to earlier in the 18th century, confirming the archaeological relevance of continued investigations on *Brunswick*. Work performed as part of this thesis aims at closing the archaeological knowledge gap.

Primary Sources

Primary data exists for both *Bato* and *Brunswick* in three locations. Logbooks and other documents relating to *Bato* are located in the Netherlands National Archives in the Hague. First mate Harteke kept a detailed logbook from 31 July 1802 to 9 January 1806. Three volumes cover the entire time period. Daily entries record wind direction, direction of travel, and any significant events of the day and take up only two lines. Descriptions of storm damage suffered en route to Batavia and the final burning are of particular importance (Appendix E). Unusual events, like the landing of Governor-General Janssens and encounters with other ships, take up more space. First lieutenant Melville recorded events in a similar manner, but only from 9 July 1802 to 13 May

1804. Events relating to Governor-General Janssens are covered in detail. Melville's status as a high ranking officer likely allowed for greater access to the future rule of the Cape Colony. A fire in the Dutch Admiralties Archive in 1844 limited the amount of archival information available (NL-HaNA, Marine suppl. 2, 2.01.29.03, inv.nr. 8).

Maps detailing the Cape Colony, its fortifications, and the Battle of Blaauwberg are available at the Dutch archives. Period maps of the colony show details of South African coastlines as recorded by Dutch and British explorers. Those detailing fortifications put in place by the British in 1796 are of greater interest. Advanced defenses were constructed during the First British Occupation in an effort to ward off further aggressive actions against the Cape colony. Unfortunately, Dutch forces did not have sufficient manpower to man the new defenses in January 1806. Troop movements prior to and during the Battle of Blaauwberg (8 January 1806) are displayed on a single map. Individual regiments are labelled and maneuvers during the battle are clearly indicated.

Western Cape Provincial Archives and Records Service (WCPARS), located in Cape Town, holds primary documents relating to the Cape Colony under Dutch and British control. Documents are available in both the original language and translated into English. Large volumes relating to specific topics are common. For example, entire books containing written material associated with Governor-General Janssens are available for perusal. In some cases, volumes contain handwritten copies of a later date. Entry logs recorded the arrival and departure of all ships to the harbors in False Bay and Simons Town. Numerous trips taken by *Bato* and accompanying Dutch naval ships are recorded here. *Brunswick's* wrecking event and arrival with *Belle Poulle* and *Marengo* is also documented. The logs provide evidence for the

presence of privateers on the South African coast. *Le Napoleon*, a French privateer, is documented as resupplying in both ports prior to her destruction in December 1805.

India Office records in London have a multitude of primary sources relating to the *Brunswick*. Ledgers, pay books, and journals are available for research on the shipwreck. Future research, however, should include an examination of these sources. Digital prints are available, but at an increased cost to the researcher. Financial and time constraints resulted in an inability to access these records for this research project.

Secondary Sources

A variety of secondary sources provided valuable information while answering research questions. Several journals provided insight to other contemporary sites. In some cases, they also contributed to the data used in the final analysis. International journals, like IJNA, provided greater global coverage, and were a mine of useful information. National journals, primarily based in South Africa, provided data on local history and archaeology.

History books provide an overview of events during the Napoleonic Era. In some cases, they covered the multinational efforts of the British Royal Navy (BRN), the HEIC, and the VOC. Geographical and historical context was gained after contemplating these books. Other books provided an historical overview of events concerning the Cape Colony. Translations of contemporary shipwright treatises were often accompanied by secondary commentary which was helpful when comparing the different national construction styles.

Several theses were used during the research process. East Carolina University (ECU), University of Cape Town (UCT), and Texas A&M University (TAMU) published all the theses used. In general, UCT theses provided good local insight and information on archaeological work performed on both *Bato* and *Brunswick*. ECU's work revealed a great deal about the

comparative use of different timber species in ship construction. TAMU students published detailed analyses of relevant construction styles.

Chapter 2: History

The Napoleonic Era (1792-1815) was a period of large scale imperial warfare. The great conflict between France and Great Britain involved other continental European powers and their respective colonies. The war was fought on several fronts and major engagements occurred all over the globe. The Cape Colony, initially in Dutch hands, was a strategic linchpin during these struggles. It is used as a case study to illustrate imperial conflict between Great Britain, France, and their allies and satellite states, especially the Netherlands. This chapter presents a brief overview of the global conflict and the regional conflict at the Cape, including the history of *Bato* and *Brunswick*.

British Colonial Empire

By 1792, the British colonial empire was one of global proportions. In the west, eastern Canada remained under British control. These provinces were important for the lumber and fur trade (Black 2004:125). Canadian fisheries were vital to British food supplies. Britain also used its colonies in Canada as a buffer against the newly formed United States of America. Territories east of officially recognized colonies were nominally claimed by Great Britain.

Middle America formed the bulwark of the western British Empire. Based around modern Jamaica, it also had smaller outposts in the Bahamas and Bermuda (Louis 1998:8332). Over three quarters of the West Indies was claimed by Great Britain, including the Virgin Islands, Barbuda, Antigua, Dominica, Barbados, St. Vincent, Grenada, Tobago, and Trinidad. There were also British colonial possessions in modern Belize and the Mosquito Coast in modern Nicaragua. Middle American colonies were crucial to British financial security. The sugar producing island of Jamaica was of particular importance as took up a large portion of British

trade and shipping tonnage. West Indian islands produced sugar and formed strategic bases in the region.

British colonial efforts in Africa were minimal before and during the Napoleonic Era. Several outposts were established on the African Gold Coast and in Sierra Leone. St. Helena was included in the African sphere as a resupply station. Outposts here served as depots for the slave trade and the exportation of European goods to African markets (Louis 1998:741). Expansion into the African continent was not attempted during this time as British explorers caught malaria and were unable to deal with the local climate (Black 2004:186).

The Eastern hemisphere held the greatest potential for the expansion of the British Empire. British forces used coastal outposts as beachheads for expansion into the Indian interior by exploiting weaknesses in the Mughal Empire and Mysore. Modern Bangladesh was also claimed as a British territory. Trading outposts in the East Indies were used to harvest and trade spices. Goods were shipped from India to China or the West. After the loss of the American colonies in 1783, trade with the Eastern colonies grew in to such a scale to become a national security issue (Louis 1998:Table 4.6).

Dutch Colonial Empire

The most important Dutch colony was Java, in modern Indonesia. From Batavia, Java's capital city, Dutch forces controlled the Spice Islands and harass British trade in the Far East. Trading outposts were also established in Ceylon, or modern Sri Lanka. Among these are Colombo and Trincomalee (Boxer 1965:94). William Pitt the Younger, prime minister of the UK in 1787, was able to gain influence over the Dutch and thus neutralize the threat that could originate from these locations. The major efforts put in to counter these colonies demonstrate their strategic importance to the British (Louis 1998:3802).

Western Africa was dotted with forts and small trading outposts held by the Dutch. There were eleven in the Gold Coast alone. Like the British outposts, these served as trading depots for slaves and European goods (Boxer 1965:211). The Dutch established a colony on the Cape of Good Hope Peninsula in 1652 (Davenport 1977:21). The station served as a victualing and medical station for ships of the *Verenigde Oostindische Compagnie* (VOC).

Dutch colonies in Central and South America were limited to a number of settlements in Suriname and Guyana. Several smaller islands were also under Dutch control. These include Aruba, Bonaire, Curacao, St. Martin, Saba, and St. Eustatius. While the colonies on the mainland could provide crops, the other islands were used as trading entrepots by placing low tariffs on imported goods (Boxer 1965:101). This was especially true of St Eustatius, where several hundred thousand tons of sugar passed through the port. The island only produced 20,000 tons of sugar. The rest was traded sugar from nearby islands (Ruud Stellten 2014, elec. comm.).

Great Britain and the Netherlands during the Napoleonic Era

France declared war on the Netherlands and its allies on 1 February 1793. A coalition force was dispatched to the Austrian Netherlands, modern Flanders, to halt the French advance there. After two years of fighting, the French forced their way across frozen rivers and captured important cities in the Netherlands. They reached Amsterdam on 20 January 1795. By this time, local revolutionaries had already declared the new Batavian. French success had catalyzed them into action. The stadtholder, William V of Orange, fled to England to avoid capture and continue the struggle against the French. Coalition forces retreated through bitter winter weather until they were evacuated from Bremen (Israel 1995:1120).

The Treaty of The Hague of 16 May 1795 firmly placed the Batavian Republic within the French sphere of influence. Previously, the British had significant amount of influence on Dutch

affairs through the actions of William Pitt the Younger (Louis 1998:3802). Treaty obligations required the stationing of a French force of 25,000 soldiers in Dutch territory. Effectively, the Dutch allowed for the quartering of an army of occupation (Palmer 1954:23). Dutch military and foreign policy was dictated by France from this point forward, creating another French satellite state. The Netherlands was then considered at war with Great Britain.

The Batavian Republic was abolished on 5 June 1806 when Louis I, Napoleon's brother, ascended to the throne of the Netherlands, cementing the region's status as a client state (Israel 1995:1121). However, Louis I did not serve to his brother's liking and was forced to abdicate prior to Emperor Napoleon's formal annexation of the region in 1810. While his brother had protected Dutch interests, Napoleon forced his new subjects to do France's bidding (Israel 1995:1128).

Dutch naval affairs entered a period of irreversible decline during the eighteenth century (Bruijn 1993:127-190). This culminated in the Battle of Camperdown in 1797 when a smaller British fleet defeated and captured most of a larger Dutch fleet. The British captured eleven Dutch battleships, crippling the Dutch navy. The decline is blamed on financial ruin and a lack of ingenuity on the part of Dutch shipbuilders (Bruijn 1993:127). After the Peace of Utrecht in 1713, the long peace allowed for reduction in army and naval expenditure by the Dutch Government. Economic recovery was the direct result. As a result, officials sought to avoid any type of military expenditure unless the need was dire. Military innovation suffered due to lower interest and financial paucity. Lack of finances also resulted in a low level of investment in new technologies, especially iron use. A general lack of archaeological evidence, however, means that this phenomenon was never completely confirmed.

French occupation hailed several changes in the structure of the Dutch Navy. The previous system of five individual admiralties was abolished and a central administrative structure developed (Booy 2013:40). The new administration was based in The Hague and worked to standardize the Dutch navy. Most importantly, this meant uniformity of ship design and construction. Naval command structure was also centralized. A uniform for all personnel, including common seamen, was developed by Jan Hendrik van Kinsbergen.

While the Dutch navy was still an independent entity, it followed French military policy. It was based off the northern Dutch island of Texel and consisted of twenty-five ships. The island was chosen because it offered a sheltered anchorage on the east side and contained a source of fresh water to supply the ships (Booy 2013:41). The newly changed Dutch fleet formed the main opposition to the British North Sea fleet. These forces met in 1797 resulting in a confrontation and a clear British victory. The Dutch navy did not recover from this loss until after the Napoleonic Wars (Adkins and Adkins 2006:68).

Conquering Dutch territory in Europe carried global consequences. Upon his arrival in Great Britain in January 1795, stadtholder William V signed the Circular Note of Kew in February. It ordered Dutch colonies not to resist British forces (Israel 1995:1127). It also implied the need to resist French influence in Dutch colonies. This allowed for the legal seizure of Dutch colonies by the British. No guarantee was offered for the eventual return of seized colonies. While the territories of Malacca, Amboina, and Sumatra surrendered without a fight, other territories developed anti-British and anti-Orangist feelings and provided armed resistance (Louis 1998:3880). Dutch Ceylon was overrun by British forces by February 1796. The Cape Colony was captured by force in September 1795. Strong anti-British feeling necessitated the use of force there (Turner 1966:182).

The Batavian Republic did not wait idly on the sidelines while its territories were conquered by other nations. In early 1796, a squadron of Dutch ships broke through the British blockade of Texel. Authorities intended to liberate Cape Colony from the British. Unfortunately, the ships were cornered in Saldanha Bay in September of that year. With no room to maneuver and guns unloaded, the Dutch commander struck his colors without even firing a shot (Turner 1966:186). The rescue attempt resulted in an abject and humiliating failure for the Dutch. When combined with the ships lost at the Battle of Camperdown in 1797, the Dutch navy ceased to be a force of importance in European and international affairs.

The Treaty of Amiens signed on 25 March 1802 heralded the brief cessation of hostilities between Great Britain, France, and their allies and client states (Harding 1999:272). Several colonies were transferred back to Dutch control. These included most of the captured West Indian islands and the Cape Colony (Marcus 1971:216). Guyana, Ceylon, and Dutch outposts in India were permanently absorbed into the British colonial system. The renewal of hostilities on 18 May 1803 meant a recommencing of expansionist British imperial policies (Louis 1998:8417).

Military Actions during the Wars as They Relate to Imperialism

At the conclusion of the Napoleonic Wars in 1815, Great Britain was the global leader in maritime and imperial affairs. At the outbreak of war in 1792, however, there was no set plan for imperial expansion. Britain gained its empire through piecemeal expansion and reactionary efforts. In many cases, Great Britain sought to claim strategic areas as its own and deny them to the French (Louis 1998:3733).

Initial efforts were focused on expansion in the Americas. The financial importance of the sugar producing islands of the Caribbean to Great Britain and France encouraged both powers to look to this region for expansion. After the near-disasters of the American Revolution,

TABLE 1

BRITISH, DUTCH, AND FRENCH NAVAL STRENGTH 1795 – 1810

Great Britain				
	1795	1800	1805	1810
Battleships	123	127	136	152
Cruisers	160	158	160	183
Small Ships	28	43	33	63
Total	311	328	329	398
France				
Battleships	56	44	41	46
Cruisers	65	43	35	31
Small Ships	41	23	11	7
Total	162	110	87	84
Netherlands				
Battleships	28	16	15	13
Cruisers	30	6	10	7
Small Ships	0	0	1	3
Total	58	22	26	23

Source: Harding (1999:292-295)

the British sought to gain naval and financial superiority over its rivals in this theater (Louis 1998:3663). The seizure of strategically vital posts aided these goals. The capture of valuable colonies assisted as well. Britain strove to expand its empire in the Caribbean and establish a presence in Latin America. With the outbreak of the War of 1812, expansion into American territory was also considered (Adkins and Adkins 2006:414).

In the first months following the outbreak of war, neighboring British garrisons were able to seize French colonial bases. Canadian forces captured St. Pierre and Miquelon off Newfoundland. French territory in India was also captured. Bases at Pondicherry,

Changernagore, and Mahé and factories at Calicut, Surat, and Masulipatam were easily overrun. In the Caribbean, the island territory Tobago was taken (Louis 1998).

The waging of colonial warfare with the forces already in place there was only effective until June 1793. Expeditions from Great Britain were required for continued expansion. In the autumn of 1793, Sir Charles Grey attempted the mobilization of 17,000 men to seize the French colonies of Martinique and Saint Domingue (Louis 1998:3827). The seizure of these colonies crippled the French economy in 1794 and, as a result, their war effort as well. Saint Domingue alone accounted for two fifths of French trade, two thirds of French shipping tonnage, and involved one third of all skilled French sailors.

Conflicts on the European continent, however, required more resources (Louis 1998:3861). Expeditions to far-off colonies were given secondary status and Grey was only able to mobilize half of the personnel required. This small force was still able to capture Martinique in March 1794, St. Lucia in April, Guadeloupe in May, and Port-au-Prince in June. The last conquest was of particular importance as the capital of Saint Domingue. The failure to reinforce Grey, however, led to the rapid loss of recent conquest (Louis 1998:3865).

British efforts in Europe severely diminished French naval strength. Over thirty ships of the line were captured by the British while only sixteen were constructed. This decrease in enemy strength allowed for increased superiority of the British Royal Navy. As a result, France sought more subtle ways to combat the British (Louis 1998:3855). Continued conflict on the European continent forced the British to diminish their imperial forces in favor of domestic security. Grey was not reinforced despite suffering heavy casualties from disease (Louis 1998:3865).

Along with small-scale military actions, France encouraged revolts by arming slaves, Francophiles, and native populations in British held territories (Louis 1998:3865). The French recovered Guadeloupe in December using these methods in 1794. Revolt was fermented in Grenada and St. Vincent during March 1795. St. Lucia was recovered in 1795. A landing was attempted in Dominica in June, but did not succeed. The valuable colony of Jamaica rose in revolt despite a strong British presence there. In the eastern theater, the British blockade of Mauritius was called off due to a lack of ships (Marcus 1971:57).

Conquering other imperial powers allowed France to add their naval and military might to its efforts (Booy 2013:41). This motivated the addition of the Batavian Republic to the French sphere of influence in 1795. Dutch military forces followed military and foreign policies dictated by France. Dutch regiments joined the French army and helped put down rebellions and defeat an Orangist invasion in (Israel 1995:1126).

Under French control, the Dutch crafted their naval policy to accomplishing French goals. The fleet based in Texel was to function as an invasion force for Ireland once the required troops had arrived (Louis 1998:3881). The British North Sea Squadron stood guard against exactly this possibility. On 11 October 1797, it was decided to remove this threat. The French Directory ordered the Dutch fleet to combat the enemy squadron at the Battle of Camperdown.

The Dutch fleet also patrolled strategic trade routes along the Southern African coast and the Indian Ocean. The colonies of Cape Town and Java provided a safe harbor for Dutch and French ships harassing enemy vessels in these waters (Turner 1966:166). As British trade with India increased during the Napoleonic era, this role became more important as privateers and naval vessels sought to capture the valuable cargos carried by British East Indiamen. The capture of just one of these vessels provided French and Dutch crews with rich rewards. *Brunswick* was

such an Indiaman when it was captured by the French Admiral Linois' ship *Marengo* and the frigate *Belle Poulle* while rounding Ceylon (Adkins and Adkins 2006:185).

Colonial bases functioned as important locations in this international struggle. The island colony of Java was used as a base by French and Dutch naval ships and privateers to capture trade ships heading to India or the Far East (Adkins and Adkins 2006:344). Cape Town and Mauritius were particularly favored by privateers as these ports allowed ships to patrol the Indian Ocean corridor favored by large trading ships (Marcus 1971:56–57). Naval forces also used these bases as a base of operations in the Indian Ocean. Admiral Linois used these colonies as staging grounds for a number of operations prior to his capture 1806. Upon his capture, Linois learned that Admiral Edward Pellew patrolled the Indian Ocean to clear it of French privateers (Adkins and Adkins 2006:184).

The Battle of Trafalgar marked a turning point in the naval war in Europe. The destruction of French and Spanish battle fleets resulted in the unquestioned dominance of the British Royal Navy. It was now possible to disengage ships from blockade duty in Europe and send forces to capture strategic colonies and bases that were still in enemy hands (Adkins and Adkins 2006:172).

Capturing enemy colonies allowed for the expansion of British trade. Cape Town was captured in 1806 to secure the trade routes to India (Marcus 1971:381). Captain Josias Rowley blockaded the privateering base of Mauritius in 1808 (Marcus 1971:381). By 1810, Great Britain controlled all of the West Indies after capturing Danish, Dutch, and French possessions there. Mauritius was conquered the same year (Adkins and Adkins 2006:355). Imperial naval activity in the later years of the war was focused in the East. Cayenne, Senegal, the Seychelles, Amboyna and Banda Neira were captured in 1811 from the French and Dutch. The island colony of Java

was taken in 1812 after a month long struggle that ended on 18 September 1812. Java's capture marked the end of the imperial struggle in the East (Adkins and Adkins 2006:365). The British only returned Java to Dutch hands when peace was declared in 1815. As such, Britain laid the basis of vast empire (Louis 1998:3779).

Cape Town: Global Politics on a Local Scale

The Cape of Good Hope in South Africa is one of the most strategic military locations in the world (Rippon 1970:303). A force based at the Cape could strangle trade between Europe and Asia. The area also served as a base for naval actions (Marcus 1971:56). Global politics were often played out in a smaller scale on the lands and waters of the Cape Peninsula. The remains of *Bato* (1806) and *Brunswick* (1805), submerged off of Simons Town, are symbolic of the turbulent colonial history of the Cape of Good Hope.

Since its settlement by the Dutch in 1652, the Cape Colony was an important half way stopover point in European trade with the Far East. Many European nations used the port and its facilities to replenish supplies and allow sick crewmembers to recover at the hospital facilities there (Boshoff and Fourie 2008:7). Between 1700 and 1793, ships from the following countries stopped at the Cape Colony: the Dutch Republic, United Kingdom, France, Austria, Sweden, Portugal, and Prussia (Boshoff and Fourie 2008:4). English, Dutch, and French ships formed the majority of ships that stopped at the Cape. The total number of ships increased steadily until the start of the Napoleonic Era in 1792. After this date, the number of European ships stopping in Table Bay declined noticeably as a result of the conflict in Europe. However, an increase in American shipping passing through the Cape offset this decline slightly (Boshoff and Fourie 2008:4). Each ship docked at the Cape for approximately 28 days (Boshoff and Fourie 2008:9). These weeks allowed the crew to recover from the long sea voyage and prepare for the second

leg of the journey to the East Indies. With a mortality rate of up to fifty percent and morbidity rate nearing seventy-five percent on voyages to the Far East, a midway recovery point was sorely needed (Harding 2011:70).

Many types of ships anchored at Table Bay prior to 1793, but detailed data and analysis only exists for Dutch ships. Over seventy percent of Dutch ships passing the Cape were *spiegelschepen* functioning as both a merchant and warship. The traditional Dutch trading ships known as *fluitschepen* formed the next largest segment at over sixteen percent. Sixty-five other Dutch warships passed by the Cape between 1700 and 1793. The large numbers of merchant and warships that passed through the Cape Colony illustrate the strategic and economic importance of the area, as well as the significance of the colony for military operations in the last decade of the eighteenth century (Boshoff and Fourie 2008:10).

In addition, researchers at Spatial Analysis, a company specializing in global information systems (GIS), has recorded and plotted the sailing path of merchant ships belonging to the Dutch Republic, United Kingdom, and Spain during the 18th-century (FIGURE 2). The maps display the presence of major shipping bottleneck at the Cape of Good Hope. Any ship hoping to trade in Asia had to at least sail by the Cape, if not stop there. As a result, inhabitants of the Cape witnessed a vast amount of shipping and a fair number of warships arrive in either Table or False Bay. The Asian trade was a pillar for both the Dutch and British economies and both nations sought to guard against anyone hoping to damage their profits. Global imperial efforts sought to capture and hold the Cape for much of modern history. The Dutch first settled the region in 1652 as a victualing station for *Verenigde Oostindische Compagnie* (VOC) ships voyaging to the Far East (Turner 1966:166). Colonists established a hospital, farms, basic dockyard facilities, and a

colonial administration. Rival European powers recognized the strategic value of the colony and worked to undermine its value or capture it (Turner 1966:166-167). The British used St. Helena

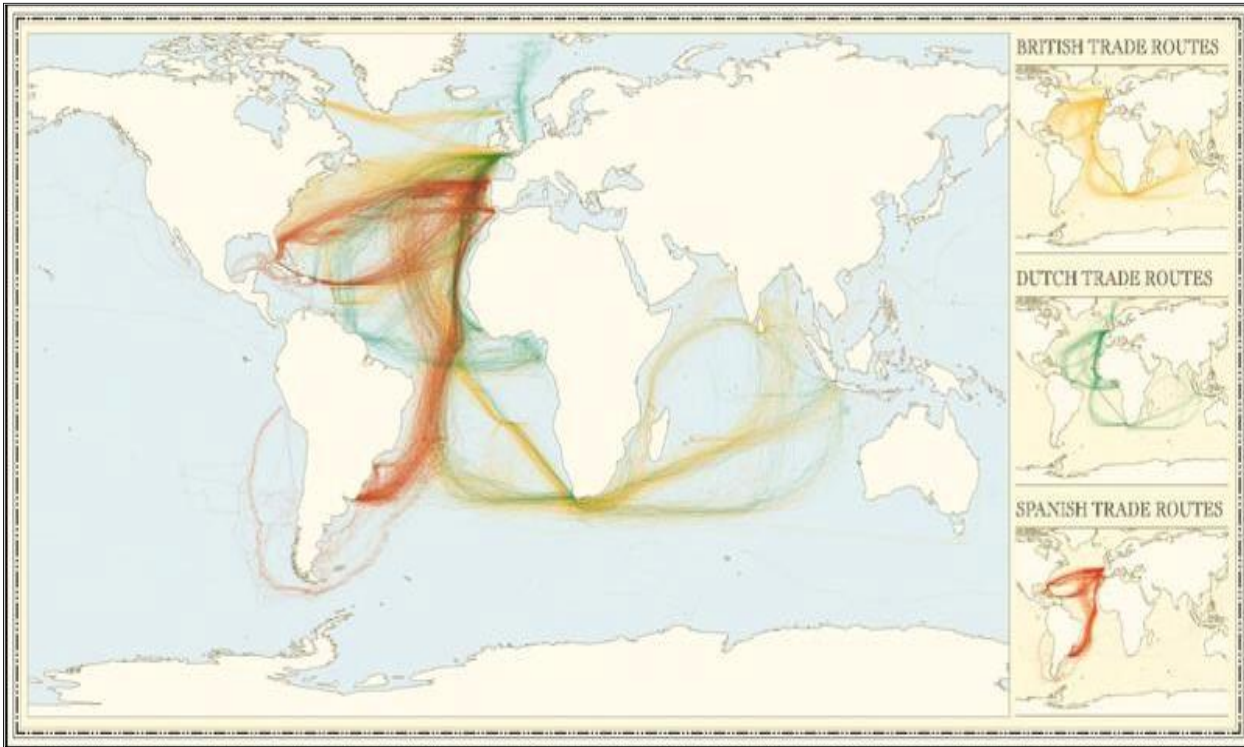


FIGURE 2. An illustration of European colonial trade. Note the bottleneck of trading at the Cape of Good Hope (Spatial Analysis 2012).

as their strategic base in the area while the Portuguese established themselves in Mozambique. Mauritius was served as the French base in the region. Despite the creation of these bases, a force based in the Cape still had the potential to strangle any East-West trade conducted by other European powers (Rippon 1970:303). To further good relations with other nations, the Dutch allowed vessels belonging to other nations to resupply at the Cape from 1684 onwards. This trade increased the profits of the Cape. The colony quickly developed to fulfil the needs of any ships stopping to resupply there. Beyond the obvious strategic benefits, the Cape proved to be a financial boon to the VOC.

The Dutch set up two main anchorages in the Cape (Turner 1966:166). The anchorage in Table Bay was based in Cape Town and used during summer. Late in the 17th century, harbor

facilities were developed in False Bay and based in Simons Town. The facility served as a winter anchorage for any ships seeking to resupply there from April to August. Two bases were required due to the winter storms that plagued Table Bay. Due to the increased protection it offered to ships, Simons Town functioned as the regional naval base for the Netherlands and its allies. These two anchorages also formed the only serviceable port in Southern Africa (Turner 1966:166). These facts are extremely important when one considers the events of the latter half of the 18th century and the early 19th century.

During the Napoleonic Era, the Cape Colony proved of high strategic value. After the creation of the Batavian Republic in 1795, the British concerned themselves with capturing the Cape Colony (Steenkamp 2012:126). Mostly, their concerns grew from the fact that the French would use the Dutch colony as a naval base. From this position, the French could strangle British trade with India and cripple the island nation's economy. All ships travelling to and from India passed by the Cape of Good Hope. This threat was made more potent by the already present French colonies in Mauritius (Steenkamp 2012:126). The combination of these bases provided an ideal patrol route in which to capture richly laden East Indiamen. The trade of the British Honorable East India Company (HEIC) formed a pillar of the British economy. Something had to be done to avoid any reduction in trade.

The Circular Note of Kew was signed by the Prince of Orange in February 1795. It gave the British official permission to take over Dutch colonies (Israel 1995:1127). Sir George Elphinstone and Commodore Blanket organized a force of three thousand men to secure the Cape Colony. The British force arrived in Simons Bay in June 1795 (Marcus 1971:57). A virtually unopposed landing was made by Major General Craig and the Note was handed to the Dutch colonial governor, Abraham Josias Sluysken, with an offer of capitulation (Steenkamp

2012:127). Conflicting popular feelings in the Cape led to extended negotiations as Sluysken waited for possible French reinforcements (Steenkamp 2012:133). British patience soon wore out, however, and forces were landed near Simons Town between 14 and 21 June 1795. The Muizenberg Pass to Cape Town was forced on 7 August 1795. After the battle, the British slowly advanced to capture Cape Town. Eventually, faced by an overwhelming British force, Sluysken surrendered the colony on 15 September 1795. The era of VOC rule at the Cape ended, and the First British Occupation began (Marcus 1971:57–58). The use of violence and superior naval might to capture the colony signified the emergence of the Cape of Good Hope as a vital military base (Steenkamp 2012:153). No longer solely an economic center, the Cape was now a strategic objective of maritime powers. Needless to say, a superior naval force would be required to conquer and hold the colony.

The British put Cape Town to good use in their imperial efforts. The British Royal Navy cut off supplies to the French bases in Mauritius (Adkins and Adkins 2006:255). British ships stationed in Cape Town and Simons Town provided increased protection to allied merchant ships (Steenkamp 2012:153). Losses to enemy privateers and enemy vessels decreased dramatically. The newly acquired naval base at Simons Town housed a squadron stronger than the one stationed in India. Cape Town also served as choke point for enemy trade; British privateers and navy vessels turned the table on their French counterparts and used the Cape as their own privateering base (Adkins and Adkins 2006:186).

In 1796, the Batavian Republic mounted an expedition to retake the Cape Colony. Led by Dutch Admiral Engelbertus Lucas, the expedition landed in Saldanha Bay on 3 August 1796. After securing a beachhead, Lucas elected to wait for non-existent French reinforcements (Steenkamp 2012:162). General Craig, the British commander in the Cape, marched to Saldanha

Bay on 14 September while Elphinstone sailed with a formidable fleet on 15 September. The Dutch forces were promptly trapped and surrendered without a fight.

The Treaty of Amiens, signed in 1802, necessitated the return of the Cape Colony to Dutch hands. Governor-General Jan Willem Janssens departed the Batavian Republic in on 5 August 1802 on board of the 74-gun ship *Bato* (NL-HaNA, Janssens, 2.21.092, inv.nr. 67). He arrived on 24 December 1802 with Commissioner J. A. de Mist (Steenkamp 2012:176). *Bato* was accompanied by several other navy ships, including *Pluto*, *Kortenaar*, *Maria Reifersbergen*, *Vreede*, *Zeenimf*, and six troop transports. *Vreede* and *Zeenimf* sank during the voyage to Cape Town, taking large amounts of essential supplies with them (Steenkamp 2012:176). Janssens assumed full command of the Cape upon de Mist's departure later the following year and remained governor until the Cape was recaptured in January 1806. During peace time, all nations were allowed to use the Cape as resupply point on their voyages (Boxer 1965:245). The resumption of hostilities between France and Great Britain in 1803 dictated the cessation of this policy.

The colony resumed many of its wartime roles. It supplied French bases in the Indian Ocean with food and medical facilities. French privateers and navy ships used the colony as a supply point for their operations in the Indian Ocean. The French ship *Atalante* arrived at the Cape to resupply after an expedition in the Indian Ocean (Steenkamp 2012:229). *Atalante* was destroyed on 3 November 1805 when forced against rocks, and sank off the Cape. *Napoleon*, a French privateer, regularly used the Cape as a base of operations (Cape Town Archives Repository (KAB): BR536, BR537, BR538). This French ship was forced aground on 25 December 1805 by the British ship *Narcissus*. Admiral Linois, who later captured *Brunswick*, used Simons Town as a strategic boon during his commerce raiding campaigns in the Indian

Ocean. Captured vessels, like *Brunswick*, were evaluated as prizes at Cape Town (Harding 2013:4).

The Dutch serviced their own ships in Cape Town (KAB: BR536). The colony fell under the theater patrolled by the East Indies Squadron, based in Batavia. Ships belonging to this group patrolled the Indian Ocean and areas of Southern Africa. They harassed and captured British merchant shipping and served as a deterrent for invasion of the various colonies in the area. Unfortunately, the Dutch fleet lacked the strength and numbers to oppose British forces and would still be overrun. This is demonstrated by naval events surrounding the British takeover of Java. There, the British were able to capture Dutch gunboats and ships and subsequently turn them on their previous owners (Adkins and Adkins 2006:255-265).

It took some time for the British to mount another assault on Cape Town. Commodore Sir Home Riggs Popham and Lieutenant General David Baird assembled a force for an attack in early 1806. In response, Napoleon dispatched Admiral Jean-Baptiste Willaumez to provide reinforcements (Clowes 1997:185). He did not make it in time to be of assistance to the Dutch forces based there. Popham was given a small squadron. He had eight ships under his command: *Diadem* (64 guns, flagship), *Raisonnable* (64, Capt. Josias Rowley), *Belliqueux* (64, Capt. George Byng), *Diomède* (50, Capt. Joseph Edmonds), *Leda* (38, Capt. Robert Honyman), *Narcissus* (32, Capt. Ross Donnelly), *Espoir* (18, Lieut. William King), and *Encounter* (14, Lieut. James Talbot) (Steenkamp 2012:221). In addition, transports carrying 5,000 troops under Baird's command sailed with the naval vessels. The squadron was joined on 6 January 1806 by *Protector* (Lieut. George Keith).

Popham assembled his squadron at Madeira and travelled to San Salvador, off the African coast. Departing there on 26 November 1805, he arrived west of Robben Island on 4

January 1806 (Clowes 1997:201). The 24th regiment attempted a landing the following day, but the surf proved too rough to allow safe passage. The 38th regiment was sent north along with a detachment of cavalry and artillery under Brigadier General Beresford to cut off the Dutch retreat. *Diomède* and *Espoir* accompanied this force. A Highland brigade consisting of the 71st, 72nd, and 93rd regiments, landed in Table Bay on 6 and 7 January. Forty-one privates of the 93rd regiment drowned during the landing when a boat overturned (Adkins and Adkins 2006:179). The Dutch attempted to counter the landing with cavalry and artillery, but the attempts were beaten off by *Diadem*, *Leda*, or *Protector* (Clowes 1997:201).

The land forces moved out in two brigades on the morning of 8 January and met the Dutch army under General Janssens at Blaauwberg. British forces numbered over 5,000 men while the Dutch numbered slightly over 2,000. Dutch forces formed a defensive line and waited for the British to advance. The Highland Brigade advanced on the Dutch line while the remaining regiments cleared Dutch cavalry and artillery off the nearby heights. After a brief exchange of fire, a bayonet charge by British forces secured victory. During the battle, Janssens lost 700 men while Baird's losses numbered 15 killed, 189 wounded, and 8 missing (Clowes 1997:202). Dutch forces retreated to Hottentot-Hollands Kloof, a nearby ravine. Upon hearing news of the defeat, the Dutch ship *Bato* was burned at anchor to avoid capture by the British (NL-HaNA, Marine suppl. 2, 2.01.29.03, inv.nr. 110).

After the battle, the British waited at Salt River for their battering train. Dutch Lt. Col. van Prophalow sent a flag of truce to Baird on 9 January (Clowes 1997:201). The following day, articles of capitulation were signed by Prophalow, Baird, and Popham. They dictated the complete surrender of all military installations, equipment, and units in the colony (*The Cape Town Gazette and African Advertiser* 1806a:1). British forces took possession of Cape Town on

12 January. All ordnance, including 113 brass guns and 343 iron guns were taken into possession (Clowes 1997:202).

Janssens signed the official articles of capitulation on 18 January, but French reinforcements did not arrive and his forces suffered heavily from desertion and privatization (Adkins and Adkins 2006:181). His surrender marked the end of Dutch rule in the Cape Colony. Great Britain did not return the colony in 1815. It was deemed imprudent due to the high strategic and economic value of the settlement (Turner 1966:167).

Bato: History of the Dutch 74-Gun Ship of Line

Upon construction in 1786, *Bato*'s original name was *Staten Generaal* (Rijksmuseum 2014a). It formed part of the reconstruction effort of the Dutch naval forces (Octopus 1998). The ship was constructed in Rotterdam shipyard. In 1737, the Rotterdam dockyard consisted of three slips over 45 m long and 13 m wide (Ollivier 1992:199). Thirteen meters separated the slips. Small storehouses and sheds accompanied the slips.

After losing the Fourth Anglo-Dutch War (1781-1784), the Dutch needed to rebuild their navy to its former strength. *Staten Generaal* was one of the largest ships constructed during this time with a strength of 74 guns. *Staten Generaal*, is also listed as 67 gun warship at times (Rijksmuseum 2014a). Only two other ships, *Brutus* and *Vrijheid*, were of equal strength. Both of these ships were constructed contemporaneously with *Staten Generaal*. Initially, the ship served in European waters as part of Vice-Admiral Jan de Winter's squadron in the North Sea. Winter sought to clear the North Sea of British Royal Navy vessels under Admiral Vince Duncan. With the North Sea clear of enemies, a clear passage to Ireland for an invading French army would be opened (de Jonge 1861a:291). *Staten Generaal* patrolled the North Sea during the summer of 1797 to judge the strength of the British blockading fleet and inflict any damage

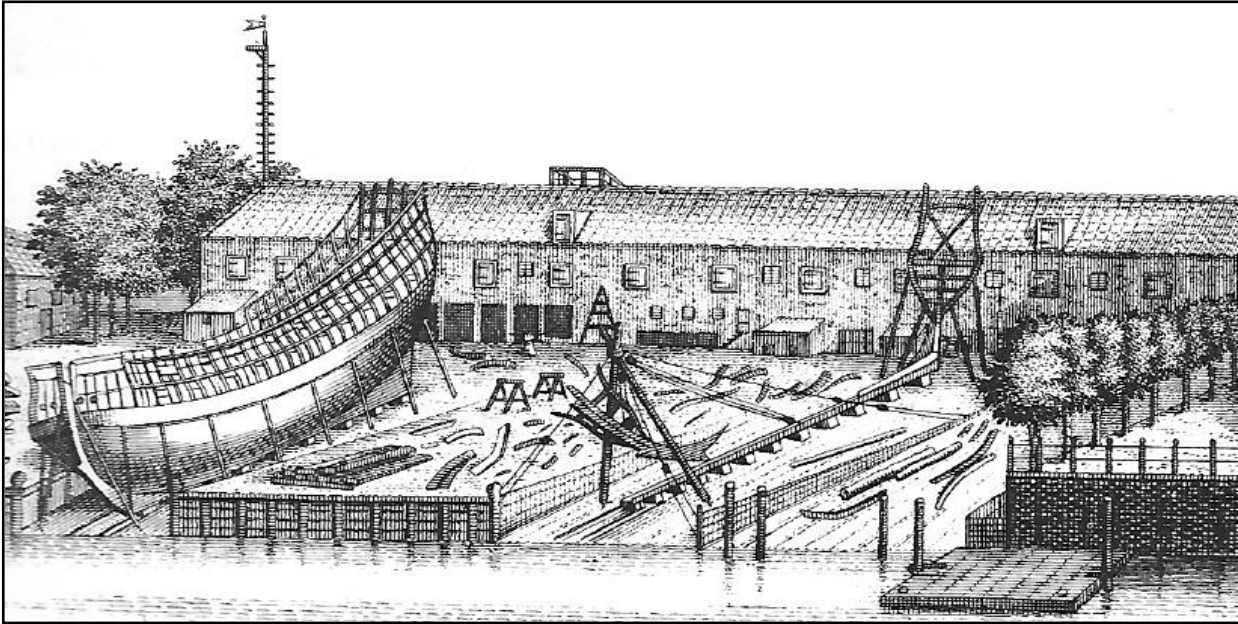


FIGURE 3. View of Rotterdam shipyard in 1737 (Ollivier 1992:198).

possible. In August 1797, *Staten Generaal* and several other Dutch ships encountered a superior British blockading squadron and were soundly beaten (de Jonge 1861a:303). Extensive repairs were required before *Staten Generaal* was ready for service again. With the work barely completed, de Winter ordered *Staten Generaal*, under Rear Admiral Samuel Story, to join his fleet in an engagement against the British blockading fleet (de Jonge 1861a:306). By this point, the favorable summer campaigning weather had passed and engagement was sought only to increase the fighting reputation of the Dutch fleet (de Jonge 1861a:293). On 11 October 1797, the Battle of Camperdown took place.

During the battle, a gap in the line appeared between *Staten Generaal* and the leading ship, *Vrijheid* (de Jonge 1861a:325). As a result, Duncan's flagship, HMS *Venerable*, broke the Dutch line behind *Staten Generaal*. *Venerable* engaged *Staten Generaal* from the Dutch ships's stern starboard quarter. Fire erupted twice on board *Staten Generaal*. The Dutch crewmen extinguished it both times. Heavy cannon and fire damage, however, forced Story to let *Staten*

Generaal drift away from the battle (de Jonge 1861a:334). Story could not re-engage and fled with the remainder of the Dutch fleet (de Jonge 1861a:350).

After the battle, *Staten Generaal* was renamed *Bato* and assigned to the defense of Amsterdam. At this time, *Bato* carried only 34 guns of a possible 74 (de Jonge 1861b:493). This is referred to as sailing *en flute*, or without any guns on the lowest gundeck. In August 1802, *Bato* readied itself to sail to the Cape Colony (NL-HaNA, Marine suppl. 2, 2.01.29.03, inv.nr. 108). Jan Willem Janssens, future governor-general of the Cape colony, was on board with his family. Janssens sailed to the Cape to reclaim the colony for the Dutch after its return under the Treaty of Amiens. The vessel departed the Dutch port of Texel on 5 August 1802. At the time of sailing, *Bato* carried 36 guns of a possible 74 and had on board 311 people. Most of these were naval crewmen and officers, but some women and children also boarded *Bato*. Harteke mentions these as the wives and children of either Janssens or the other officers.

After an uneventful journey, *Bato* anchored in Table Bay on 25 December 1802. Janssens soon departed from the ship to take his place as the new governor-general of the Cape Colony. Assigned to the Dutch East India Squadron, *Bato* sailed to Batavia (modern Jakarta, Indonesia) in February 1803 (NL-HaNA, Marine suppl. 2, 2.01.29.03, inv.nr. 109). Along the way, *Bato* protected trading vessels from hostile ships and pirates. Bad weather and general disrepair, however, put a stop to these plans. *Bato* was forced to dock at St. Louis, Mauritius for repairs to her rudder mechanism. *Bato* departed the French colony in January 1804 (NL-HaNA, Marine suppl. 2, 2.01.29.03, inv.nr. 110). With the renewal of hostilities, *Bato* was ordered to capture any enemy trading ships she could. No mention is made of combatting enemy naval forces. On 27 February 1804, *Bato* returned to Table Bay. The ship would not leave South African waters again.

Shortly after her return to the colony, *Bato* moved to Simons Bay. The only time *Bato* left those waters was from April to July of 1805. During this expedition, the South African coastline was explored for possible landing sites. Several Dutch navy ships assisted *Bato* in this venture. From July 1805, *Bato* remained in Simons Bay as a deterrent to any aggressors. It was during this time that Harteke witnessed the arrival and subsequent destruction of *Brunswick* (FIGURE 4). Constant drilling ensured an alert and battle ready crew. With limited mobility and an incomplete complement of guns, however, *Bato* did not pose a serious threat to a determined invasion force.

The destruction of *Bato* signifies the lack of Dutch naval involvement in the events surrounding the Battle of Blaauwberg. Upon hearing of the Dutch defeat there, *Bato*'s crew abandoned ship and burned it to the waterline. Harteke records a feeling of great loss as he watched flames engulf his ship. A British officer also witnessed the destruction as he piloted his ship into Simons Bay on the night of 8 January 1806 (Clowes 1997:203).

Bato's history illustrates the role of Dutch warships during the Napoleonic Era. The defense of home waters was important. Dutch ships ventured out to colonies only after the VOC could not maintain its hold. Improper funding and a general state of disrepair plagued a great deal of ships within the Dutch navy. This problem was compounded when the tropical waters of East Africa and the East Indies are factored in. The infrastructure to deal with the necessary repairs did not exist and ships suffered as a result. Supplies to fully outfit warships were also lacking.

Brunswick: History of the British East Indiaman

Perry & Company completed *Brunswick* in 1792 at the Blackwall Yard near London. Fully constructed, *Brunswick* was 1244 tons and carried up to 30 guns (Harding 2013:4). It is possible that *Brunswick* was constructed in the Brunswick Basin of Blackwall. John Perry and

his sons completed the construction of this part of their yard in 1790 (Sutton 1981:48). Lloyd's Register of Shipping, however, records that *Brunswick* carried only between nine and

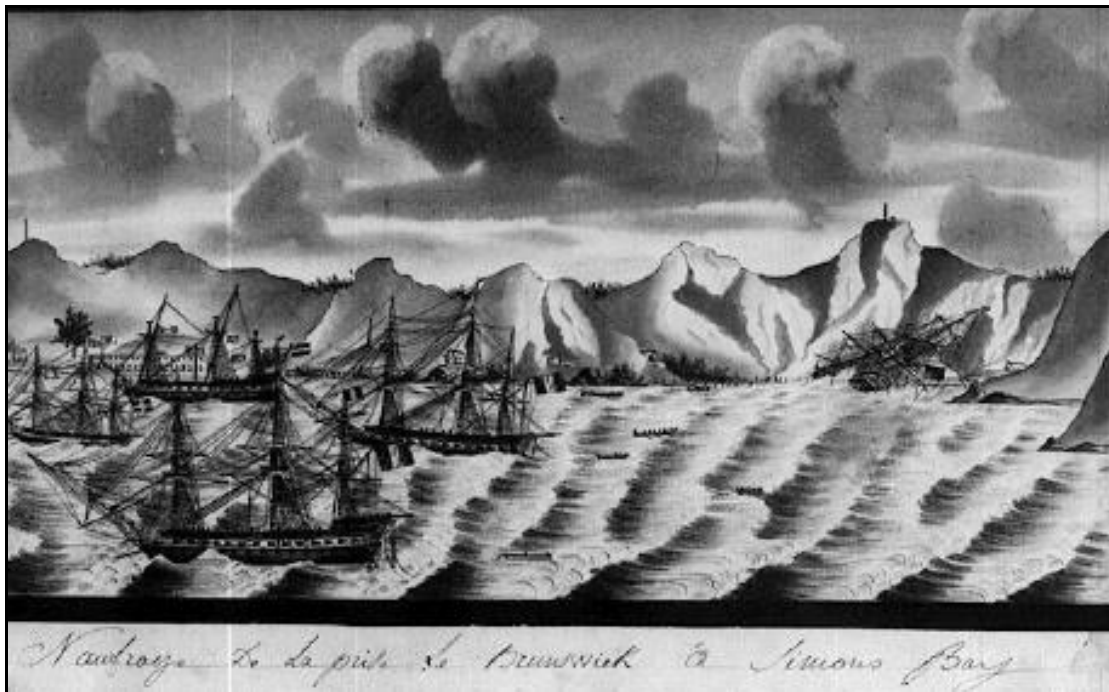


FIGURE 4. The destruction of *Brunswick* is seen on the right. In the left background a Dutch warship, possibly *Bato*, is seen (Gardiner 1997).

fourteen guns (Lloyd's Register of Ships 1794). They ranged in size from 6 pds. to 12 pds. The Lloyd's Register only lists traditional guns, and not carronades. Furthermore, ships often carried more guns than the amount they were officially rated for. As a result, *Brunswick* could have carried more than fourteen guns as a protective measure against hostile raiders, privateers, and pirates (Sutton 1981:38). HEIC ships, however, often minimized the number of guns to maximize cargo space.

Blackwall Yard was located in a bend of the River Thames (FIGURE 5). Great expansion took place during the 1780s (British History Online [BHO] 1994). Ships of the line, East Indiamen, and other large ships were constructed at Blackwall Yard. Business was so successful

that John Perry II, owner of the yard, ordered construction of Brunswick dock in 1789. The new dock was completed in 1790. The new dock allowed for increased production numbers. Smaller

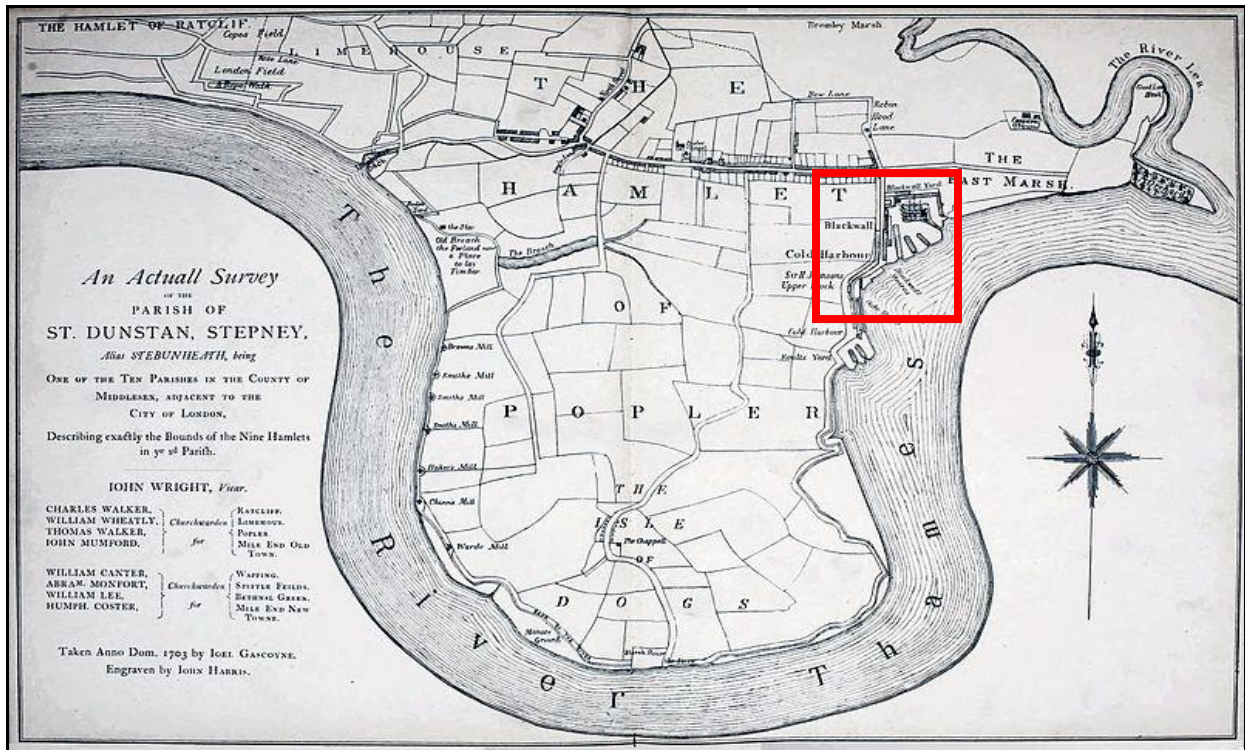


FIGURE 5. Map showing the location of Blackwall Yard (Green and Wigram 1881:20).

ships, like coasting ships and Greenland whalers, could now be repaired without the need for dry docking. Business increased steadily until Perry II retired in 1803.

Ships like *Brunswick* provided the lifeblood of British international and colonial trade. By 1786, English shipping tonnage had risen to 752,000 (Black 2004:128). British export value reached a value of £18.9 million. This trade financed the British war effort against Napoleonic France. Thomas Newton Esq. owned *Brunswick* until its destruction in 1806 (Hardy 1811:133,170,188,201,218,233). The ship completed six voyages under several captains. Each voyage ended in China with stop in India or Ceylon. Although it may not seem so much, six voyages was the maximum allowed for ships like *Brunswick* (Sutton 1981:172). After three voyages, a ship was in dire need of repair and had to be refitted. The use of copper sheathing

allowed the timber to survive the extra three voyages. Prior to this addition, ships were only permitted four voyages each. A declining insurance rating in Lloyd's Register of Shipping displays this trend. There is a return to A1 status after *Brunswick's* third voyage, indicating that necessary repairs took place.

Brunswick departed Portsmouth for its final voyage on 20 March 1804. At this time, she was damaged and leaking according to Lloyd's Lists (1805). According to Harding, the ship was in bad condition when it departed (2013). Upon its destruction, Captain James Ludovic Grant commanded *Brunswick*. The crew included Hugh Scott, Benjamin Bunn, Leonard Wasse, Benjamin Martin, William Jardine, and James Pears. The surgeon, William Jardine, is of particular note (Grace 2004). Jardine joined the HEIC as a surgeon and started his career on board *Brunswick*. After surviving its wrecking, Jardine grew to become a very successful merchant within the ranks of the HEIC. He was instrumental in the exploitation of the Opium trade in China after the Napoleonic Era.

Brunswick departed on her homeward voyage in May 1805. Damage forced Captain Grant to remain in port and miss the returning convoy. The next convoy would depart in a year's time. Grant could not afford to wait and decided to risk the passage (Gardiner 1997:29). French Rear-Admiral Linois' *Marengo*, along with several other French ships, still patrolled the waters. Over the past few months, Grant had observed their state and found them wanting. He believed that *Brunswick* could outmaneuver Linois' ship due to the stringent discipline he enforced on board.

On the morning of 11 July 1805, the French ships *Marengo* and *Belle Poule* emerged from a thick fog to pounce upon the unsuspecting Grant (Adkins and Adkins 2006:185). Linois captured *Brunswick* and made his way toward Simons Town. Along the way, Linois harassed

several more merchant ships but was chased off by British convoy escorts. The three vessels arrive at Simons Town on 13 September 1805. Linois and his ships departed soon after and left *Brunswick* to be evaluated and repurposed (Adkins and Adkins 2006:186). Most of the crew was paroled on shore. Six days later, the inhabitants of Simons Town woke to find *Brunswick* heading straight for shore. Addison, a midshipman on board *Brunswick*, described the event as follows: “poor old *Brunswick* running in with all her sails split to ribbons, everything adrift: obviously parted from her anchors, and evidently reduced to the last alternative of running the ship ashore” (Addison 1805:362). The ship ran aground and was subsequently dismantled by waves and human action.

Chapter 3: Previous Work

Historic Salvage

Salvage work on *Bato* and *Brunswick* started soon after sinking. Once the British establish control of the Cape, they permitted salvors to recover the cargo and metal fittings on the wrecks (*Cape of Good Hope Gazette* 1806:2). An advertisement in the Cape Town Gazette announced the sale of 60 to 70,000 pounds of Sandalwood, *Bato*'s rudder, the iron on *Bato*'s wreck, 100,000 pounds of iron knees, 30,000 pounds of wrought iron, several boats, and a collection of timbers. A public auction initiated the sale of these valuable items. An American captain purchased the material salvaged from Brunswick for 3,500 rix-dollars (Submerge 2009:24). To date, historical evidence for the range of salvaging techniques used on *Bato* and Brunswick have not been located in the primary sources, so the full effects of historical salvage cannot be ascertained yet.

Modern Salvage

Modern times witnessed further salvage attempts on both wrecks. In 1967, the American salvor Jim Knowles recovered *Brunswick*'s rudder (Harding 2013:26). He found the rudder while searching for marketable scrap in Simons Bay (Visser 2004:1.) When divers discovered the rudder was covered in copper sheathing. Knowles contacted Bodo van Zelewski who, in turn, contacted the South African Cultural History Museum (SAHCM). The museum reserved a corner of its courtyard for display of the hull remains that were identified as a rudder. On 19 August 1967, a team lifted the rudder using a truck with a winch. A double folded inflatable dingy acted as a lifting sling attached to a block and tackle. Once free of the bottom, the winch pulled the rudder onto shore.

Once the rudder reached shore, Knowles and Zelewski realized that they could not lift the rudder over the nearby railway lines and load it onto the truck. It was simply too large to handle, so the team wrapped the inflatable dingy around the rudder and paddled it to Simons Town Harbour (Visser 2004:17). Halfway through the journey, the boat sprung a leak and the South African Navy (SAN) was called in to save the rudder and the boat. Thereafter, the rudder was moved to the town pier using a winch crane. It remained at the pier for several days. Most of the copper sheathing was removed during this time. Eventually, the rudder was moved to the courtyard of the SAHCM where Conservators applied a limited quantity of fungicide. No other conservation work has taken place since the recovery operation. The rudder is stored at the IZIKO Slave Lodge Museum in Cape Town, which replaced the SAHCM.

Salvage work also played a role in shaping *Bato*'s remains. Private recovery operations during the 1960s and 70s contributed to further disturbance and destruction of *Bato* wreckage. In 1960, a heavy gale blew a 30 foot iron ketch onto Long Beach, near Simons Town (Dilley 2012:1). Completely aground, the ketch crew called for help. Harry Dilley, a Simons Town resident, mobilized his salvage company to assist. They rigged a towing line during the gale to drag the ketch loose. This attempt was unsuccessful and the next morning, Anderson Ndongeni, a salvage diver, rigged a kedge anchor to *Bato*'s wreckage in a second attempt. The salvage team continued, succeeding in freeing the vessel. After securing the vessel at the town pier, Ndongeni mentioned to Dilley that he saw two large cannons on top of *Bato*'s wreckage.

In 1976, The Simons Town Town Council ordered Dilley to recover the cannons (Dilley 2012:2). The Council's goal was to display the cannons as a testament to Simons Town's historical heritage. Dilley and his crew removed the cannons using a crane and transported them to the East Dockyard. A mobile crane hoisted the cannons and loaded them into a truck. The

cannons were stored in the Municipal Yard while the team developed a conservation plan. Eventually, the cannons were treated at Salt River Works in one of their railway furnaces. They were heated to over 1000° C and allowed to cool (Harry Dilley 2014 pers. comm.). Upon completion of the procedure, Allan Brinkley, of Nautilus Marine, sandblasted the cannons and covered it with preservative paint (Dilley 2012:2). Initially, the cannons were displayed at the Simons Town Post Office, but are now displayed on the Simons Town Jetty.



South African Navy (SAN) Divers

Both wrecks are located near a major South African naval base that houses a contingent of South African Navy (SAN) Divers. With the easy access provided by both wrecks, SAN divers have performed training exercises on both wrecks (Jaco Boshoff 2014 pers. comm.). In Brunswick's case, Navy divers descended on the wreck to practice the removal of large metal rods from shipwrecks (Lynn Harris 2015 pers. comm.). Divers sawed through a number copper

drift bolts, leaving broken hacksaw blades as evidence. SAN returned the rods after intervention by the National Monuments Council and the Simons Town Museum (Jaco Boshoff 2015 pers. comm.). Saw marks are still visible on some of the drift bolts (FIGURE 6). No direct evidence exists for such activity on Bato. Military diving operations continue to pose risks to protected shipwrecks in the area (Boshoff et al. 1995:10).

Nautical Archaeology Society: Project Sandalwood

Archaeologists associated with the National Monument Council (currently SAHRA), UCT, and Iziko investigated both wrecks prior to the East Carolina University investigation of 2014. To launch the Nautical Archaeology Society (NAS) in South Africa, archaeologists completed a full scale investigation of *Brunswick* from 1993 – 1995 (Boshoff et al. 1995). The project included several different components (Boshoff et al. 1995:4). Participants worked to create accurate methodologies and equipment for use in underwater archaeology. Any information on ship construction techniques was painstakingly recorded. The team collected data relating to site formation processes. This included information on the public use of the site and the ecological factors impacting the shipwreck. Finally, a public relations campaign was implemented to promote the conservation of shipwrecks.

Project Sandalwood's public outreach initiatives aimed to increase involvement in South African maritime archaeology. A public presentation was held in June 1994 to inform the wider Simons Town community about the project (Boshoff et al. 1995:15). Interested parties and members of the wider public attended the meeting and continued to generate interest afterwards. Local press wrote articles in KRYGKOM, the Historical Shipwreck Society newsletter, SAHCM newsletter, and Fish Eagle Publications. Entries in 'Dive Sites in South Africa' allowed the opportunity to address issues surrounding shipwrecks in South Africa. Future public meetings

were scheduled to further inform the community. Public involvement was limited during archaeological operations, however. The small size of the team did not allow for space for volunteers, though they were accepted whenever possible.

During the 1990s project, the mapping method entailed setting up an irregular reference grid with nails embedded in wreck timbers as control points (Boshoff et al. 1995:16). Reference nails were placed at irregular intervals along the 'keel line'. No baseline was used. Irregular separation caused inaccuracies in measurement and another system was required. The larger extent of the debris field posed difficulties in using the nails as base markers for measurements. The nails were also placed in the lower portions of the shipwreck; making further measuring difficult. Furthermore, sand repeatedly buried the base markers, making it impossible to relocate them.

A second grid system was adopted in mid-May 1994 (FIGURE 7, Boshoff et al. 1995:17). Participants placed markers 15 meters apart along and perpendicular to the keel line. The large space between markers caused divers to lose their way while moving between markers (Boshoff et al. 1995:18). Placing markers exactly perpendicular to the keel line proved too difficult. This system was abandoned in favor of the final grid system in June 1994 (Boshoff et al. 1995:19). The final grid system covered an area of 60 m x 60 m (Boshoff et al. 1995:19). The grid was placed between 11 June and 1 October 1994. Temporary wooden stakes marked the locations for more permanent markers. After checking the measurements, participants placed more permanent PVC markers for the final grid (Boshoff et al. 1995:22). Rope was used to break down the separate squares into more manageable sections. The final grid contained a total error of 200 mm (Boshoff et al. 1995:20). The error between base markers was less than 50 mm. The new grid system allowed for the creation of an accurate pre-disturbance site plan (FIGURE 8).

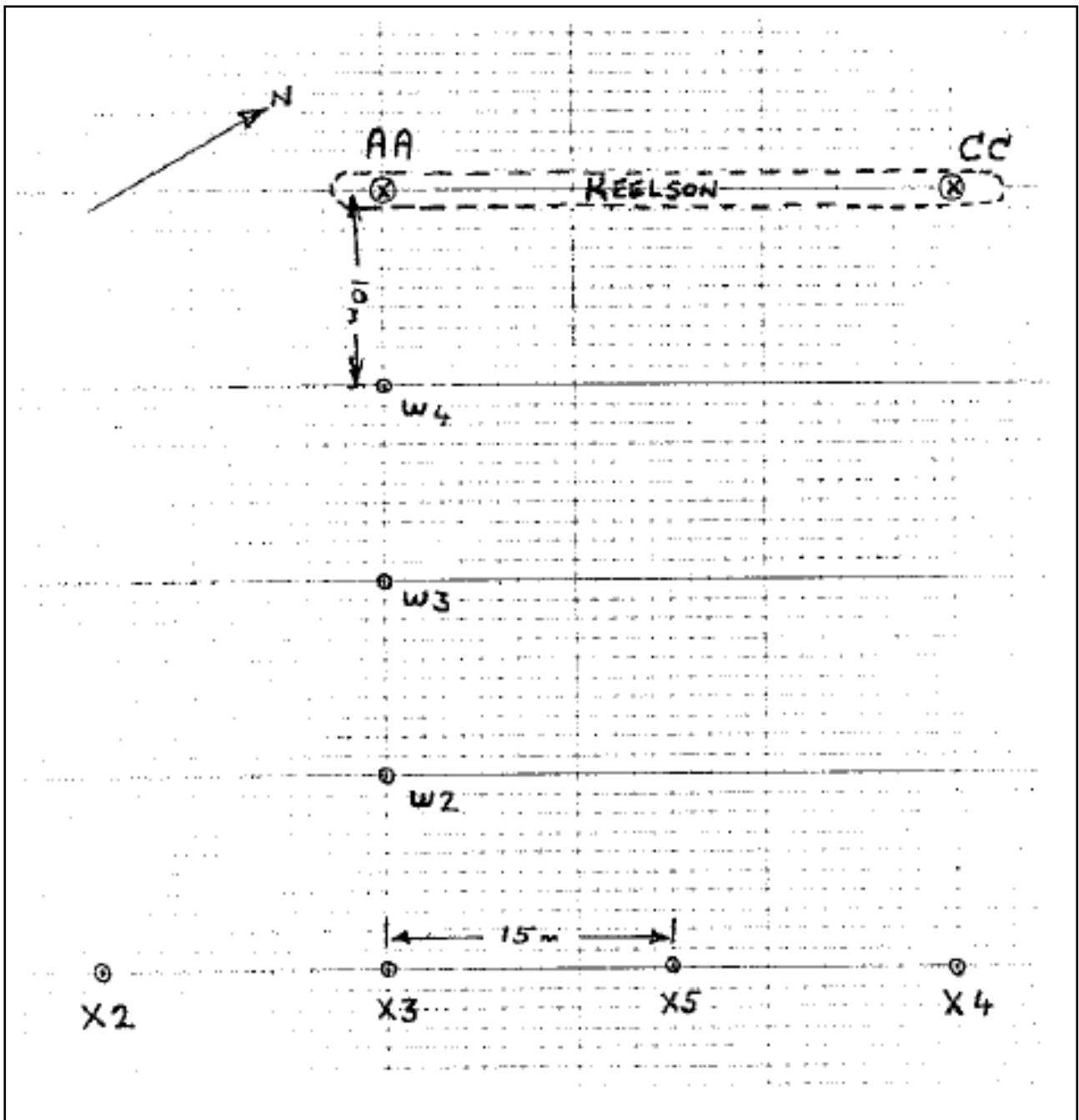


FIGURE 7. Layout of second grid system on *Brunswick* (Boshoff et al. 1995:17).

Once the pre-disturbance survey was completed, limited excavation occurred in key areas using a 5 m x 5 m square for reference (Boshoff et al. 1995:36). Prior to any excavation activities, the surface artifact scatter was systematically collected and recorded (Boshoff et al. 1995:32). Recovered artifacts included copper bolts, nails, some bottles, ceramic fragments, and fasteners. The team recorded each artifact and transported the collection to conservation facilities at the South African Cultural Museum.

Boshoff and other team members created scaled sketches of the iron knees discovered on site. In this case, only T-shaped knees were recorded (FIGURE 9). The sketched knee is slightly smaller than those recorded during the ECU project, though it does reveal some new information. Due to permit restrictions, ECU participants did not excavate to uncover the thickness of the iron knees. The NAS sketch reveals an average thickness to be 10 cm or 15 cm. Several cannons were also located closer to shore. It is unconfirmed if the cannons were on board *Brunswick* when it sank. It is possible, however, that ordnance was being transported from the ship to the shore deposited on site (Jaco Boshoff 2014 pers. comm.). Scale drawings and a map reveal three cannons, cannon balls, and a pile of ballast stones (FIGURE 10). Participants made several observations concerning natural impacts on *Brunswick*. In particular, two underwater species resulted in adverse effects on the remains. Male Steentjes (*Spondyllosoma emarginatum*), a local fish species, dug out circular areas of the wreck during mating displays (Boshoff et al. 1995:12). The excavation unit was 1 m in diameter and over 400 mm in depth. Each spring, large areas of the wreckage are uncovered by these fish. Rapid exposure of the timbers accelerate decay of the wood. In addition, Octopi collect broken glass, porcelain sherds, and other small artifacts to decorate their burrows, losing archaeological context (Boshoff et al. 1995:12).

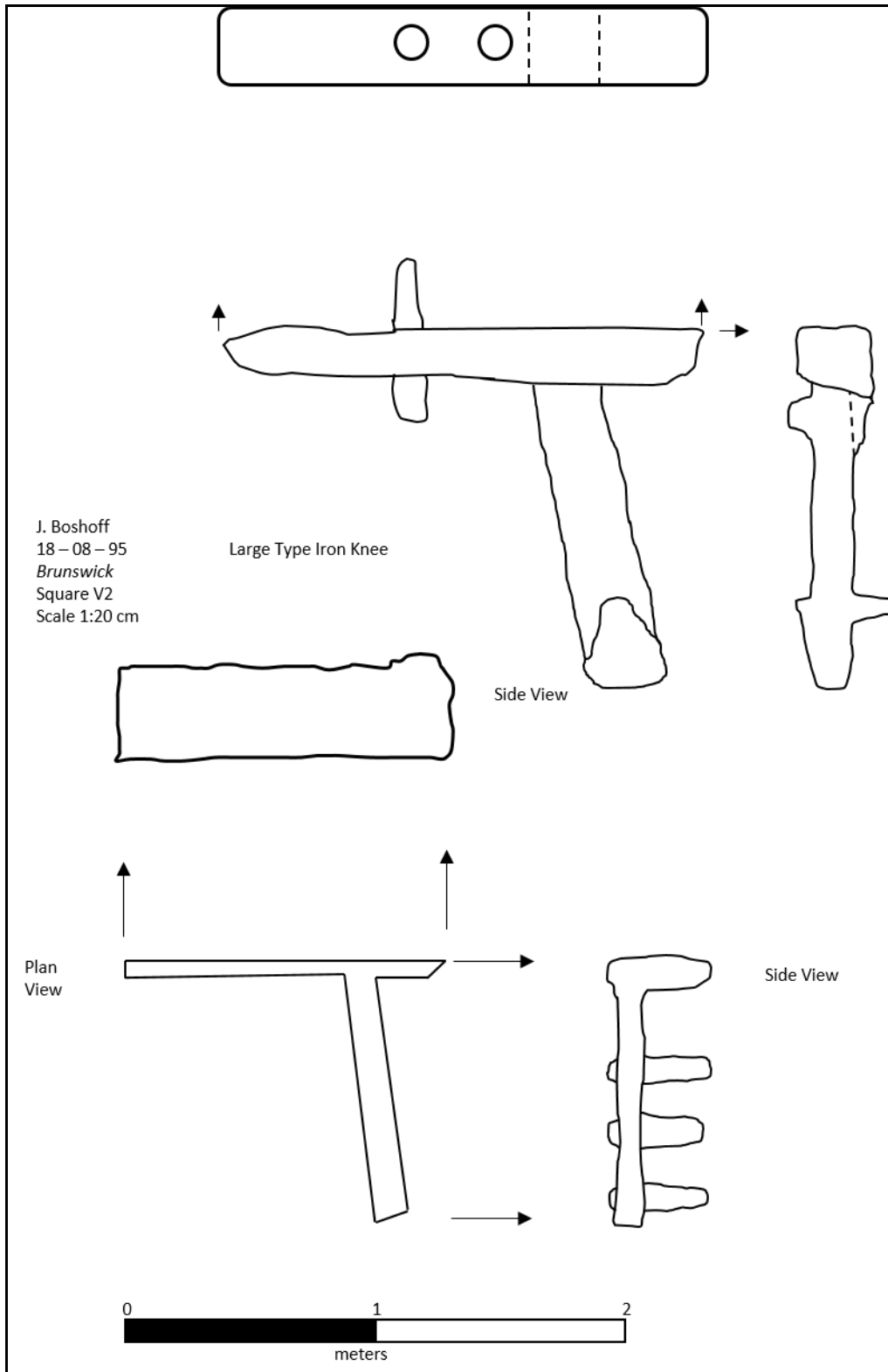


FIGURE 9. Sketch of iron knees (Jaco Boshoff).

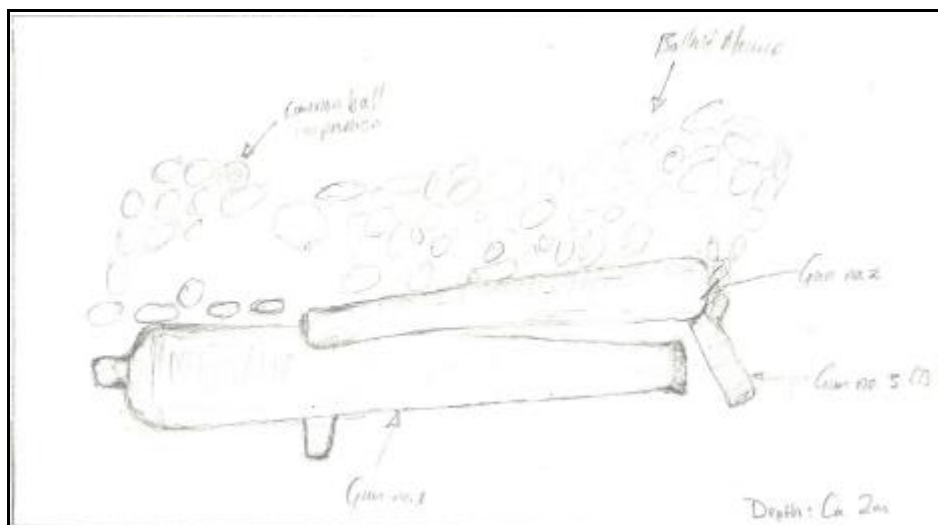


FIGURE 10. Sketch of guns found near *Brunswick* (Jaco Boshoff).

University of Cape Town: an Archaeometallurgical Study 1997

TABLE 2

RESULTS OF MILLER'S ARCHAEOMETTALURGICAL STUDY

Sample	Identified Element	Percentage Composition
JB1 (<i>Bato</i>)	Copper	97
	Tin	2.9
	Lead	0.2
JB2 (<i>Brunswick</i>)	Copper	93.7
	Tin	5.6
	Lead	0.7

Source: Miller (1997:29)

In 1997, Duncan Miller completed a metallurgical analysis of copper samples from Bato's and Brunswick's rudder assemblies (TABLE 2, Miller 1997:29). Bato's sample revealed details concerning Dutch manufacturing processes. A cored dendritic structure is consistent with slow cooled casting (Miller 1997:33). The porous surface indicated a lack of an annealing process. Scientist found evidence of residual cold work in traces of slip banding. The sample contained 97% copper, 2.9% tin, and 0.2% lead (Miller 1997:29). Both factors point towards the sample being manufactured using slowly cooled casting. Once again, no annealation occurred and the

metal was very porous. In contrast to *Bato*, no residual cold work occurred on *Brunswick's* copper. The sample contained 93.7% copper, 5.6% tin, and 0.7% lead (Miller 1997:34). Miller did not speculate why *Brunswick's* sample was less pure than *Bato's*.

Octopus 1996 – 1998

From November 1996 to June of 1998, the Hungarian maritime archaeology organization Octopus performed a detailed investigation of *Bato* (Octopus 1998a). The team took several weeks to clear the shipwreck of growth and some concretion prior to work (Octopus 1998b). *Bato* was overgrown with kelp and algae, and a cleared site was considered necessary for accurate measurements. It is unclear if there was any lasting damage to the shipwreck as a result. Removing the kelp root structures from the shipwreck likely caused damage to the historical remains as the roots pulled small timber fragment with them.

Once the remains were cleared of growth, divers positioned datum points around the shipwreck which were used to section the site into manageable portions (FIGURE 11, Octopus 1998b). The entire shipwreck was mapped using a baseline offset method. Upon completion, the illustrated sections were parceled together to create site plan. This site plan was not published, though the dive team completed various sectional sketches. The center of the site contained a mass of concretion with articulated and disarticulated timbers around the perimeter. The site appeared to have the same characteristics during the ECU work in July 2014.

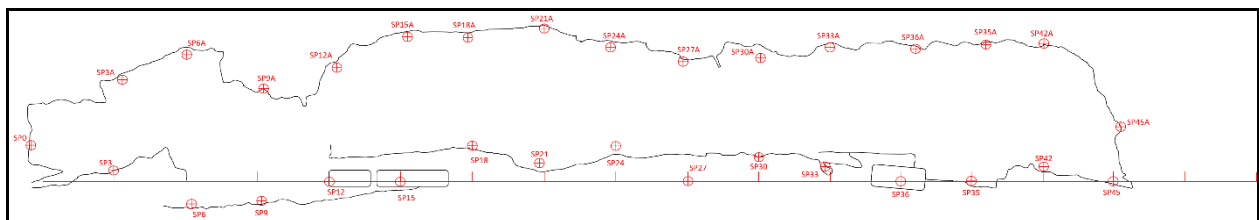


FIGURE 11. Datum locations on *Bato* used during the Octopus investigation (traced from Octopus 1998b).

Many artifacts were recovered, but never conserved. Artifacts include glass bottles, copper sheathing, nails, fasteners, barrels, cannonballs, and a supposed fire mechanism for a musket. Upon closer examination, it was revealed that several of the objects were misidentified by inexperienced archaeologists. The artifacts were removed from the concretion using a hammer and chisel (FIGURE 12). Participant photographed each object before storage. No conservation was attempted. By 2014, several of the artifacts were so corroded they fell apart when recovered.



FIGURE 12. Removal of artifacts from *Bato* using a hammer and chisel during the Octopus investigation (Octopus 1998b).

Archaeologists took several metal and wood samples. No locations exist for the various samples. They were sent to a Hungarian laboratory for chemical analysis and timber identification (TABLE 3). Results identified all wood samples as European oak. The copper sheathing sample revealed a chemical contents of 95% copper, 3.5% tin, less than 1% lead, and the remainder consisting of other metals. A sample of smelt lead contained 94% lead, 4% iron,

TABLE 3

OCTOPUS METALLURGY RESULTS

Sample	Identified Metal	Percentage Composition
Copper Sheathing (S – 5)	Iron	0.132
	Nickel	0.221
	Copper	94.857
	Zinc	0.000
	Arsenic	0.173
	Silver	0.249
	Tin	0.000
	Antimony	3.406
	Lead	0.871
	Bismuth	0.091
Smelt Lead (S – 7)	Iron	3.929
	Copper	0.891
	Arsenic	0.000
	Silver	0.046
	Tin	1.915
	Lead	93.218
	Bismuth	0.000
Smelt Copper (S – 6)	Iron	0.062
	Nickel	0.092
	Copper	92.559
	Zinc	0.000
	Arsenic	0.753
	Silver	0.200
	Tin	0.000
	Antimony	4.876
	Lead	1.030
	Bismuth	0.428
Copper Nail (S – 9)	Iron	0.681
	Nickel	0.000
	Copper	79.082
	Zinc	0.809
	Arsenic	0.000
	Silver	0.151
	Tin	0.811
	Antimony	4.369
	Lead	14.096
	Bismuth	0.000

Source: Octopus (1998b).

and 1% tin. Smelt copper contained 92.5% copper, 4.8% tin, and 1% lead. Samples of a copper nail contained 79% copper, 14% lead, and 4% tin. Wrought iron contained 89% iron, 6% tin, and 3% copper.

University of Cape Town: Simon's Bay Rudders 2004

In 2004, Visser, a UCT student, completed an honours thesis on rudders found in Simons Bay. Of particular note are *Brunswick's* rudder and the unidentified rudder, previously thought to be *Bato's*. Visser discovered two different timber species in rudder (Visser 2004:19). Oak comprised the main piece and fore edge while fir was used in the back boards. The thesis did not discuss reasons for using different wood species, although Visser took detailed measurements.

Visser recorded a second, unidentified, disarticulated rudder and named it the USB. It is still located in Simons Bay and is in a state of severe natural degradation (Visser 2004:22-27). However, it was still possible to gather diagnostic measurements. These revealed a rudder similar in structure to that of *Brunswick*, but smaller in size. Using historic formulas, Visser determined that the rudder belonged to a ship 125 Amsterdam feet or 117 English feet in length (2004:29). This size reference is too small for the rudder to belong to *Bato* or a ship similar to *Brunswick*. The bronze work on the rudder indicates it probably belonged to an English or Dutch ship of the early 19th century (Visser 2004:30).

University of Cape Town: Brunswick Investigation

In 2012 and 2013, Jake Harding performed a survey of the *Brunswick* shipwreck as part of his honours thesis. He described the natural and cultural environment surrounding *Brunswick* (Harding 2013). In the report, collected data was compared with data from Project Sandalwood to create a picture of the site formation processes occurring on the site.

As part of Harding's work, the team took multi-beam images of the shipwreck. To gather the images, survey vessel *Blue Dolphin* passed over the wreckage seven times at a speed of less than 5 knots (Harding 2013:72). Processing occurred at Underwater Surveys (Pty) Ltd with the resulting point cloud revealing images of up to 10 cm resolution. For the final comparison, Harding overlaid the high resolution image with the site plan created during Project Sandalwood (FIGURE 13). The image revealed several site characteristics. Marine life is far more prevalent on the site today than in 1995. Although the overlay images suggests a shrinking debris field, this is not necessarily the case. Sediment coverage prevented sensors from detecting remains of the buried wreckage and, because a sub bottom profiler was not used, there is no clear image of sub-surface remains under the sandy substrate. Exposed timbers show increased damage from abrasion and shipworm activity (Harding 2013:76-84). The continued effects of storm surges, shipworm, and kelp attachments cause increased deterioration.

After determining an increased presence of marine life on the shipwreck, Harding investigated the effects of various species on the integrity of the cultural remains. Kelp still dominated the site, though it is unclear if the plant's holdfast attachment and growth damaged the timbers or not. The only visible effect occurs with heavy surge conditions that rip the plants loose, possibly dislodging small timber segments. Increased kelp coverage provides an ideal environment for barnacles and wood burrowing worms (Harding 2013:36). Barnacles attach by burrowing into the surface timber, while the worms eat their way through the timbers. Further scientific study is required to assess the damage done to the wood.

The team recorded suspension feeding crinoids, including Common Feather Stars (*Comanthus wahlbergi*) and Black and White Sea Lilies (*Tropimetra carinata*) in more sheltered areas of the wreck (Harding 2013:41). No negative effects are associated with these organisms.

In fact, their presence may benefit the survival of archaeological remains through the creation of a protective conglomerate. Harding also investigated the predator prey cycle between Large Spiny Starfish (*Marthasterias glacialis*) and Black Mussels (*Choromytilus meridionalis*) (Harding 2013:39). Group(s) of Spiny Starfish (*Marthasterias glacialis*) feed on the black mussel colony until food supplies are depleted. Afterwards, they migrate to other feeding sites and return to *Brunswick* when the Black Mussel (*Choromytilus meridionalis*) population has recovered.

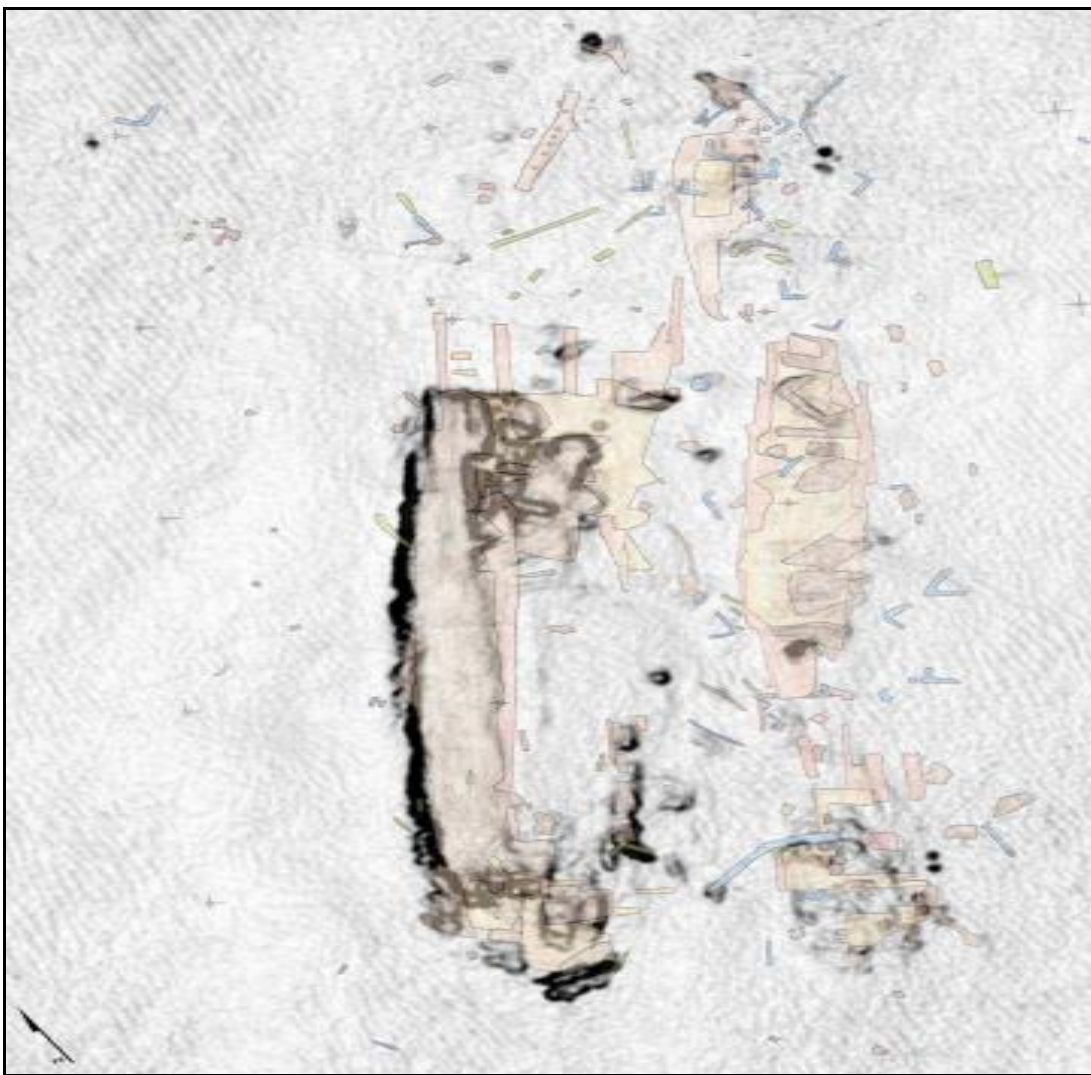


FIGURE 13. Overlaid site plan and multibeam image (Harding 2013).

Chapter 4: ECU Archaeology

A team from East Carolina University (ECU) performed a pre-disturbance survey on both *Bato* and *Brunswick* in late July and early August 2014. During the following week, two team members returned to *Bato* and *Brunswick* to gather more information. A final dive was completed later in the company of Jake Harding to gather video footage and final measurements. The ECU archaeology team consisted of graduate students Justin Edwards, Nathaniel King, and Ivor Mollema. James Smailes of the Maritime Archaeological and Historical Society (MAHS) volunteered to participate in the ECU project. Dr. Lynn Harris, a professor of maritime archaeology at ECU, supervised the project. Tara van Niekerk and Stephanie-Anne Barnardt served as representatives of the South African Heritage Resources Agency (SAHRA). A Nautical Archaeology Society (NAS) student, Francis ‘Jelly’ Gelletich also assisted us as part of his continued education.

The team stayed at Simons Town Boutique Backpackers for the dives in July. After these dives, Ivor Mollema and James Smailes stayed at St. Martini Gardens Apartments. Ivor Mollema remained there until 21 August 2014 to complete historical and archival research. Pisces Divers provided facilities for gear storage and tank fills. They also provided boats and captains for the two days we used them. Pisces also offered the use of their shop as a staging area for our operations.

The ECU team operated under permits *Brunswick* 1844 and *Bata* 1845 issued by SAHRA. Under permit guidelines, participants carried out a pre-disturbance survey using accepted archaeological methodology. The collection of small wood samples (1 cm³) was also permitted. The recovery of artifacts and any form of excavation was prohibited. Light hand

fanning to clear exposed remains of debris was permissible under the permit conditions (Appendix A).

Site Descriptions

The remains of *Bato* are located 50m offshore at the north end of Long Beach in Simons Town. Co-ordinates for the wreck are S34°10.998' E018°25.560' (**Error! Reference source not found.**). It is found directly off where the beach meets the cement railway bulkhead. A small runoff stream flows into the sea at this location. Divers access the surf adjacent to the runoff. The maximum depth varies with the tide and ranges between 3 and 5 meters. Due to its close proximity to shore and its shallow depth, divers on *Bato* are frequently subjected to heavy surge conditions. Such conditions complicated sampling and measurement operations.

Most of the wreckage is located in a large oval representative of *Bato*'s hull below the waterline when it was burned. The oval lies on a north-south axis. Measurements on the oval are 50m in length and a maximum of about 8m wide for total surface area of 400m². The southeastern section of the wreck protrudes from the oval pattern. A large mass of copper sheathing and iron is visible at the northern end of the wreckage. Most of the timber remains are overgrown with kelp or have a large mass of concretion resting on them. Exposed timbers show evidence of burning and charring. The majority of wreckage is wood, followed by iron and copper. It was not possible to determine the composition of the concretion covering the wreck.

Brunswick's remains are located about 120 meters offshore from the railway bulkhead at S34°10.880' E018°25.607'. *Bato*'s wreckage is found 250 meters to the south. Without a boat, access to the site is gained by crossing the nearby railway and climbing down the railway embankment. Divers enter the water at the bottom of the embankment. Boat access is easier, but



FIGURE 14: Map showing the GPS locations of *Bato* and *Brunswick* (Author).

has complications. Due to heavy surf conditions, boat operators use a drop line to guide divers to the shipwreck. Once divers enter the water, the boat operators back off to calmer waters until a diver resurfaces. Maximum depth on the shipwreck is 6 meters, but most of the remains are located at 4.5 meters. The sand surrounding *Brunswick* has a tendency to shift and can rebury or uncover different portions of the wreck. Different aspects of the wreckage are visible from day to day.

The debris is more spread out than *Bato*'s. A main hull section is visible and extends up 1.5m above the seafloor. To the south, iron knees and other hull sections are scattered. During our operations, it was difficult to get an accurate picture of the wreck layout due to the constantly shifting seafloor. In some instances, entire knees were uncovered that were invisible the day before. Copper drift bolts are visible throughout the remains. They are worn in differing patterns and show the effects of sand and water on the wreck. Some copper sheathing was also visible.

Similar to *Bato*, *Brunswick* is surrounded by a sandy and seemingly lifeless seafloor. The wreckage provides marine life the opportunity of nourishment and shelter. Kelp (*Ecklonia maxima*), algae, crinoids (*Comanthus wahlbergi* and *Tropimetra carinata*), and black mussels (*Choromytilus meridionalis*) cover the wreckage. Several Klipvis species and steentjies (*Spondyllosoma emarginatum*) were visible throughout the wreck. Steentjies were given particular attention as they pulled off sponges and portions of wreck. Small sharks inhabit some of the scoured areas under the hull remains. Three cannons form a concreted mass roughly west of *Brunswick*. It is unclear if they form part of *Brunswick*'s remains or another shipwreck. As Simons Town has served as a harbor for the past 250 years, either scenario is likely.

Mapping & Labelling

The first dives focused on mapping and labelling the sites. Prior to any labelling, each diver orientated themselves on the wreckage by drawing a ‘mud map,’ a rough and unscaled site map. The mud maps allowed participants to plan future operations and ensured correct orientation on the shipwreck during dives. Detailed mapping was unnecessary as both shipwrecks had recently been subject to scale drawings and site surveys in previous years. Harding’s work on *Brunswick* provided detailed site maps and multi-beam images to guide our preliminary efforts. SAHRA completed a mapping project on *Bato* in early 2014. The results of this survey are still awaiting publication.

Initial exploration of *Bato* revealed a site that seemed relatively unchanged since the Octopus team investigation. The remains still covered an area oval in shape (FIGURE 16). The center was covered in a concreted mass while the edges of the wreckage revealed burnt timbers and occasional remains of copper sheathing (FIGURE 15). An unidentified caulking agent was found between the timbers. This substance generally showed fewer signs of wear than the surrounding timbers. Beyond the occasional iron fastenings, no copper bolts were documented. To the southeast, the debris field extended from the oval reef shape. An old dredge tube and anchor were found near this location. Remains of sheathing and more burnt timbers were also found here. The section also contained two piles of rock, possibly ballast. Similar piles were located near the northern end of the shipwreck. The northern area of the wreck contained the majority of copper sheathing remains. A possible keelson structure extended from this end in a northeastern direction. All exposed timbers showed at least some evidence of burning. Many were completely covered in scorch marks and still black in color. In some areas, the curved hull planking was scoured out, exposing more timbers and other remains.

Participants spotted a variety of marine life on *Bato*. Kelp covered most of the concreted center masts. In several cases, holdfasts thrived on the exposed timbers and planking. Smaller algae growth was spotted as well. Though less prevalent than on Brunswick, suspension feeding crinoids inhabited *Bato*'s remains as well. Rock Lobsters (*Jasus lalandii*) and Cuttlefish (*Sepia tuberculata*) interrupted our work on several occasions. The most prevalent fish species were



FIGURE 15. Frames and planking on *Bato*. Note the extensive charring on timber remains (James Smailes).

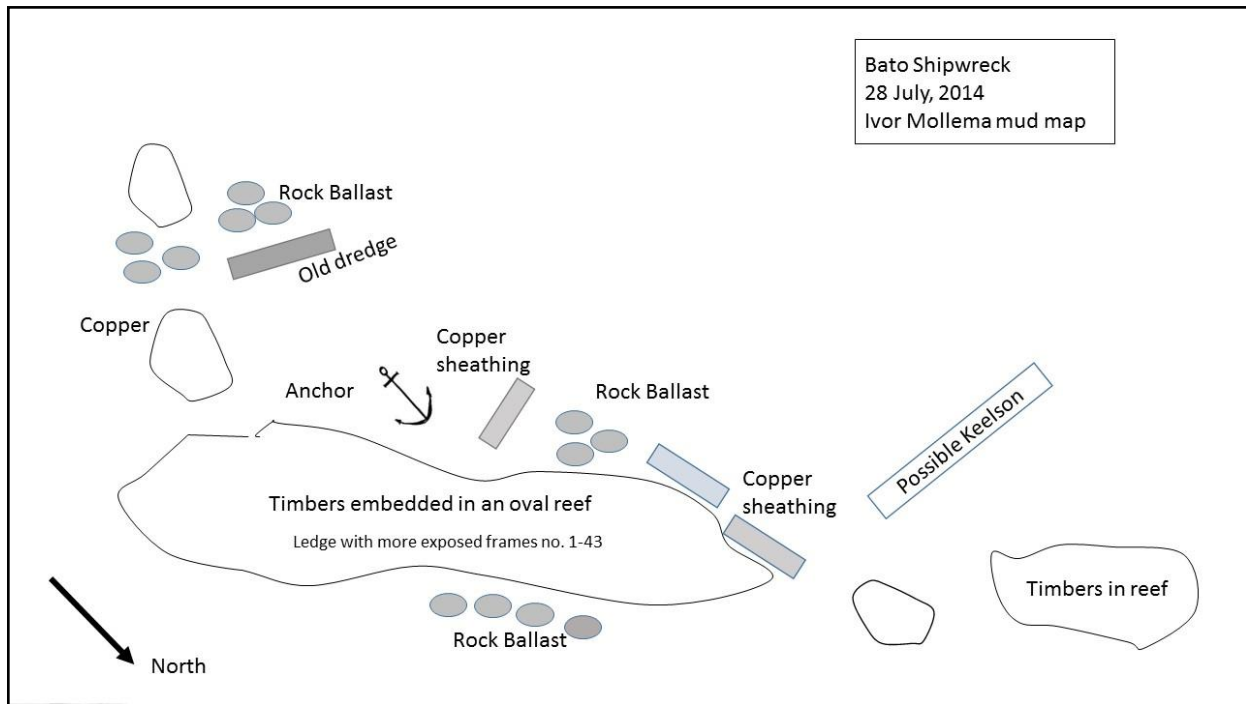


FIGURE 16. Digital mud map of *Bato* from ECU investigation (Author).

different Klipvis and Steentjies (*Spondyllosoma emarginatum*). Pyjama Sharks (*Poroderma africanum*) and several catshark species inhabited the scoured areas underneath the wooden remains.

As indicated by previous projects, *Brunswick*'s debris field was more spread out than *Bato*'s. Several fragments of hull remains are exposed on the seafloor. Intermingled with the remains were some loose planking and the iron knees. Copper sheathing protruded from the sand at the edge of the debris field. Drift bolts, primarily copper, are visible throughout the wreckage (FIGURE 17).

The marine life inhabiting *Brunswick* was almost identical to that found on *Bato*. There were two notable exceptions. Firstly, a large area of the reef on *Brunswick* was populated with mussel shells, both alive and dead. Secondly, suspension feeding crinoids were far more prevalent on *Brunswick*. Further analysis reveals what affect this has on the shipwreck.

The team labelled both shipwrecks (FIGURE 18). On *Bato*, divers labelled 60 frames starting on the southwestern corner and ending in the southeastern section, in proximity to anchor. Seven loose ceiling planks were tagged for future measurements. Nine hull planks received tags for direct comparison. On *Brunswick*, two each of knees, ceiling planks, hull planks, and frames were tagged.

Scantling Measurements

The team recorded detailed scantling measurements on *Bato*. Due to adverse weather conditions, it was impossible to collect the same measurements from *Brunswick*. Fortunately, ECU divers had access to the average measurements recorded during Project Sandalwood in 1995 for comparison. To gain an accurate picture of *Bato*'s construction, divers measured exposed timbers molded and sided dimensions (Appendix B). Room and space was also

established where possible. In some instances, frames were missing or covered in marine growth so this was not feasible. Such was the case at F1, F2, F5, F7, F8, F9, F10, F13, F25, F26, F30, F41, F45, F49, F51, F56, and F60. Team members recorded measurements for labelled timbers that were not too burnt or eroded. Average dimensions were compiled from collected measurements (TABLE 4). Several outer hull planks were labelled and measured as well. The inner planks (IP1 – 7) were deemed too burnt or eroded for the measurements to be of any use (TABLE 5). The hull planks (OP1 – 9) were more accommodating and provided useful measurements (TABLE 6).

TABLE 4

AVERAGE SCANTLING MEASUREMENTS ON *BATO* AND *BRUNSWICK*

Frames ^a	Molded		Sided		Space	
	<i>Brunswick</i>	<i>Bato</i>	<i>Brunswick</i>	<i>Bato</i>	<i>Brunswick</i>	<i>Bato</i>
	38	18.81	16	26.52	2	8.51
Outer Hull Planking	Thickness		Width			
	<i>Brunswick</i>	<i>Bato</i>	<i>Brunswick</i>	<i>Bato</i>		
	10	4.38	32	27		

^aAll measurements are in cm.

TABLE 5

BATO CEILING PLANK SCANTLINGS

IP# ^a	Thickness	Width	Length
1	3	35	Unable to document
2 – 7	These timbers are very burnt and concreted together. There is no way to discern seams or any other diagnostics.		

^aAll measurements are in cm.

TABLE 6

BATO HULL PLANK SCANTLINGS

OP#	Thickness	Width	Location	Condition
1	5	29	near F 4, 5, 6	weathered edges
2	5	25	near F17, F18	weathered edges
3	4	18	near F29, 30	weathered overall
4	5	24	near F34	weathered, burnt
5	2	20	near F39	very burnt
6	5	30	near F43	surface burnt, edge is in good condition
7	5	35	near F46	very burnt
8	4	27	near F56	very burnt
9	no edge more than 1 cm	35	loose	no edge, very burnt

^aAll measurements are in cm.

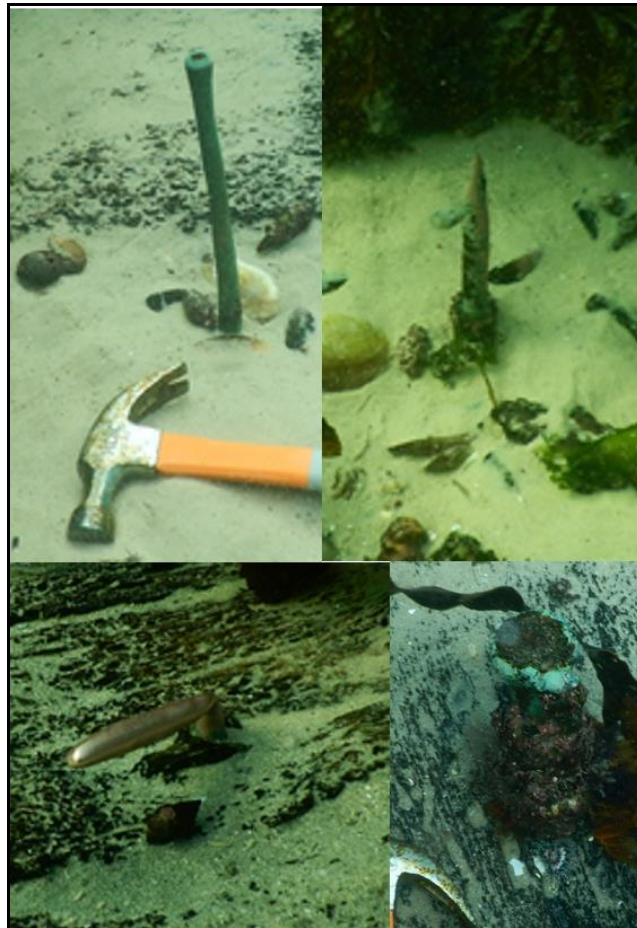


FIGURE 17. Various copper drift bolts on *Brunswick* (James Smailes).



FIGURE 18. Sample of labels used on both *Bato* and *Brunswick* (Tara van Niekerk).

Iron Knee Measurements

The ECU project recorded eight iron knees on *Brunswick* (TABLE 7). No iron knees are located on *Bato*. In each case, the length of both arms was recorded (FIGURE 19). The thickness at the end of each arm was also documented. If there were any other segments, these were noted as well. In total, three different types of iron knees were identified: hanging knees, lodging knees, and T-shaped knees. It proved impossible to dig through the bottom and gain a molded dimension of the iron knees. However, scaled drawings from Project Sandalwood indicate a molded measurement ranging between 10 and 20 centimeters. These will be incorporated during the final analysis.

TABLE 7

AVERAGES OF IRON KNEE MEASUREMENTS ON *BRUNSWICK*

Hanging Knees ^a			
L1 Average	W1 Average	L2 Average	W2 Average
122.50	11.50	120.00	10.50
Lodging Knees			

L1 Average	W1 Average	L2 Average	W2 Average		
111.50	11.50	142.25	10.75		
T-Shaped Knees					
L1 Average	W1 Average	L2 Average	W2 Average	L3 Average	W3 Average
111.00	15.50	93.50	12.00	14.50	11.00

^aAll measurements are in cm.

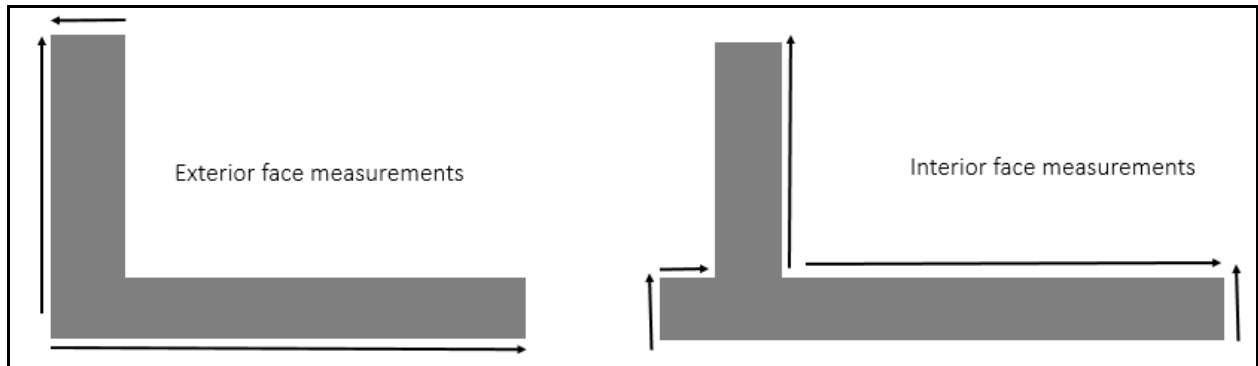


FIGURE 19. Measurements taken on iron knees (author).

Anchor Measurements

Bato's wreckage contained one anchor (FIGURE 21). The team took diagnostic measurements of the anchor to assist in identification later (FIGURE 20, TABLE 8). Although the anchor was heavily concreted, every effort was made to ensure the measurements were as accurate as possible. This was exceptionally hard with the flukes. Divers found no attached chain or line with the anchor.

TABLE 8

ANCHOR MEASUREMENTS ON *BATO*

Dimension	Measurement ^a
Ring Outer	18
Ring Inner	15
Ring Thickness	3
Shank Length	77
Shank Diameter	25
End of Bills along shank	55 from eye
Distance from shank	23L/22R
Crown	13

L Fluke	36
R Fluke	27
End fluke	16

^aAll measurements are in cm.

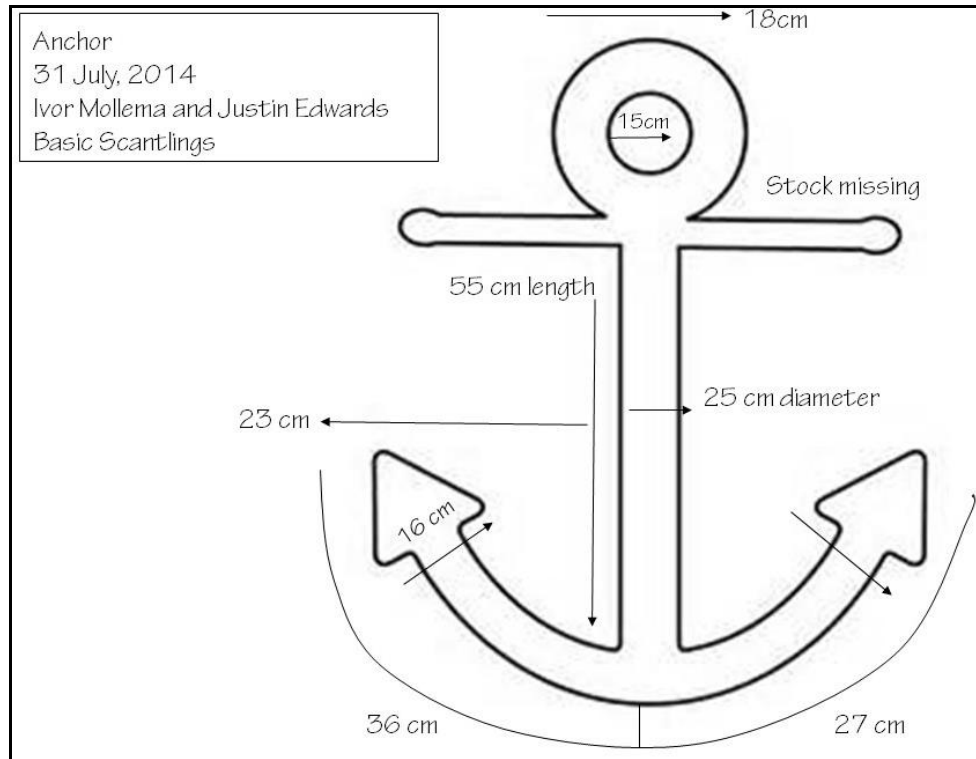


FIGURE 20. Anchor measurements taken during ECU investigation (Justin Edwards).

Wood Samples

The team collected wood samples on both shipwrecks. Sampling processes included slicing into the wood on either side of the targeted timber, followed by the use of hammer and chisel (FIGURE 22, FIGURE 23). Each sample was placed in a labelled plastic bag filled with seawater. The keelson, outer planking, inner planking, and frames were all sampled twice on both shipwrecks. In *Bato*'s case, samples were also taken of the possible caulking agent. Samples were no larger than 1 cm³.

Once properly packaged to guarantee continued preservation, the samples were sent to



FIGURE 21. *Bato's anchor in situ* (James Smailes).

Professor Marion Bamford of the University of Witwatersrand, near Johannesburg. She analyzed the samples and was able to ascertain a genus for all samples using microscopic analysis (FIGURE 24, TABLE 9, Appendix C). One sample was destroyed during transport. Unfortunately, it was not possible to analyze the caulking agent found on *Bato*.

TABLE 9

SAMPLE WOOD IDENTIFICATIONS ON *BATO* AND *BRUNSWICK*

Site	Sample No.	Location	Wood identification (to genus level only)
<i>Brunswick</i>	BRWS1	OP2	<i>Quercus</i> (oak)
	BRWS2	F3	<i>Quercus</i> (oak)
	BRWS4	OP3	Sample destroyed
	BRWS6	F2	<i>Quercus</i> (oak)
	BRWS9	Keelson	<i>Abies</i> (fir)
	BRWS10	Keelson	<i>Quercus</i> (oak)
<i>Bato</i>	WS1	F49	<i>Quercus</i> (oak)
	WS4	IP2	<i>Quercus</i> (oak)
	WS5	F44	<i>Quercus</i> (oak)
	WS7	Keelson	<i>Quercus</i> (oak)

	WS8	F54	<i>Quercus</i> (oak)
	WS10	OP3	<i>Quercus</i> (oak)
	WS11	Keelson	<i>Quercus</i> (oak)
	WS12	IP1	<i>Quercus</i> (oak)

Source: Marion Bamford

Photography and Videography

On each dive, a team member documented our investigation using photos or videos. A Nikon COOLPIX AW110 camera was used during to take photographs. The GOPRO Hero 3+ Black Edition was used to take videos and some photo stills. Most of the photographs displayed in this section are the direct result of this activity.

Each labelled frame was photographed prior to measurements. Iron knees were individually photographed. Interesting features, like the old dredge pipe and copper sheathing, were photographed as discovered. Varying activities, like wood sampling and recording measurements were also documented. A full record of these photographs is available.

Preliminary Marine Life Survey

In an effort to better understand site formation processes on *Bato* and *Brunswick*, videos and photographs were used to document marine life on both shipwrecks. Usually, a diver handled the GOPRO camera for the duration of the dive and videoed any marine life we came across. Still taken from these videos were used to compile a list of species visible on both shipwrecks (Appendix C).

Participants noted several important species and behaviors on the shipwrecks. Sea Bamboo (*Ecklonia maxima*), a type of kelp, grows abundantly throughout the remains of both ships. The plant anchors into the wreckage and roots burrow into the wreckage. It attaches to organic remnants to gain access to required nutrients. When Sea Bamboo is forcibly removed, fragments of timber are removed with the root cluster. Storms and kelp collection are the most



FIGURE 22. Sawing into timbers to prep for sample removal (James Smailes).

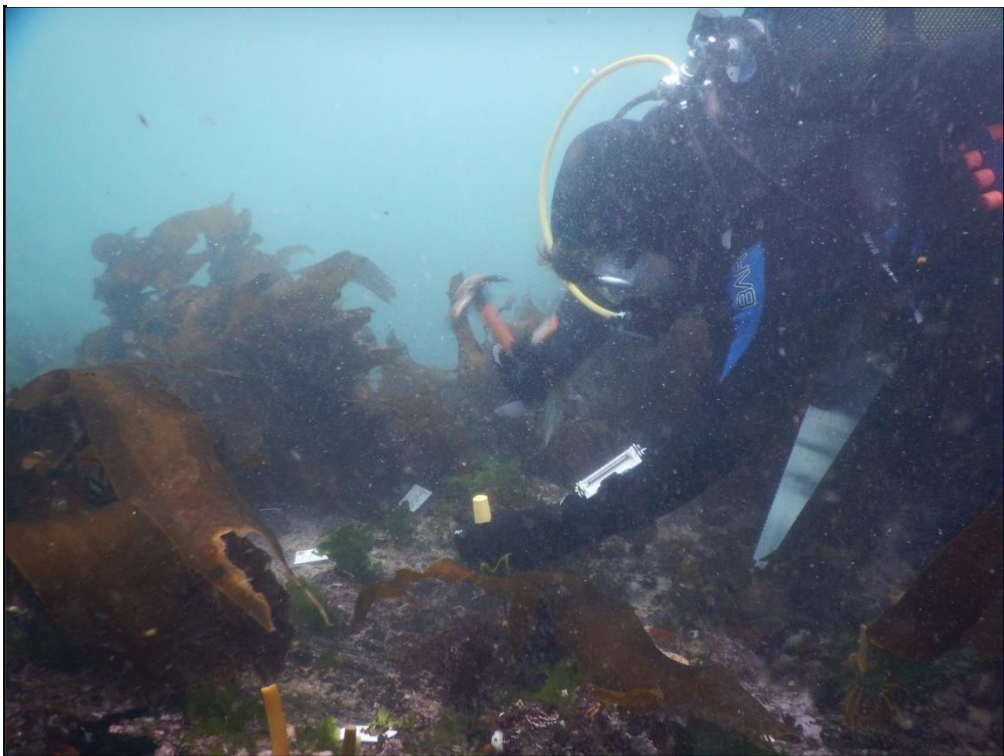


FIGURE 23. Using a hammer and chisel to remove samples (James Smailes).



FIGURE 24. Microscopic plates used during wood analysis of BRWS1
(Marion Bamford, University of the Witwatersrand).

common causes of such removal. As mentioned above, great care was taken by team members Steentjies (*Spondyllosoma emarginatum*), a common bait fish, are prevalent on both shipwrecks. Divers observed a small school of Steentjies removing marine growth from the timber remains. As the plant tumbled, the fish ate it completely. With expertise of marine biologists in future site assessments, the rate of species repopulation on the shipwreck timbers may be more scientifically analyzed. During Project Sandalwood, the mating behavior of these small fish was also a cause for concern (Boshoff et al. 1995:12). As part of their ritual, male Steentjies fan out a shallow depression in sea floor, creating a nest (Fairhurst et al. 2007:79). Eggs are laid in the nest by interested females and watched over until spawning. Regular occurrence of such behavior exposes, or re-exposes, wreckage possibly preserved under the bottom sediment.

Although no live octopi were observed on either shipwreck, there were reports of recent sightings. Pisces divers reported octopi on the site two weeks prior to the ECU investigation. During Harding's thesis field work, he observed three active octopus burrows. These creatures collected pottery sherds, copper fragments, and other small items from throughout the shipwrecks. Any artifacts observed around these burrows must be reconsidered as a secondary redeposition.

Cannon Measurements

As mentioned in the previous chapter, Mr. Harry Dilley and his salvage crew removed two cannons from *Bato* in 1976. The cannons were heat treated in a railway furnace, eventually displayed at the head of the Simons Town Jetty, and managed by jetty supervisor, Dennis Lihou (FIGURE 25). An effort was made to document these cannons. The results are displayed below. Due to the conservation methods used, it was difficult to discern and reinforcement bands or similar features on the cannons. As a result, the measurements provide only a basic outline of the

cannon shape and size (TABLE 10, TABLE 11). The picture demonstrates the degree of degradation suffered by the cannons.



FIGURE 25. Bato cannon on left side of jetty (Author).

TABLE 10

MEASUREMENTS OF CANNON ON LEFT SIDE OF JETTY

Dimension	Measurement
Overall length	267
Barrel length	251
Cascabel to breech reinforce	17
Button length	9
Reinforce to touchhole	18
Circumference in front of breech reinforce	145
Breech reinforce to first reinforce	25
Thickness first reinforce	4
Breech reinforce to second reinforce	83
Thickness second reinforce	3
Breech reinforce to third reinforce	114
Thickness third reinforce	3

Muzzle diameter	27
Bore diameter	18
Muzzle circumference	86
Diameter left trunion	11
Length left trunion	9
Diameter right trunion	13
Length right trunion	11
Distance to middle of trunions	125

^aAll measurements are in centimeters (cm).

TABLE 11

MEASUREMENTS OF CANNON ON RIGHT SIDE OF JETTY

Dimension	Measurement
Overall length	273
Cascabel to breech reinforce	24
Muzzle diameter	31
Bore diameter	16
Length to center of trunions	146
Diameter left trunion	13
Length left trunion	11
Diameter right trunion	14
Length right trunion	12

^aAll measurements are in centimeters (cm).

Artifact Analysis

The Iziko Maritime Archaeology Laboratory houses artifacts from both Project Sandalwood and the Octopus team investigation. It is the repository for a large collection of artifacts from both *Bato* and *Brunswick*. The author photographed selected items from the collections for comparison. Copper products received special attention. Both collections comprised a large number of drift bolts, sheathing tacks, and sheathing plates. Each was photographed and measured for comparison. Average measurements are inserted below (TABLE 12, TABLE 13).

The copper sheathing tacks on both *Bato* and *Brunswick* are nearly identical in shape and size.

TABLE 12

MEASUREMENTS OF BOLTS FOUND ON *BRUNSWICK*

Bolt Number	1	2	3	4	5	6
Type	Round	Round	Round	Round	Round	Square
Total Length	31.7	35.2	25	26.5	26.8	12.5
Diameter head	3	2.8	2.7	2.8	2.7	3.2
Thickness head	0.6	0.4	0.6	0.5	0.6	1.3
Length shank	31.1	34.2	24.4	25.5	26.2	11.2
Diameter shank	1.8	1.9	1.8	1.8	1.8	1.4
Length spike	5.5	8.1	4.6	5.5	5.6	4.6
Thickness Point	0.3	0.2	0.4	0.1	0.2	0.3
Diameter Cast Line	0.1	not visible	0.1	0.1	0.3	not visible

^aAll measurements are in centimeters (cm).

TABLE 13

MEASUREMENTS OF BOLTS FOUND ON *BATO*

Bolt Number	1	2 ^b
Type	Round	round
Total Length	29.5	18.4
Diameter head	3	4
Thickness head	0.6	2
Length shank	28.9	16.4
Diameter shank	1.8	1.8
Length spike	5.8	5.3
Thickness Point	0.3	0.1
Diameter Cast Line	0.1	not visible

^aAll measurements are in centimeters (cm).

^bUpon further examination, it was realized that his bolt was eroded to length shorter than its original.

Both have rounded heads and vary from 3 – 5 cm in length. The drift bolts are of similar design and shape as well: a round head with a round shaft and tapered end. In this case, the head measured an average of 3 cm in diameter while the shaft measured about 2 cm.

The Octopus collection contained a number of interesting artifacts. A small barrel was recovered, but did not receive any conservation treatment. A small cannon ball was also recovered, but is now starting to fragment. A large portion of both collections included later period bottles and debris that accumulated in Simons Town Harbour. *Bato*'s collection also contained some smaller machine parts, notably screws and fastener plates, and other glass fragments.

Historical Research

A range of primary and secondary sources provided a comprehensive understanding of the historical context of *Bato* and *Brunswick*. The primary sources were accessed through two principal archives: The National Archives of the Netherlands, located in Den Haag, and the Western Cape Provincial Archives and Records Service, located in Cape Town. Journal articles, source compilations, and secondary history narratives formed the bulk of the remaining research.

The Dutch National Archives served as a good starting point for archival research. Original logbooks of *Bato* dated from 1802 to its destruction in 1806. The journals are written by the Pilot Harteke and First Officer Melvill. Most of the daily entries consist of sailing data, including wind direction, strength, and the course set for that day. Occasionally, noted events are recorded in the logbooks. This includes events like the boarding of Governor-General Janssens, *Bato*'s destruction, storm damage, and encounters with other ships.

Detailed period maps of the Cape of Good Hope were also located and photographed. Some displayed the position of Dutch and British fortification in the area, while one showed unit dispositions during the Battle of Blaauwberg. The battle map proved particularly useful as it illustrated the British landing site in detail. Official records of the surrender of the Cape Colony were also located.

The Western Cape Provincial Archives and Records Service provided excellent primary sources dealing with local events at the time. Harbor logs detailed the comings and goings of many ships, including *Bato* and *Brunswick*. French ships, like Admiral Linois' *Marengo*, are also detailed in the logbook. Finally, privateers of several nations are recorded. The most notable of these is *Le Napoleon*, a French privateer forced into the cliffs near the Cape of Good Hope.

Archaeological Research

To gain an appreciation of the previous work completed on both *Bato* and *Brunswick*, it proved necessary to visit a number of places. SAHRA's Maritime Underwater Cultural Heritage (MUCH) headquarters, in the Castle of Good Hope, provided information on the investigation completed by Octopus in 1996 – 1998. Simons Town Museum and the IZIKO Maritime Centre provided information on Project Sandalwood. The John Marsh Research Centre of IZIKO proved particularly helpful in gaining more information about modern salvage operations concerning both shipwrecks.

Theoretical Framework

Naval supremacy and imperial might are inextricably linked to one another. Without control over major trade and supply routes, an empire cannot function properly. In most cases, this requires military security both on land and on the water. Never was this more true than during the empire building of the 18th and 19th centuries. Nations vied for control of strategic terrestrial and maritime locations worldwide.

Maritime strategy was investigated to understand the full benefits a technological advantage provided an imperial power in the Napoleonic era. The theories of three naval thinkers were consulted: Admiral Raoul Castex, Sir Julian S. Corbett, and Captain Alfred Thayer Mahan. Each theorist revealed important aspects of naval strategy affected by technology. Although their

origins are found in navies of a later age, their broader applications are suited to examine the Napoleonic era. Mahan provides an overview of the effects of sea power on history, but focuses mostly on events in Europe during the time covered here. In the work *The Influence of Sea Power upon History*, Mahan briefly mentions the Cape as insignificant because it lacked any military strength. Though incorrect, this assumption illustrates the Eurocentricity present throughout Mahan's work. The other two works illustrate events during their time and draw broad conclusions from them. In some cases, other military thinkers, like Clausewitz, are used as a comparative basis.

Technology placed limits on naval operations (Castex 1994:281). According to Castex, sailing ships traversed all corners of the globe without technical interruptions or limitations. The only logistical constraints existed in the amount of food, munitions, and water that a ship carried. Travel speed, however, was another matter entirely. The same voyage, taken in opposing directions, could take significantly different amounts of time depending on wind speeds and directions (Castex 1994:282). Étienne Eustache Bruix, a French Navy admiral, is cited as the source of these limitations (Castex 1994:282). He undertook a voyage between Brest and Toulon. The first time, the voyage took just 17 days, while it took 41 days in the opposite directions. The same effect was felt in trans-oceanic voyages like the ones undertaken to reach Asian ports.

Technological differences, like those investigated here, allowed navies to lessen the geographic constraints they experienced. A reliance on a dwindling timber supply lessened the longevity of vessels. The replacement of timber reinforcement with iron countered this problem. Copper sheathing increased hull life on transoceanic ships. Differences in ship construction played a role as well.

Mahan cites that the goal of all naval conflict is to destroy all enemy combat abilities (Mahan 1890:240). Secondary objectives include the destruction of commerce and communications lines (Mahan 1890:205,235). Nelson's Battle of the Nile is cited as an illustration of the destruction of the enemy's naval force and the disruption of communications between Napoleon in Egypt and his superiors in France (Mahan 1890:231). Although the Cape of Good Hope is not specifically mentioned in Mahan's work, his principles are reflected in the use of the Cape and technology during the Napoleonic Era. The Cape controlled lines of communications and commerce between Europe and the Indian Ocean. It used this position to great advantage by housing varying naval and privateer forces during the Napoleonic Wars. These squadrons enacted a *guerre de course* on the East Indian trade and used the Cape of Good Hope as a resupply and repair point. Evidence in contemporary harbor logs supports this. The comings and goings of French privateers and naval forces are well documented. Admiral Linois' *Marengo*, *Belle Poulle*, and the privateer *Le Napoleon* are all mentioned several times.

Mahan does not reference the influence of technology upon strategy in any direct way. There is only a vague reference to the technical leaps that have been made in the navy since the introduction of steam power (Mahan 1890:114). Strategy is directly affected by technology. During the Age of Sail, technology and construction styles limited the length of a ship's service, how long it could stay out at sea at a time, and many other factors. Several of these technological influences are investigated here.

Corbett draws a clear distinction between unlimited and limited warfare (Corbett 1988:xx). In unlimited warfare, the goal is the complete destruction of the enemy. Limited warfare has clear and defined objective that must be achieved. Unlimited war is similar to the term 'total war'. Examples of limited war include land grabs to sue for peace, seizing certain

territories, or the reduction of select enemy forces (Corbett 1988:50). Mahan's theories of great fleet engagement are an example of unlimited warfare.

Limited warfare plays a significant part in the creation, and maintenance, of maritime empires (Corbett 1988:52). During the Napoleonic Era, several limited operations were used to achieve the unlimited goal of France's destruction. The Cape Colony was attacked in 1795 and 1806, operations in South America occurred in 1806, and repeated operations occurred in the West Indies and Mediterranean. In a limited war operation, the objective must be restricted in area and have reduced political importance (Corbett 1988:55). The objective's location must allow it to be strategically isolated. Alternatively, it can be isolated through other strategic operations.

The geographic isolation of the Cape of Good Hope allowed Great Britain to control East Indian trade and lines of communication. Isolated posts, like the Cape, allowed for limited troop numbers and ships to be involved in the operation. The Cape was the only post of its kind in Southern Africa, allowed for a small and limited war. Needless to say, the strategic advantage Great Britain gained through this 'war' provided great benefit in the unlimited war against Napoleon.

Far flung strategic operations required technological prowess. The durability of ships was improved to accommodate the demands of a global empire. Technological advantage gifted the user with the ability to take on several limited operations to aid in the larger, unlimited goal. The adversary, at a technological disadvantage, was forced to fight a defensive war without the ability to strike at a global scale. The following chapter illustrates the differences between Dutch and British maritime technologies and how they affected this struggle.

British naval policy dictated that the primary goal of the BRN was the protection of the British Isles (Moore and van Nierop 2003:102). Geography ensured the importance of the navy in the defense of Great Britain (Moore and van Nierop 2003:103). During the Seven Years War (1757–1762), 64% of the BRN's ship days occurred in home waters or the Mediterranean (Moore and van Nierop 2003:105). During the American War for Independence, deviation from standard policy resulted in an unsuccessful naval campaign outside of European waters (Moore and van Nierop 2003:105–106). From that point forward, British naval strategists argued the importance of a strong home fleet (Moore and van Nierop 2003:107). This thinking was put to the test during the Napoleonic and Revolutionary Wars.

Economically valuable colonies were not considered the most important (Moore and van Nierop 2003:107). Small and geographically strategic colonies proved more valuable. They opened up new theaters of trade or allowed access to those controlled by imperial rivals. Control of colonial trade was the lifeblood of both France's and Great Britain's war efforts during the Napoleonic Era. The main fleet remained in the western approaches to the Channel, but considerable naval assets deployed to major colonial, and imperial, theatres. Expeditions outside Europe served several functions. Conquering French sugar producing colonies in the Caribbean struck at their colonial trade, and the lifeblood of their economy (Moore and van Nierop 2003:107). Naval might was best used to strike at colonial trade. British naval might also prevented the French expansion (Moore and van Nierop 2003:108). Operations in the Mediterranean limited Napoleon's attempt at expansion in the Middle East. In other cases, the British seized enemy colonies to prevent their use as naval bases. In some cases, like the Cape of Good Hope, the captured bases provided great strategic benefits to the British. The BRN designed its ships to endure long foreign cruises and further its imperial operations.

Dutch naval policy focused on European waters. Primary objectives focused on the return of the VOC fleet and trade protection in the West Indies and Suriname (Moore and van Nierop 2003:114). In the summer months, the navy provided protection on the final leg of the VOC's return journey through the English Channel or around the British Isles (Bruijn 2011:136). In particular, this was done to avoid smuggling with British and French ports. Four frigates served convoy duty for the VOC. A regular convoy service to the West Indies and Suriname was set up in 1737 (Bruijn 2011:133). Dutch convoys also protected merchantmen travelling to the Iberian Peninsula and into the Mediterranean (Moore and van Nierop 2003:114). The Barbary corsairs of the North African coast posed a particular threat and the Dutch frequently deployed naval squadrons to the area to protect their interests (Bruijn 2011:139). Most Dutch naval operations occurred in European waters, close to home.

This all changed during Fourth Anglo-Dutch War (1780–1784) when the VOC made its first ever request for military assistance in 1783 (Bruijn 2011:139). Five ships of the line, under Captain van Braam, sailed to the East Indies in 1781. Primarily, these served to convoy merchantmen and assist in local conflicts. They also served to halt British ambition in the nearby Malay Peninsula (Moore and van Nierop 2003:116–117). Twenty five Dutch navy ships operated in Asian waters between 1783 and 1795, marking a significant departure from previous naval doctrine (Bruijn 2011:140). The loss of Middle American colonies during the war freed up Dutch resources for operations in the East (Moore and van Nierop 2003:115). During the Napoleonic Era, few Dutch ships reached the East Indies due to British control of the major sea lanes (Moore and van Nierop 2003:119). Only two small squadrons reached the area between 1795 and 1811. Three ships of the line and a frigate arrived in 1803 under Admiral Simon Dekker. Another two ships and a single frigate arrived in February 1804. Inadequate shipyard

facilities, naval stores, disease, and lack of manpower prevented any significant action by the Dutch naval force in the East Indies. Ships suffered accelerated rot and malaria wreaked havoc on European sailors (Moore and van Nierop 2003:119). Colonial and imperial operations did not suit Dutch naval vessels.

The BRN followed Mahan's secondary objectives and sought to destroy enemy commerce and communication lines. The capture of key bases across the world demonstrates allowed for the projection of British naval power along key trade routes and limited enemy commercial capabilities. After recapturing the Cape of Good Hope in 1806, British naval forces took several merchantmen, and even a French naval vessel, as prizes to demonstrate their ability to maintain a global blockade on French trade. British strategy utilized several 'limited wars' to achieve victory in the 'unlimited war' against Napoleonic France. Once, again the geographic isolation and strategic location of the Cape of Good Hope made it a prime target for British imperial expansion. From this location, BRN harried enemy trade and patrolled against privateers and naval expeditions. The combination of strategic expansion and a focus on trade created a larger and more powerful British empire.

Dutch strategy focused on maintaining, not expanding, their European and colonial territories. As a result, they focused only on the destruction of British naval forces in Europe for much of the conflict. As this negated key secondary objectives required for imperial expansion, it is a small wonder that Dutch imperial initiatives lacked success. Even the deployment of Dutch ships to the East did little to change strategic thinking. Ships tasked with local patrols and resolving local conflicts could not expand Dutch imperial possessions. Reliance on a European squadron resulted in a negative impact on Dutch empire building efforts.

Chapter 4: Analysis & Discussion

The data analyzed in this section answers the central research question: In maritime affairs, were the British or the Dutch technologically superior. A number of key aspects are investigated. Scantling measurements provide insight to the wood construction capabilities of both nations. Additional analysis of iron knees illustrates their role in maritime technological advancement. The role they played in ship construction is also portrayed. *Bato*'s anchor is compared with standard weights and measures. Timber samples are compared and the results explained. An attempt is made to identify *Bato*'s cannons and the gun pile near *Brunswick*. Duncan Miller's copper analysis is revisited and placed within the wider imperial framework of the Napoleonic era. Finally, the bolts documented at IZIKO are compared for differences in style and purpose. Each segment ends with a basic description of superiority, inferiority, or equilibrium.

Chapter 5: Analysis and Discussion

Scantling Measurements & Ship Construction

By the Napoleonic Era, European methods of ship construction were fairly similar. This was particularly true when comparing British and Dutch ships. In 1727, three British shipwrights entered the Amsterdam Admiralty dockyard: Charles Bentam, James May, and Thomas Davis (Gawronski et al. 1992:63). Bentam proved the most influential of the three. Gustaaf Willem Baron van Imhoff hired them to improve and standardize Dutch shipbuilding. Both the VOC and the Admiralties desired this (Gawronski et al. 1992:44). Bentam and his colleagues introduced the “English” method of construction using draughts and the frame-first construction method (Gawronski et al. 1992:64). Previously, Dutch shipyards did not use plans and the northern shipyards still built their ships using the shell-first method. As part of this process, Bentam also introduced the use of moulds. By 1742, van Imhoff and Bentam had succeeded in the complete standardization and modernization of the Dutch shipbuilding industry (Gawronski 1996:21). From this point on, British and Dutch vessels showed a great degree of similarity in design. This was already evident in 1737, as detailed by the indication of several Dutch ships constructed in the English manner (Ollivier 1992:212). This change in ship design and construction affected the Amsterdam admiralty most of all, and was transported to other admiralties (Hoving 2005:33–35). The VOC, heavily influenced by the Amsterdam Admiralty, also changed its ships to fit a more modern, and English method.

Bato, however, was built in Rotterdam. The ‘new’ British techniques did not receive an enthusiastic audience there (Hoving 2005:59). These similarities allow a comparison of *Bato* construction to the methods used in other, non-Dutch, historical sources. Paulus van Zwijndrecht had already developed his own drafting methodology. Construction methods had to change to

accommodate the new drafting techniques. The hull of the shape had to be based on mathematical or scientific principles, much like those of the English Bentam. In this case, a number of circles combined in such a way to give shape to the hull. Although scientific principles were shared between Holland and Great Britain. Zwijndrecht simply used them to design hulls suited for the shallower waters surrounding his home country. Most notably, this included a flatter hull and fuller hull shape.

Zwijndrecht's drawings resulted in changes to the construction methodology as well. Natural woodshapes and types no longer determined the shaped of a ship's frames or hull. Preplanning, based on detailed lines drawings, allowed for more precise shaping of the hull (Hoving 2005:77–85). However, tactical and technological developments during the second half of the 19th century resulted in standardized ship designs that were fairly universal between the major European powers. Differences in construction proved to be the vital differences. Archaeological analysis will reveal which nation constructed better ships.

Due to the location of the measurements, the measured frames comprise both full frames, Y-frames, and possibly cant frames. Previous work by identified the southern section of the shipwreck as the stern. All of the measured frames are located in this section. As a result, frames of several different types were documented. An identification of these frames types is required prior to any further analysis. It is also possible that some timbers, initially tagged as frames, are actually segments of hull planking. This is discussed below.

The stern of a 74-gun ship of the line was constructed using Y-frames (Boudriot[1]1986:71, figure 34). These frames were angled and spaced farther apart than the main frames (Boudriot[1] 1986:71, plate VI). Filling pieces and transoms were used to fill any remaining space and maintain a solid wall of oak to protect the stern during battle (Goodwin

1987:23). Lacking any comparative statistical data, the team was forced to rely on observations of the ship's structure to identify different frames. The concreted mass at center prohibited any accurate frame identification. Boudroit states the last six to eight frames were cant or Y-frames. Without any knowledge of which frames still remain, this does not assist in identification. As a result, a number of frames closer to amidships was chosen for accurate representation. Frames 21 – 30 represent a good sample of full main frames used in *Bato*'s construction (TABLE 14). These frames were chosen due to their position in the shipwreck. They are far enough forward and thus offer a relative certainty of being full frames.

TABLE 14

BATO SCANTLINGS F21 – F30

Frame Number	Sided ^a	Moulded	Length to Reef	Space to Next Frame
F21	25	18	53	3
F22	25	11	46	2
F23	25	10	22	3
F24	29	23	25	16
F25	15	18	35	too far away
F26	25	17	55	too far away
F27	22	21	57	7
F28	27	25	75	1
F29	26	10	55	7
F30	20	15	61	too far away

^aAll measurements are in centimeters (cm).

TABLE 15

BATO & *BRUNSWICK* AVERAGE MAIN FRAME SCANTLINGS

Dimension	Sided	Moulded	Space
<i>Bato</i>	23.9	16.8	2
<i>Brunswick</i>	38	16	2

^aAll measurements are in centimeters (cm).

When compared with the 1995 findings on *Brunswick* (TABLE 15), interesting structural differences are noted. Less than 1 cm separates the averages in moulded dimension. The

Brunswick sided dimension is over 1.5 times larger than *Bato*'s. In general terms, this indicates a stronger British ship and a weaker Dutch vessel.

Timbers labelled F46 – 51 and F57 were initially identified as frames (TABLE 16). Further investigation revealed that they are actually planks. Most of the other frames are eroded and on the surface, but only preserved with original full moulded dimensions below. These timbers, on the other hand, maintained a consistent moulded dimension throughout their recorded length. When compared to the other hull planks (OP1 – 9), the sided dimension match up very well (TABLE 17). The discrepancy in the moulded dimension is explained by the burnt and eroded state of these planks on the outer edge of the wreckage.

TABLE 16

BATO F46 – 51 AND F57 SCANTLINGS

Frame Number	Sided	Moulded	Length to Reef	Space to Next Frame
F46	36	8	162	1
F47	21	6	163	14
F48	38	4	142	2
F49	43	4	161	too far away
F50	37	4	143	1
F51	29	8	160	too far away
F57	12	8	290	19

^aAll measurements are centimeters (cm).

TABLE 17

BATO & *BRUNSWICK* HULL PLANK SCANTLINGS

Dimension	Sided ^a	Moulded
<i>Bato</i>	28.69	5.13
<i>Brunswick</i>	32	10

^aAll measurements are centimeters (cm).

An interesting pattern emerges when the hull planks of *Bato* and *Brunswick* are compared. The sided dimension, or width of the plank, are almost equal and do not signify major

structural differences. When the moulded dimension is examined, however, a striking difference presents itself. *Brunswick*'s hull planks are almost twice as thick as *Bato*'s. Once again, this signifies superior British ship construction during the Napoleonic Era.

Shipwrights had to meet certain structural requirements when building *Bato* and *Brunswick* during the late 18th century. Different rules governed a ship of the line and an East Indiaman. Although minor construction details differed between nations, these guidelines were used by most, Western European shipwrights. A 74-gun ship of the line required the following: a flat floor, a sharp entry, a fine run, full floors, and delicate lines with a rising floor (Boudriot[1]1986:20). A high lower battery required a full hull shape with a correct amount of tumblehome to center the weight of the guns carried (Boudroit 1986:20). An equilibrium between the fullness of the hull shape and a ship's lines allow for a ship that steers well, sails well, and behaves well in a seaway (Boudroit 1986:20 – 21). A number of structural features, including frame size, thickness, and shape are taken into consideration when constructing a ship to fit these specifications.

A ship of the line should be framed closely to provide a solid wall of oak against enemy fire and the regular wear and tear of the sea. The frames are shaped to ensure a correct hull shape and battery placement. In most instances, the 'room and space rule' is used to establish the correct space between frames (Goodwin 1987:13). The rule dictates a space between frames of 5 – 6 cm. This left enough room for ventilation to prevent damp and rot. *Bato*'s main frames follow this rule with few exceptions. Only F24 is well beyond the rule at 16 cm. Others are close enough to allow for acceptance.

The sided and moulded dimension of frames play an important in the ship's life expectancy (Lavery[1] 1983:122). British naval officers complained of diminished scantlings in

captured European ships. They required larger frames to withstand longer periods at sea than their European rivals, including the Dutch. French and Dutch ships limited their scantlings to allow for less weight and the shorter voyages more typical of their navies. Originally constructed for service in European water close to home, *Bato*'s frames are only two thirds the size *Brunswick*. These frames were not suited to service in tropical waters or long voyages. This may account for the frequent damage and rapid decay suffered by *Bato* prior to her demise. In this case, British ship construction was superior and allowed for more efficient colonial and imperial expeditions.

Planking a ship of the line required a large amount of thick, long planks. Planking on the stern was generally expected to be 7 – 8 cm thick, and *Bato* is extremely lacking in this regard. Thicker planks allowed for longer voyages and generally stronger ships. In this case, smaller planks were used on *Bato* for the same reason that accounts for its smaller frames: it did not serve long periods at sea or endure varying environments during long voyages.

Due to their size, large British East Indiamen were often compared to 74-gun ships (MacGregor 1980:174). Designed to carry a large amount of cargo for large distances, these ships required a full hull shape to maximize cargo capacity. The bow and stern were not as fine lined as a warship to further maximize hull space (MacGregor 1980:182). A degree of tumblehome also existed in their construction. This increased hull size and allowed for a strong center of gravity. East Indiaman could carry upwards of thirty guns and thus needed to avoid a top heavy design. The rigors of a Far Eastern voyage into tropical waters forced the HEIC to use only the finest ships. Vessels were framed in a manner similar to British Royal Navy vessels (Sutton 1981:55). Large frames with minimal space were used. Only 5 – 8 cm of space was

allowed for a ship to pass inspection. Planking was required to be at least 10 cm thick (Sutton 1981:55).

Brunswick fulfills both of these structural requirements. Its construction represents a clear superiority in British shipbuilding. Thicker frames and planks allowed for long voyages to the Far East. It also accounted for the increased degradation suffered by ships in tropical waters during the long voyage. As a result, *Brunswick* was able to carry out trade and survive where *Bato* did not. The East Indiaman fuelled a drive for imperial expansion by providing a steady stream of commerce between Far Eastern colonies and Great Britain. *Bato* was unable to do the same due to inferior construction. Similar in design to naval ships, *Brunswick* represents a technical, and therefore, a strategic advantage for the British over the Dutch. As a result, the British were able to maintain continued commerce to fuel their global war effort. Far-off, small scale, and localized conflicts could be undertaken to achieve the ultimate defeat of the Batavian Republic and Napoleonic France.

The information presented above reveals interesting aspects about European ship construction during the Napoleonic Era. Although the general building methods were the same throughout most of Western Europe, national differences did exist. Ships were modified slightly to suit their country's commercial and military requirements. The different scantlings of British, Dutch, and French ships all indicate this. Planks were made larger, thicker, smaller, or thinner based on the needs of each nation. Subsequent analysis of other aspects of ship construction reveals further differences and similarities.

Iron Knee Measurements

English shipwrights used more iron than continental shipbuilders (Unger 1970:113). In particular, Dutch builders preferred the use of treenails to iron components. British builders

attempted to introduce the large scale use of iron in 1670, but rejected the concept due to economic concerns. Unger argues that minor experiments continue from this time to the Napoleonic Era (1970:113). Increased iron use resulted in extra strength and decreased wood use. The demands of the Napoleonic Wars on the available global timber supply necessitated the inclusion of more iron in British shipbuilding. Rising timber prices and the reduced cost of iron components made for an easy choice. The inclusion of large iron components in British shipbuilding provided massive long term advantages to British ships (Unger 1970:113).

The French were the first to introduce iron knees in substantial numbers (Stammers 2001:115). *Invincible*, a French warship lost off Portsmouth, UK in 1758, contained a substantial number within her structure (Goodwin 1998:28). The British started using iron knees when Gabriel Snodgrass served as surveyor of the British East India Company from 1755 to 1794 (Stammers 2001:115). In 1796, Snodgrass wrote a report firmly advocating the use of iron knees. Some British East Indiamen were retroactively fitted with iron knees during his time as surveyor. By 1810, the use of iron knees was prevalent throughout the British East India Company and was being introduced to the British Royal Navy as well (Stammers 2001:115, Goodwin 1987:75).

The introduction of iron knees to British naval ship construction required the advancement of British industrial capacity. At the time *Invincible* was constructed, iron knees were composed of impure wrought iron. The addition of coke during the smelting process caused the impurities (Goodwin 1998:27). An iron rolling mill opened in 1754 in Fareham, not far from the Portsmouth Royal Dockyard (Goodwin 1998:29). Rolling allowed the creation of stronger iron bars and bolts. Henry Cort introduced the ‘puddler’ to the iron smelting industry in 1784. Combined with the use of grooved rollers, Cort used his ‘puddler’ to produce fifteen tons of

malleable wrought iron bars every twelve hours. The increased production was required for the advanced introduction of iron to British ship construction (Goodwin 1998:29).

Three different types of iron knees were discovered in *Brunswick*'s remains: hanging knees, lodging knees, and T-shaped, or plate, knees. Snodgrass made the use of iron knees in the HEIC widespread by 1796. He even helped design different types, including the T-shaped variety. Each of the three served to support the deck or hull, but their specific purpose with the ship's structure varied. In each case, however, the use of iron ensured a stronger, more durable ship.

Both hanging knees and lodging knees fall into the category of right-angled knees, the most common types of iron knees (Stammers 2001:118). Hanging knees replaced the wooden component of the same name. They supported the underside of main deck beams. In many cases the lower arm was cranked to avoid the heavy timbers below the deck beam. The lower arm is usually longer. Measurements indicate that this was also the case with *Brunswick*. It was not possible to measure the degree of cranking, but it was clear the metal was bent in some knees and not in others. Presumably, this was done to fit the curvature of the hull and avoid the obstructions mentioned above (FIGURE 26). Lodging knees attached horizontally to either side of the deck beam for additional support (Stammers 2001:118). Both arms were of equal length, as identified on *Brunswick* as well. T-shaped knees acted in a similar way to hanging knees. Designed by Snodgrass, they served to support the main or upper-deck beams. In both cases, the intention was to reinforce lighter scantlings. Stronger knees were used to support the main hold beams. The idea was to simplify knee design and facilitate mass production.

The production of large iron knees indicate a strong industrial advantage for the British. Historical sources indicate that similar advances in iron production did not reach the Netherlands

until after the Napoleonic Wars ended in 1815. The ability to produce iron knees also assisted Great Britain in her imperial ambitions. Iron knees required less maintenance and cost less than their wooden equivalent. By adopting this new technology, Great Britain also decreased its reliance on a dwindling timber supply and the crippling cost of building a ship entirely from wood. Lower maintenance requirements and decreased cost made it easier for the British to pursue far flung imperial expeditions and fight their enemies in all the waters of the globe. The Dutch, still reliant on wood, did not enjoy this freedom. Their smaller scantlings and wooden knees required constant maintenance and repairs, limiting the operational capabilities of ships. British industrial advances, most notably in iron production, favored British imperial efforts. Production of iron knees resulted in lower maintenance and longer voyages. A global empire was thus easier to maintain.

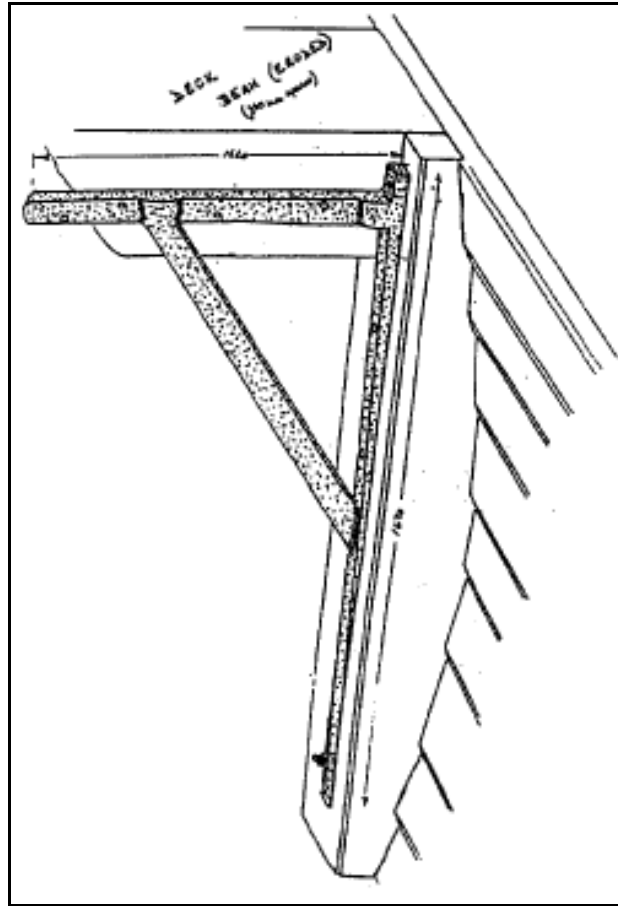


FIGURE 26. Illustration of iron knee use on the French ship *Invincible* from 1758 (Goodwin 1998:29).

Anchor Measurements

Seventy fours rated as third rate ships during the Napoleonic Era. Their size required several anchors to be carried (Boudriot[2] 1986:plate 13). Main anchors, called bowers, were located in the bow for immediate use (Lavery[2] 1984:107). They weighed around 2,400 kg. (Boudriot[2] 1986:plate 13). Length of shanks averaged around 5 m. Kedge anchors served the most specialized function. Longboats carried and dropped them ahead of the ship, the crew then using a the capstan to haul the ship forward (Lavery[2] 1984:108). Their shanks measured between 0.76 m and 0.92 m and they weighed around 800 kg (Boudriot[2] 1986:plate 13). The final anchor type is the sheet anchor. Traditionally, these are the largest anchors on board and are

only deployed in extreme emergencies (Lavery[2] 1984:108). They weighed approximately 2,445 kg and measured just over 5 m on the shank (Boudriot[2] 1986:plate 13).

Bato's anchor was identified by comparing its shank length to that of other anchor types used on similar contemporary ships. The length of the anchor on *Bato*'s shank is 77 cm. It does not come close to any of the other anchor types. As a result, it is not suitable for use in comparative analysis. Several reasons exist for the anchor's presence amongst the debris field. Simons Town has existed as commercial, civilian, and military harbor for over 250 years. It is possible that a boat lost an anchor snagged on the wreck at some point. Modern salvage events, however, lend a different explanation. Mr. Harry Dilley used kedge anchors in an attempt to dislodge the steel ketch. One of these anchors may have been lost during the storm-tossed operations.

Wood Samples

Navies used wood as their primary construction material for hundreds of years. Oak trees required up to 120 years to reach a width of 2–3 ft. (Dodds and Moore 1984:14). At this point, a sufficient amount of heartwood was harvested. Bigger ships required larger oak trees that took up to 150 years to grow. The high demand for compass timbers also influenced timber supply (Dodds and Moore 1984:14). Growers chained down branches to ensure the correct curvature was grown. The curved pieces were used in important structural components such as knees, frames, and breasthooks.

Several factors contributed to the rise in timber prices prior to and during the Napoleonic Era. A landowner had several choices for cultivating his fields. Generally, the final choice fell between wheat and timber (Dodds and Moore 1984:16). The increasing price of wheat, especially during and leading to the Industrial Revolution, resulted in many farmers choosing it

as their crops. Wheat had the added benefit of providing a rapid, annual yield. Oak trees required a minimum of 80 years to mature, but could take almost double that time (Dodds and Moore 1984:14). Charcoal production also consumed large amounts of oak (Dodds and Moore 1984:16). Used extensively in iron production, charcoal did not require fully mature oaks. Therefore, landowners viewed it as faster and more profitable use of resources. The population boom during the Industrial Revolution increased demands for housing timbers, firewood, and other wooden objects (Mitchell 1994:11). Rural inhabitants stripped hedgerows of valuable compass timbers for use in houses and as firewood, increasing pressure on an already dwindling timber supply.

By 1792, the sheer number of ships constructed strained the global supply of timber. The problem becomes more acute when examining the size of European navies from 1680-1815 (Rodger 2004:608). From 1770 to 1800, the number of ships in the BRN increased from 235 to 328 (Harding 1999:292). Although this is partly due to the capture of enemy vessels, the construction of new ships continued at a steady pace (Mitchell 1994:14). In some cases, a complete rebuilding and refitting of the ship was required. Accelerated rotting and the use of improper timber necessitated such massive overhauls (Dodds and Moore 1984:17). The steady increase in merchant shipping further compounded the problem. By 1780, the Dutch merchant fleet carried 2,000 vessels with a capacity of between 400,000 and 450,000 tons (de Vries and van der Woude 1997:490). The British fleet carried over 1,000,000 tons and the French fleet carried 700,000 tons. France, Great Britain, and the Netherlands sponsored construction efforts on a massive scale to maintain and expand these gigantic fleets.

The 74-gun ship HMS *Triumph* required 3,028 loads or 151,400 ft³ of timber (Mitchell 1994:11). Mature oak tree produced one load, or 50 ft³, of timber weighing 1.25 tons (Mitchell

1994:11). About 3,000 trees provided the necessary wood for construction, covering about 30 acres of forest. A detailed list of timber used in the construction of the 74-gun ship HMS *Thunderer* is visible below (TABLE 18). HMS *Thunderer* launched on 19 March 1760 (Dodds and Moore 1984:12). East Indiamen of 620 tons required at least an equivalent number of trees during production (Sutton 1981:52). East Indiaman required one mature oak tree per ton of shipping during construction. Following this logic, *Brunswick* consumed around 1,200 oak trees.

With native timber supplies running low, British and Dutch shipwrights looked for timber elsewhere. The timber supply problem manifested itself for the first time during the American

TABLE 18

BREAKDOWN OF TIMBER USED IN HMS *THUNDERER*

Timber Type	Ship Component	Number of Loads	Percent of Total
Oak Timber	Straight Timber	723	
	Compass Timber	1892	
	Combined Total	2615	70.43
Elm	Not Specified	50	
Fir	Not Specified	121	
	Combined Total	171	4.61
Oak	Square Knees	68	
	Raked Knees	79	
	Combined Total	147	3.96
Thick Stuff ^a	10 inch	19	
	9 inch	59	
	8.5 inch	Not specified	
	8 inch	81	
	7.5 inch	Not specified	
	7 inch	29	
	6.5 inch	16	
	6 inch	136	
	5.5 inch	18	
	5 inch	70	
	Combined Total	428	11.53
	English Oak	4 inch	128
3 inch		62	
2.5 inch		3	
2 inch		3	

	Combined Total	196	5.28
Danzig Oak	4.5 inch	1	
	4 inch	86	
	3 inch	10	
	Combined Total	97	2.61
Danzig Elm	4 inch	58	
	3 inch	2	
	Combined Total	60	1.62
Total Timber Usage		3713 ^b	1000

^a Defined as planks over 4 in. thick and up to 12 in. wide.

^b Equal to 185,650 cubic feet of timber. One load = 50 cubic feet = 1 average oak tree

Source: Dodds and Moore (1984:14).

Revolution (Albion 1926:315). Great Britain relied on imperial and trade links to replenish its supply. North America and Europe provided the bulk of required timber (Albion 1926:325). The construction of ships in India was also considered (Albion 1926:324). Upper Canada harvested 3,000 loads of oak (Albion 1926:325). The New England region of the United States of America also provided key naval stores, including construction timber (Black 2004:63). Rhine oak from Dort was investigated and valued as acceptable (Albion 1926:325). A supply of oak from Dantzic was secured, but the price proved too high for sustained trade. Adriatic and Black Sea oak was considered as well. Baltic countries, including Denmark-Norway, Sweden, Prussia, and Russia provided a great deal of oak, pine, and fir for ship construction (Hutchison 2012:5). British shipwrights also experimented with other types of timber. The prejudice against foreign timber was dropped by commercial and naval shipyards (Albion 1926:325). In particular, various types of fir and pine were sought. Both were used in the construction of hulls below the waterline. Copper sheathing permitted the use of wood types previously thought to be inferior to oak as the copper would mitigate any lesser qualities the timber possessed. Wood sample analysis examines the type of wood use and reveals data on timber types used by the HEIC.

Dutch shipwrights used foreign timber since depleting local forests in the late Middle Ages (Dominguez-Delmas 2011:151). Dendrochronological studies in Groningen revealed an accurate map of the Dutch timber trade in the 16th and 17th centuries (FIGURE 28, Dominguez-Delmas 2011:152). The pattern does not change when compared with dendrochronological data from an 18th century shipwreck (van Daalen and van der Beek 2004:128–129). Sampling in



FIGURE 27. Map showing the origin of Dutch shipbuilding timber in the 18th century (van Daalen and van der Beek 2004:128).



FIGURE 28. Map showing the origin of Dutch shipbuilding timber in the 16th and 17th centuries (Dominguez-Delmas 2011:152).

Groningen revealed timber from the Rhine and Elbe regions in modern Germany (FIGURE 28, Dominguez-Delmas 2011:152). It also indicated timber originating from Gdansk, in modern Poland. These regions are listed as centers of oak, pine, and fir production (Albion 1926:325). A study of Dutch-Baltic trade routes reveals an active trade between the Baltic and important Dutch ports like Amsterdam and Rotterdam. Active shipyards existed in these cities and used Baltic timber (Hutchison 2012:6). A ship constructed in the 18th century, the same time as *Bato*, revealed a similar pattern. In this particular case, timber originated from the Rhine and Elbe regions of Germany only (FIGURE 27, van Daalen and van der Beek 2004:128). Easy transport was available through the rivers and the North Sea (van Daalen and van der Beek 2004:129). Analysis of wood samples collected from *Bato*'s remains reveal if this pattern continued.



FIGURE 29. Video still showing the Silver Fir fragment on *Brunswick*'s keelson (Jake Harding).

Almost every single wood sample collected was identified as European Oak (pers. comm. Marion Bamford). Only one sample, located on *Brunswick*'s keelson, was identified as Silver Fir (FIGURE 29). Accurate measurements of the entire fir piece were impossible due to marine growth. The placement of the piece, however, suggested that it was part of a repair. *Brunswick*'s last voyage

took it to China and, eventually, Bombay. (Harding 2013:5). The ship halted in Bombay for repairs after her hull started taking on water. By 1775, shipyards in India began to rival European ones for the size and quality of ships produced (Sutton 1981:49). As a result, any repairs *Brunswick* required could have been completed there. It is possible the repair to her keelson was made there using stockpiled silver fir from the dockyard or from *Brunswick's* own stores. *Brunswick's* old age allowed for a compromise in the use of softwood rather than hardwood. On her sixth voyage, *Brunswick* was an aging ship likely to be sold off on her return (Harding 2013:5).

The extensive use of European Oak by both vessels indicates several things. Timber shortage were not yet so extreme to force either nation to seek ship timber far afield. Most likely, the Baltic or German states provided the necessary supplies. Experimentation with other wood species had not yielded sufficient positive results to convince either nation to switch from reliable oak. The only different sample in *Brunswick* results from a repair. No definite conclusion is reached concerning the superiority of either Great Britain or the Netherlands in the use of various timber species during the Napoleonic Era.

Cannon Measurements

Research revealed that total length and bore diameter are the most useful diagnostic measurements for further identification of *Bato's* cannons. Dimensions of *Bato's* cannons are compared with those of standard Napoleonic naval guns to standard measurements for naval guns (TABLE 19). Measurements are presented in both imperial and metric units. Cannon types are based on those commonly carried by European ships of the line. Initial examination correlates the bore diameter closest with a 42 pdr. Overall length matches 24 pdr., 18 pdr., and 12 pdr. guns. Guns of this size were frequently carried by Napoleonic warships of all nations, and reveal no strategic advantage to either side.

TABLE 19

CANNON DIMENSIONS COMPARED

Cannon Type	Bore Diameter		Overall Length	
<i>Bato</i> Cannon 1	18 cm	7.09 in.	2.67 m	8 ft. 9.12 in.
<i>Bato</i> Cannon 2	16 cm	6.30 in.	2.73 m	8 ft. 11.48 in.
42 pounders	17.83 cm	7.018 in.	3.05 m	10 ft.
	17.83 cm	7.018 in.	2.90 m	9 ft. 6 in.
32 pounders	16.28 cm	6.41 in.	3.05 m	10 ft.
	16.28 cm	6.41 in.	2.90 m	9 ft. 6 in.
24 pounders	14.78 cm	5.82 in.	3.05 m	10 ft.
	14.78 cm	5.82 in.	2.90 m	9 ft. 6 in.
	14.78 cm	5.82 in.	2.74 m	9 ft.
18 pounders	13.44 cm/13.16 cm	5.29 in./5.18 in.	2.90 m	9 ft. 6 in.
	13.44 cm/13.16 cm	5.29 in./5.18 in.	2.74 m	9 ft.
12 pounders	11.73 cm	4.62 in.	2.90 m	9 ft. 6 in.
	11.73 cm	4.62 in.	2.74 m	9 ft.
	11.73 cm	4.62 in.	2.29 m	7 ft. 6 in.
9 pounders	10.67 cm	4.20 in.	2.29 m	7 ft. 6 in.
	10.67 cm	4.20 in.	2.13 m	7 ft.
6 pounders	9.30 cm	3.66 in.	2.44 m	8 ft.
	9.30 cm	3.66 in.	1.83 m	6 ft.
4 pounders	9.30 cm	3.66 in.	1.83 m	6 ft.
	9.30 cm	3.66 in.	1.68 m	5 ft. 6 in.
3 pounders	7.39 cm	2.91 in.	1.37 m	4 ft. 6 in.
	7.39 cm	2.91 in.	1.68 m	5 ft. 6 in.

Source: Henry (2004:4)

Corrosion of the iron cannons and improper conservation are the most likely causes of the skewed data. Due to high carbon content, cast iron guns corrode in layers that peel off the original artifact (Rodgers 2004:72). Over 150 years spent underwater and near the tidal zone clearly had a negative effect on *Bato*'s cannons during the final analysis. The muzzle end of the cannon clearly suffered from exfoliated corrosion and no longer retains its original shape. Allowances for corrosion must be made during the final analysis.

Knowledge of the corrosion rate allows us to shed more light on *Bato*'s cannons. Measuring

the bore at the end of the muzzle, rather than further down the tube, caused a skewed measurements due to increased corrosion occurring at the muzzle. Exfoliation likely occurred at a lower rate further down the tube and measurements there would yield more accurate results.



FIGURE 30. Muzzle end of *Bato*'s cannon on the right of Simons Town Jetty (Author)

Copper Analysis

The use of copper in shipbuilding was widespread by the Napoleonic Era and served a number of functions. There is evidence of VOC using copper sheathing on parts of their hull as early as 1606 (Bingeman et al. 2000:220). Charles Parry introduced copper sheathing to the British Royal Navy in 1708 (Staniforth 1985:23). The British Royal Navy, however, rejected the technology due to the increased construction costs it entailed. A subsequent proposal by Benjamin Robinson in 1728 was rejected out of hand. It used “rolled copper, brass, iron or tinned plates”

(Staniforth 1985:24). The technology to allow for efficient rolled metal production did not exist yet (Goodwin 1998:27). Nehemiah Champion attempted the introduction of a brass lateen system in 1740 (Staniforth 1985:23). Once again, the British Royal Navy rejected the technology due to cost concerns. The British added thin copper sheathing to the frigate *Alarm* in 1761. After two years, the copper had worn out somewhat and been affected by the corrosion of iron fastenings in contact with the copper (Bingeman et al. 2000:219). Despite this setback, another four vessels were coppered by 1779 (McCarthy 2005:102).

A number of techniques were used to combat the galvanic corrosion between iron bolts and copper sheathing. Ultimately, it was decided that the use of copper tacks, nails, and bolts provided the best guarantee against deterioration. Pure copper, however, is too soft to hammer into timber and must be hardened (Rodgers 2004:107). A copper-tin-zinc alloy was developed that produced harder nails capable of being hammered through sheathing and into wood (McCarthy 2005:103, Rodgers 2004:108). Referred to as ‘mixed’ or ‘compound metal,’ this mixture was used to cast nails, pintels, gudgeons, and braces. Its hardened nature allowed it to absorb the stress of these rudder components. Copper pintels have been identified on both *Bato* and *Brunswick*. While this solved the problem of attaching the copper sheathing to the hull, another problem remained. The iron bolts used in the hull’s timber still degraded upon contact with copper.

Further metallurgical experimentation solved this problem. HMS *Pandora* records the use of the copper pintel consisting of 87.3 % copper, 6.9 % tin, 0.24 % lead, and 0.04 % zinc. Traces of iron, arsenic, and antimony were also detected (McCarthy 2005:104). Eventually, this ‘mixed metal’ proved too brittle for continued use and another alloy was required. Advances in industry allowed for trials with mechanically hardened bolts of pure copper. A mixture of mechanically

treated bolts of copper and zinc were also trialed. The trials resulted in bolts superior to ‘mixed metal’ bolts in use before (McCarthy 2005:105).

Forbes, a naval inventor, developed a way of using grooved rollers while manufacturing copper bolts in July 1783 (McCarthy 2005:105). The rollers removed impurities from the metal. Developed by Henry Cort, the same roller types were used in the production of iron. A mixture of spelter and copper was used to ensure hard, usable bolts. If this was not required, the same process was used with pure copper. The rolls were driven and a tilting hammer was used to shape the bolts (McCarthy 2005:106). Williams and Westwood, competing inventors, filed a patent for a different production method in November 1783 (McCarthy 2005:106). Their rollers were adjustable and could accommodate a smaller aperture groove during the rolling process. This resulted in harder copper bolts almost twice the original length (McCarthy 2005:106). The inventor reached an agreement to produce bolts with their names on them and supply them to BRN ships (McCarthy 2005:106). Later observations would prove which were most effective. These bolts were used in all classes of ships, especially those sheathed in copper.

By the end of the 18th century, coppering was accepted as standard practice in the navy. The BRN sheathed its entire fleet by 1782. The initial cost of coppering a hull was outweighed by the avoidance of repairs and time saved. A coppered ship needed less hull maintenance and therefore less time out of the water. Less marine growth on the hull increased speed and allowed for longer cruises and far flung voyages. The BRN could not ignore these advantages, and justified the cost of coppering ships. Several measures of copper thickness were used. East Indiaman and BRN ships received the thickest copper (Sutton 1981:56). Outfitting a third rate ship of the line, similar in size to *Bato* and *Brunswick*, cost £1178 in the late 18th century. After these findings, it was decided to

slowly introduce coppered hulls as a standard part of ship construction and refitting. By the end of the 18th century, the entire naval fleet was equipped with copper sheathing.

Copper sheathing was also introduced to the merchant fleet, although at a slower rate than the BRN (Staniforth 1985:26, Sutton 1981:56). In 1779, barely any HEIC ships were coppered (Sutton 1981:56). The Company had sheathed 22 ships by 1790. Increased speed was the prime advantage for the HEIC (Sutton 1981:56). Ships advertised copper bolts and sheathing to ensure consumers recognized the increased speed of their vessel. Added speed allowed ships to outpace competitors and deliver their cargos first. An early cargo fetched the highest prices. The possibility of increased profits created an acceptable investment for the HEIC. Ships serving in the tropics, like *Brunswick*, received coppering first to combat the effects of *teredo navalis* and accelerated marine growth (McCarthy 2005:108).

The production of new bolts accelerated the spread of copper use in Western Europe. The advantage of copper protection was realized and adopted by the French, Spanish, and Dutch navies (McCarthy 2005:108). Adopting the new technology also prevented the BRN from advancing too far ahead of its rivals. The British producer Williams supplied the bulk of copper products to the foreign navies (McCarthy 2005:108). British copper products were discovered to be cheaper, more reliable, and stronger than their foreign counterparts. During the peace between the global American War of Independence and the Revolutionary Wars with France and the Netherlands, trade in such commodities was commonplace and resulted in a degree of similarity in ship construction.

The archaeometallurgical analysis completed by Duncan Miller provides insight to the production abilities of both the British and Dutch. The copper used in *Bato*'s construction was more pure than *Brunswick*'s. The British copper, however, showed no signs of residual cold work. Both samples showed a lack of annealation, a type of heat treatment used to strengthen metals. Residual

cold work permanently rearranges a material's atomic structure by putting pressure on it. In some methods, pressure is exerted until the surface cracks (DeGarmo 1974:349). Rolling is one of the most common forms of residual cold work. The process allows for more accurate results than hot work, like casting. Evidence of this process in *Bato's* sample indicates that Dutch copper was stronger than the British; giving them an advantage in ship construction.

The difference in purity could be caused by dezincification which occurred while the copper artifacts were deposited on the seafloor (Rodgers 2004:110). In a process known as galvanic dissolution, zinc and tin selectively corrode out of copper alloys due to differences in corrosion potentials (E Corr). The removal of zinc is known as dezincification while the removal of tin falls under destanification. The processes can reduce copper artifacts to a crystalline matrix (Rodgers 2004:110). The physical strength of the artifact is greatly reduced once the reaction is complete (Rodgers 2004:111). Zinc was present in significant quantities in both *Bato's* and *Brunswick's* copper (Miller 1997:29, 34). Dezincification may have reduced the amount of zinc present in the copper samples prior to Miller's analysis. If this is the case, the analysis presents an inaccurate picture about copper use in British and Dutch shipbuilding.

The purity of the copper used reveals some of the industrial capabilities of each nation. The addition of tin and lead provided extra strength to a bolt primarily made of copper. Certain copper ship components, like pintels and gudgeons, required this extra strength. Rudder movements exerted large amounts of stress on these components. Zinc hardened the copper and lead facilitated movement (McCarthy 2005:105). The addition of these metals to British copper reveals the existence of stronger copper than the Dutch alloy.

McCarthy cites that Williams' business, the Parys Mine Company, provided the bulk of British copper components to the Netherlands. Closer examination of *Brunswick's* rudder revealed

the industrial stamp of Forbes on the gudgeons. The different production methods of both companies could have produced copper of varying characteristics. Williams' adjustable rollers increased tensile stress on the copper during the production, and thus produced a harder copper. Forbes' methods focused on the use of a zinc-copper alloy to harden and strength his products. This explains the different alloy and lack of residual cold work on *Brunswick*.

The similarities between *Bato*'s and *Brunswick*'s bolts are undeniable. Measurements revealed that *Bato*'s bolt goes in line with *Brunswick*'s. Even if the production methods of the bolts differed slightly, the end result would have looked very much the same. Lloyd's shipping dictated the official required dimensions of the bolts. If they deviated too much, the ship was not insured. As a result, manufacturers produced bolts that looked identical, but differed in their chemical make-up. Without further testing on the recovered bolts held at IZIKO, it is impossible to establish which one is stronger.

Chapter 6: Conclusion

A clear relationship existed between technological and imperial prowess during the Napoleonic Era. British and Dutch maritime organizations worked to expand their technological arsenals and press the advantage in an empire-wide playing field. Located in Simons Town, a key imperial possession during the Napoleonic Era, *Bato* and *Brunswick* serve as case studies for an analysis of the relationship between empire and technology. *Bato* is a Dutch 74-gun ship of the line constructed several years prior to the Napoleonic Era. *Brunswick* served with the HEIC as a large merchant ship travelling to China and India. The shipwrecks contain evidence of a number of contemporary technologies that allow for direct comparison between the two nations.

The Cape of Good Hope functioned as an important imperial possession during its colonial history. Both commercial and military functions were served by the colony. In later years, expansionist leaders used it to launch the exploration of South Africa's interior. Militarily, the Cape served as base for privateers and naval vessels alike. During the global conflicts of the Napoleonic Era, it guarded and controlled the trade passage to India and the Far East. Ships based there patrolled Southern African waters for pirates and enemy vessels. Privateers, notably French ones, resupplied there while they scoured the waters between the African continent, Mauritius, and India. French navy ships under Admiral Linois also undertook such expeditions. It was during one such voyage that *Marengo* and *Belle Poulle* captured the HEIC ships *Brunswick*.

Dutch settlers founded the Cape colony for the VOC and its commercial endeavors. Seasonal harbors in False Bay and Table Bay positioned the colony on the midway point on the sailing route between Europe and Asia. Prior to the opening of the Suez Canal in 1869, all trade between Europe and Asia travelled by the Cape. Due to a lack of available harbors elsewhere in Southern Africa, the Dutch colony served as the main stopping point for trade with the Far East.

Between a 130 and 180 ships stopped at Table Bay in the years preceding the Napoleonic Era (Boshoff and Fourie 2008:4,FIGURE1). This only accounts for recorded arrivals of American, British, Danish, Dutch, and French vessels. A hospital, shipyards, and a developed agricultural infrastructure guaranteed continued business for the colony as a refitting and resupply station. Clearly, the Cape Colony served an important imperial function and allows for a glimpse into the role of technology in 18th and 19th century empire building.

Bato and *Brunswick* hold evidence of important maritime technologies. The most important are iron knees, copper sheathing, ship construction, cannon, and the use of different timber species. All of these were observed during the ECU Project of 2014. Previous archaeological efforts were investigated for information that complemented our data. Most notably, this included the Octopus Project, Project Sandalwood, Harding's environmental assessment, and Miller's archaeometallurgical study. The first two investigations involved archaeologically destructive investigations that provided complete site maps, wood samples, and recovered artifacts. Harding researched environmental impacts on *Brunswick* and re-documented key features. Miller analyzed copper samples from *Bato* and *Brunswick*. Data from each of these projects, coupled with data with from the ECU Project, provided insights to the technology available at the time.

Iron knees form prevalent features amongst *Brunswick*'s remains. Three types were identified: hanging knees, lodging knees, and T-shaped knees. Each served to strengthen the hull and deck structure of British ships and limited the need for large, heavy, wooden knees. Increased used of iron limited British dependence on a dwindling timber supply. Reduced maintenance and extra longevity of British ships also resulted from the addition of iron knees. Iron structural features soon became a mainstay of British maritime architecture. No iron knees are observed on *Bato*, indicating a lack of industrial capacity in the Netherlands.

British industry paved the way for advanced iron ship components. Smelting and forging methods allowed for strong wrought iron production. Impurities were removed and iron bars formed quickly and efficiently. Officials like Gabriel Snodgrass introduced the cutting edge technology while serving in the HEIC and BRN. Dutch industry lacked the technology to produce suitable iron ship components. The Netherlands still enjoyed access to timber supplies from the Rhine and Baltic, suppressing impetus for the use of iron in ship construction. This resulted in the use of more timber in Dutch ships, including *Bato*.

Iron knees provided a key advantage to the British in maritime imperial operations. Industrial capacity doubtlessly affected other aspects of British shipbuilding as well. Industrial standards could be applied to the production of fasteners and other iron parts. Reduced maintenance allowed for longer voyages and expanded theatres of operation. British ships affected a large area and were thus able to manage a large empire. It allowed for strategic operations far from home that eventually helped topple the Napoleonic regime, and its Dutch allies, in the Cape of Good Hope.

Copper sheathing formed a standard part of ship construction in late 18th century. After successful experiments with HMS *Alarm*, Great Britain adopted copper sheathing as a standard where cost-effective. Information on the new technology spread to other Western European powers. France and the Netherlands soon adopted this as standard practice. Naval inventors, like Cort, Forbes, Williams, and Westwood, developed new production using grooved, adjustable rollers to create usable copper alloys. An alloy was necessary due to the soft nature of copper. It eroded quickly and tin or zinc was used to harden the alloy. These yielded bolts, tacks, and other components used in both *Bato* and *Brunswick*. Such components were required to avoid the use of iron in combination with the copper, as this accelerates copper degradation.

Factories in Great Britain produced copper components for British and Dutch ships. As a result, most components show similar characteristics and dimensions. Bolts were similar in size and shape. Tacks showed similar lengths and styles. Previous work by Duncan Miller showed that Dutch copper was of a purer quality than the British copper. *Bato*'s copper also showed evidence of cold working, while *Brunswick*'s did not. Dutch copper was thus purer and harder, yielding better products. The use of British factories by Dutch shipwrights, however, meant that the British had access to similar technology and should not be discounted. Historical sources shed no further light on the matter. There is no clear case for either British or Dutch superiority in the production or design of copper ship components.

General ship construction differed little across most of Europe. Detailed analysis was required to yield usable data and conclusions about differences in British and Dutch shipbuilding. Scantling measurements indicate the presence of larger scantlings on *Brunswick* than *Bato*. This fits with the general construction styles of Dutch and British shipwrights. Dutch ships, like *Bato*, were built for short, port to port, voyages and not for long voyages between imperial holdings. British ships were, in general, constructed heavier and sturdier than their Dutch counterparts.

As a result, British imperial maritime expeditions had an advantage in ship construction. Their ships displayed superior longevity and could thus endure longer voyages, a requirement for contemporary imperial obligations. Operations occurred father away from home waters and sea routes were secured to these distant locales as well. Evidence exists in British naval operations during the Napoleonic Era in the East Indies and Central America. Dutch ships, without the benefit of added endurance, had a tougher time of it. Even a large ship, like *Bato*, had trouble weathering the long voyage to Batavia.

Analysis of *Bato*'s cannons revealed no advantage to either side. Dimensions indicate that the cannon was not unusual for a 74-gun ship of the line. Historical sources, however, indicate that a lack of funds led to a lack of guns on *Bato*. Both British and Dutch ships carried similar armaments and no obvious advantage existed for either side.

Both nations faced the problem of a dwindling timber supply. Overreliance on European oak in ship construction caused a shortage of suitable construction timbers. Countries looked first to the Baltic and later to the Americas and New Zealand for more oak. However, increasing costs of oak forced shipwrights to experiment with new timber species. With this in mind, the team sampled diagnostic timbers on both *Bato* and *Brunswick*. All samples but one were composed of European Oak. A *Brunswick* keelson sample returned as silver fir. Softwoods, like silver fir, were not used in the construction of major wooden ship components. Historical sources suggest that fir was added during a repair to the keelson after the ship suffered storm damage off Sri Lanka. The use of Silver Fir in the repair emphasizes the general lack of European Oak in Great Britain and demonstrates the weaker state of the vessel due to improper wood use.

Dutch shipwrights enjoyed an advantage in resources over Great Britain in the wooden shipbuilding industry. They enjoyed access to still plentiful timber supplies in Germany and the Baltic states. The Rhine provided opportunities for easy transport and access to Dutch, and German, shipbuilding markets. As a result, required innovation was limited in the Netherlands and ship construction continued without having to wait for the creation of iron components. Ultimately, this proved of short term benefit only. Dwindling timber supplies affected all European nations and Great Britain was more technologically advanced to deal with them. Efficient use of the new technologies allowed Great Britain to far surpass its imperial rivals.

The British enjoyed a technological superiority over the Dutch during the Napoleonic Era. Iron knees reduced maintenance constraints and limited reliance on a dwindling timber supply. While differences in copper sheathing yielded no advantage, British shipwrights constructed ships more suited to far away maritime imperial operations. Analysis of timber samples indicated a short term benefit for the Dutch as they did not require large scale innovation to continue constructing ships. Long term shortages in the global timber supply, however, indicate that Great Britain was ahead of its European competitors in the development of construction techniques requiring less timber.

British and Dutch naval policy varied considerably during the Napoleonic Era. The BRN sought to annex small, strategically important colonies. Naval bases in the Caribbean, Southern Atlantic, and the Indian Ocean were all seized with this objective in mind. By following such policies, the British met Mahan's secondary goals of naval campaigning. Forces must be deployed to interrupt or capture enemy commerce and communication. Once this is secured, work can begin on the destruction of enemy combat abilities. Corbett's view of limited and unlimited warfare also played into British hands. Limited operations, like those that captured the Cape in 1795 and 1806, succeeded in their objectives of territorial gain and establishing bases for the BRN. It was limited operations like these that allowed for the completion of the unlimited objective: France's defeat, both at home and abroad.

Dutch naval forces ventured into the Indian Ocean for the first time in the late 18th century. The VOC could no longer afford the protection required of their trading outposts in the East. Vessels deployed to Eastern waters did not have a clear mission and suffered from material and personnel fatigue. Lighter European ships and Dutch sailors endured with great difficulty in foreign

waters. Attempts were made to recapture key posts, like the Cape Colony, but were ultimately unsuccessful. Mahan's objectives were not met.

Castex dictates that technology affects strategy in the same way that it affects the abilities of a warship. Assigned missions should not exceed the structural abilities of a naval ship. With this in mind, the BRN developed technologies to give it an edge in maritime imperial operations. The Dutch attempted to keep up, but could not. It is clear that its position of technical superiority allowed Great Britain to excel in its maritime imperial endeavors.

Chapter 7: Future Recommendations

This chapter presents options for the continued preservation of *Bato* and *Brunswick*. An overview of South African legislation is presented. Maritime archaeological activities are discussed briefly. Combined, these two sets of information reveal a number of themes and issues present within Maritime and Underwater Cultural Heritage (MUCH) management in South Africa. Finally, the best case scenario, a shipwreck preserve and trail, is presented. International and South African models are presented as examples.

The Origins of South Africa's MUCH

Ocean currents and the sharp rise of the continental shelf only 100 km off the coast created an extremely shipwreck prone maritime environment on the South African coast (Sharfman et al. 2012:89). An initial lack of natural harbors and lighthouses further contributed to the problem. South African waters contain over 2,700 documented shipwrecks, with hundreds still awaiting discovery and identification. The shipwrecks represent 38 different nations, creating a truly global maritime heritage. With almost 2,800 km of coastline and several thousand shipwrecks, the management of MUCH in South Africa faces huge logistical issues (Sharfman et al. 2012:92).

The first known wreck in South African waters dates to 1505, but the majority originate from the 19th century. The first recorded salvage attempt occurred in 1727, when the Dutch governor ordered the recovery of goods from *Rotterdam* and *Zoetigheid*. Salvors sold recovered goods back to the VOC or used them to supplement their personal income. Despite the use of dangerous and primitive diving bells, these projects marked the birth of a very active salvage community in South Africa (Gribble 2002:555).

The Development of Legislation

The first legislation concerning underwater salvage was implemented in 1884 after two divers met underwater and had an ‘altercation.’ From that point forward, salvors required a permit to work on any wreck in South African waters (Gribble 2002: 556). This was still the case when *Brunswick*’s rudder was recovered in 1967. The public still viewed shipwrecks, however historic, as locations of great possible wealth and personal enrichment.

Legislation for the preservation of shipwrecks developed slowly. The National Monuments Act (Act 28 of 1969) established the need to protect MUCH, but did not specifically mention shipwrecks. A large grey area remained for salvors and treasure hunters to exploit. Even official municipalities, like Simons Town Town Council, took advantage of the loophole and ordered the recovery of *Bato*’s cannons (Dilley 2012:2). As in this case, artifact salvage often led to improper conservation and the further degradation of historic remains. An amendment to the act in 1979 (Act 35 of 1979) corrected this and provided protection to any shipwrecks over 80 years old. While this should have included *Bato* and *Brunswick*, only 23 ships received protected status by 1984 (Gribble 1998:121). The two shipwrecks discussed here were not among them.

The amendments of 1979 allowed for a greater degree of protection, but did not outlaw artifact salvage outright. Act 13 of 1981 changed this, mainly with the amendment that artifacts were now protected if they had been underwater for over 100 years. The contents of *Bato*’s and *Brunswick*’s shipwrecks were now afforded legal protection. A shortage of law enforcement personnel, however, led to a continued lack of actual protection. Furthermore, the lack of any actual legal punishment for the salvage of artifacts did not deter illegal salvage (Gribble 1998:121).

Section 12 (2C) was added to the National Monuments Act in 1984. It provided blanket protection to all shipwrecks over fifty years old and instituted a permit system for the commercial

or scientific use of these vessels and their contents. Permits are issued for three years and apply to either pre-disturbance survey or excavation projects. If the completed work concurs with designated standards, the permit is extended and the excavation allowed to continue. Research goals and questions, an outlined methodology, and proof of identification of the shipwrecks were required before a permit could be issued. If the wrecking event occurred before 1850, a maritime archaeologist was required to be on staff. Everything must be documented, published, and reported to a scientific standard. After work reached completion, recovered artifacts were split 50–50 between the permit holder and any associated museums or heritage authorities (Gribble 1998:121). The first permit was issued for the investigation of *Armiston* in 1982 (Gribble 1998:122). As of 2000, 99 permits have been issued, 32 rejected, and 4 were still pending. A vast majority of these permits targeted 19th-century shipwrecks. While this law accomplished a great deal for the management of MUCH, a lack of enforcement capabilities meant it was openly flaunted by salvors (Gribble 1998:122).

In 1996, South Africa adopted the International Council on Monuments and Sites' (ICOMOS) Charter on the Protection and Management of Underwater Cultural Heritage. Under these guidelines, South Africa pledged itself to the scientific analysis and preservation of MUCH. Any investigations were to be done to a high standard and artifacts could not be traded for commercial value. The *in situ* preservation of MUCH was to be considered as the first option in preservation efforts (Sharfman et al. 2012:95). *Bato* and *Brunswick* were to remain as undisturbed as possible. Major archaeological fieldwork, including the Sandalwood and Octopus Projects, was completed prior to this date. No significant disturbance work took place after 1996 on either shipwreck.

The National Heritage Resources Act (Act 25 of 1999) repealed the National Monuments Act of 1969 on April 11, 2000. Based on the principles outlined in the ICOMOS Charter of 1996, the new legislation established the South African Heritage Resource Agency (SAHRA) to replace the National Monuments Council (NMC). It also established that any shipwreck over 60 years old was now an archaeological site and guaranteed extra protection. All shipwrecks and their contents were transferred over to state ownership. The 50-50 split of artifacts was abolished. A network was created where coastal and maritime museums work to preserve nearby shipwrecks. This act also fuelled the reorganization of several museums in Cape Town under the umbrella organization of Iziko (Gribble 2002:562).

The United Nations Educational, Scientific, and Cultural Organization (UNESCO) Convention on the Protection of Underwater Cultural Heritage of 2001 was ratified by the South African government in June 2015. Any future preservation efforts will be based on the guidelines laid out in the Convention. Most notably, UNESCO argues for the use of *in situ* preservation as the first choice in preserving MUCH. Furthermore, any signed parties are obliged to share information and collaborate on projects relating to MUCH (Dromgoole 2013:86).

Bato and *Brunswick* now achieved the maximum protection possible in South Africa. The shipwreck remains and its contents are protected under national law. UNESCO provides preservation with international backing, adding extra credibility. It also provides South African archaeologists with an international network that provides additional insight, personnel, and expertise. An excellent example of this is the Slave Wrecks Project undertaken on *Meermin*. Here, staff from the National Park Service, George Washington University, and various other institution partook in maritime archaeology focusing on a Slave Wrecks (pers. comm. Jaco Boshoff 2014).

The UNESCO partnership also provides a framework for the creation of shipwreck trails focused on the history of the Cape of Good Hope.

Maritime Archaeology in South Africa

Maritime archaeology did not develop in South Africa until the 1980s. In 1982, Dr. Lynn Harris was employed and sponsored by The Archaeology Unit of the South African Museum to obtain government-regulated Department of Manpower Scientific Diver certification and to initiate a national shipwreck database project in collaboration with the National Monuments Council (NMC and now SAHRA). During her employment, Harris worked with local dive clubs and the South African Historical Shipwreck Society to compile baseline field site data to complement the historical record. Thereafter, she left South Africa to obtain a second graduate degree specializing in Maritime Archaeology at East Carolina University in the USA and compile thesis research on Table Bay shipwrecks. Another important project that laid the groundwork for the recognition of maritime archaeology in South Africa was the fieldwork that Jim Jobling, then a graduate student at the Archaeology Department, University of Cape Town conducted under the supervision of Professor Andrew Smith on the British shipwreck *Arniston* in 1982. Jobling left South Africa to specialize in Maritime Archaeology at Texas A&M University in the United States. In 1988, the University of Cape Town (UCT) and the South African Cultural History Museum created a joint maritime archaeology position, appointing Dr. Bruno Werz from Europe. In 1994, the National Monuments Council offered a 1-year contract position to Harris, then employed by the University of South Carolina, to resume working as a consultant on the shipwreck database and to develop a public outreach program around South Africa for the diving community utilizing the internationally recognized NAS program as an umbrella. The NAS courses were offered in partnership with Jaco Boshoff, an employee of the SA Cultural History Museum (now IZIKO Maritime Museum). One of

these courses utilized *Bato* and *Brunswick* as field training sites partnering with the Institute of Maritime Technology at the South African Navy in Simons town. In sum, Harris, Boshoff, and Jobling's early efforts were vital to cultural resource management and the development of maritime archaeology in South Africa, and the NMC position was made permanent in 1996 (Harris pers. comm. 2015; Gribble 1998:122; Jobling, 1982). With academic experts now at hand, it was possible to commence *bona fide* research projects. While salvors had occasionally attempted to adhere to archaeological standards on their projects, a general lack of resources, expertise, and understanding thwarted this noble goal (Sharfman et al. 2012:98).

The instructional courses set up by the Nautical Archaeology Society (NAS) are still an important tool used by MUCH managers in South Africa. Started in the 1990s, the first round of courses culminated with the excavation of *Brunswick* during the Sandalwood Project directed by Harris and Boshoff (Gribble 2002:560). These courses were primarily used to educate divers and salvors about the importance of MUCH. They are also used to train volunteers for maritime archaeology projects. The courses also provide an interface for the interaction between SAHRA and the users of MUCH resources. Since their inception, over two hundred divers have passed through the NAS programs (Gribble 2002:56).

The MUCH Unit in South Africa

In recent years, SAHRA's MUCH unit has been responsible for most of the maritime cultural resource management efforts in South Africa. The MUCH precedes over the maritime and underwater cultural heritage of South Africa. Recently, it has made serious progress in expanding the public's perception of MUCH. It has also worked to broaden South Africa's maritime heritage to include items beyond shipwrecks. In some instances, this can include terrestrial sites like jetties and dockyards.

The unit started work on the African Slave Wrecks Project in 2005, under direction of Jaco Boshoff and Steve Lubkemann of George Washington University. The projects saw members of the MUCH unit partner with various institutions on both a national and international scale. Notable partners include Iziko Museums, George Washington University, and the United States National Park Service. The project aims to explore the maritime aspect of the Atlantic slave trade. MUCH has assisted Iziko Museums in this project since its inception (SAHRA 2005).

New project standards were written by the unit in the same year. Based on the guidelines in the 2001 UNESCO Convention, they were used to evaluate permitted activities on any protected shipwrecks. Adherence to these best practice guidelines ensured a scientific standard in all work undertaken on protected shipwrecks and their contents. Coupled with the completion of new archaeological standards was a great increase in public awareness efforts. The continuation of NAS schools and presentations at dive shows and conferences has provided for continued interaction between SAHRA and the dive community (SAHRA 2006).

Establishing National Heritage Sites is of key importance to SAHRA. These sites include a number of underwater sites. In 2006, several MUCH sites were identified and given formal protection as National Heritage Sites. They included pre-colonial fish traps in the Western Cape, the *Arniston* shipwreck, *SS Mendi*, and the area around Waenhuiskrans and Kassiesbaai (SAHRA 2007). Expanding the definition of maritime sites allowed SAHRA to include prehistoric and historic resources. The inclusion of terrestrial sites at Waenhuiskrans and Kassiesbaai indicated an awareness of using maritime landscapes in public outreach operations. Cultural maritime landscapes allow for the inclusion of sites, museums, and other resources in outreach initiatives, especially the creation of shipwreck trails.

The Center for International Heritage Activities (CIE), based in the Netherlands, and the Consulate of the Embassy of the Kingdom of the Netherlands in Cape Town partnered with SAHRA to create a Maritime Archaeology Development Program (MADP) in 2008. The program was funded by the Embassy of the Kingdom of the Netherlands in Pretoria and marked the beginning of fruitful partnership between the Netherlands and South Africa in matters of MUCH management. The program has a number of ambitious objectives. Primarily, it seeks to develop the capacities of SAHRA, the MUCH Unit, universities, museums, maritime communities, and the diving community. First, a coastal network of professionals, volunteers, and the general public is to be created by offering training whenever possible. The promotion of MUCH preservation was to be facilitated by the creation of an academic network amongst students and heritage practitioners. A conservation facility was created and equipped to handle the requirements of preserving MUCH artifacts and shipwrecks. To convince the public of the viability of maritime archaeology as an alternative to treasure hunting, a public awareness program was started. It focused on the use of maritime archaeology as a means to increase the nation's knowledge of maritime cultural heritages. Finally, an Underwater Cultural Heritage Unit was established to create and enforce a national strategy for the protection and management of MUCH (SAHRA 2009).

The new partnership between SAHRA and CIE proved itself useful in 2008 when the partnership assisted in halting illegal salvage activities on *Clan Stuart* in Table Bay. Increased international co-operation has also allowed for increased protection of South Africa's underwater cultural heritage. Needless to say, the MADP provided additional impetus for the preservation of MUCH in South Africa and laid the basis for extra enforcement capabilities (SAHRA 2009).

A draft of MUCH Best Practices in South Africa was submitted to help revise the National Heritage Resources Act in 2009 (SAHRA 2010). The regulations institutionalized MUCH policies

already in place within the MADP and the SAHRA MUCH unit. The guidelines advocated the use of regional and international partnerships to facilitate the preservation of MUCH in South Africa. Community participation is regarded as being of prime importance to the preservation of MUCH. Local oral traditions are regarded as vital when investigating the intangible aspects of sites like Lake Fundudzi or the fish weirs in the Western Cape. The creation of a three-tier database facilitates the documentation of both intangible and tangible aspects of MUCH sites. The database system allows for complete documentation regardless of the technologies available to the local community. NAS training and courses were revised, or ‘Africanized,’ to include more local sites and management issues. Finally, the guidelines highlight the necessity of using new mass media technologies to raise awareness of MUCH issues among the South African public. The new best practices were accepted and adopted in April 2011 (SAHRA 2011b). *Bato* and *Brunswick* would fare well under these regulations. International protection, new legislation, and public participation create an ideal environment for the preservation of shipwrecks.

The co-operative agreement between the CIE in the Netherlands and SAHRA was concluded in 2011, ending the MADP. The funding provided by the Netherlands allowed for a large segment of the local population to be exposed to South African MUCH. Over one hundred students attended the sponsored NAS courses and are now firm advocates for the preservation of MUCH. The program also allowed the continuation of the Robben Island Youth Program, focused on educating young students about the maritime cultural landscape surrounding the island (SAHRA 2012).

SAHRA marked 2012 with the addition of SAS *Pietmaritzburg* to the register of National Heritage Sites. The vessel was used as minesweeper by the British Royal Navy in World War Two and led the advance on D-Day in 1944. After being scuttled to form an artificial reef, the

importance of the vessel was recognized and extra protection was granted (SAHRA 2013). This year also saw increased international co-operation between the MUCH Unit and the United States.

Trends in South African Maritime Archaeology

Several trends are identified in the practice of maritime archaeology in South Africa. Regional, national, and international co-operation is an important part of MUCH management in South Africa. The most prevalent of these partnerships is the relationship between SAHRA and Iziko Museums. This relationship has allowed for the development of conservation capacities and the incorporation of a regional museum into the MUCH preservation network. Iziko led the way for many of SAHRA's projects, especially the African Slave Wrecks Project. Jaco Boshoff, has been involved with this project from its conception. SAHRA has also held true to its pledge to involve coastal museum in its preservation efforts. The museums near Port Elizabeth and Durban are particularly active in this regard. The involvement of these institutions allows for full coverage of South Africa's coast.

International co-operation was brought to the forefront with the development of the MADP and the African Slave Wrecks Project. American and Dutch partners are particularly active in this regard, and a framework was created for involvement of more nations. The most prevalent amongst these are Great Britain, the Netherlands, France, and Portugal. Each of these nations were active in the East Indian trade and eventual colonization of Southern Africa. The attraction of further nations to South Africa's MUCH program allows the construction of a larger support network. Experts could spread knowledge and assist in the management process. A larger stakeholder network also allows for the possibility of extra funding and further research.

The continued training of current and future MUCH users is a constant theme in SAHRA's work. Over two hundred students completed courses run by SAHRA since the creation of an NAS

training regimen in South Africa. SAHRA currently offers all parts of the NAS curriculum, including the chance to become an NAS tutor or instructor. This training proved invaluable to the efforts of government officials, divers, volunteers, and avocational maritime archaeologists. Local stakeholders ensure the continued preservation of MUCH. Convincing inhabitants to involve themselves in the management process minimizes the need for proper law enforcement and reduces costs. Ideally, a mechanism will be created that institutionalizes public involvement.

The Youth Program run by the MUCH Unit allows SAHRA to gain access to and educate South African youths. Efforts center on visits to Robben Island shipwrecks and SAS *Mendi*. By conveying the importance of valuable cultural resources, SAHRA hopes to recruit young minds to their cause. Hopefully, they will assist in the future preservation of MUCH sites throughout South Africa. SAHRA is also active on mass social media sites and is constantly expanding its outreach efforts. It has a presence on Facebook, Twitter, and various other social media outlets. Such efforts spread information and educate the general public as well. Advancements in information technology necessitate a realization of the importance of social media in maritime archaeology.

Issues in MUCH Management in South Africa

Several issues have been identified when dealing with MUCH in South Africa. The most obvious of these is the general lack of enforcement capabilities of SAHRA and its partners. While the MUCH Unit possesses some research vessels, it does not have any vehicles, waterborne or otherwise, to monitor and control its sites on a continuous basis. The police, coast guard, and navy also lack the capacity to commit any amount of force to patrols of legally protected sites. The cost of dedicated satellite or webcam monitoring is prohibitive.

As a result of the low level of law enforcement, the commercial exploitation of supposedly protected shipwrecks and other underwater sites still occurs. Salvors have a strong attachment to

some wrecks and see it as their right to exploit them. Later shipwrecks are particularly vulnerable to such endeavors as they contain a large amount of iron or copper. Any shipwreck reputed to have valuable artifacts on board is obviously at risk. Putting a stop to illegal salvage will require the full co-operation of the public. The courses and public awareness campaigns run by SAHRA go a long way to alleviating this problem, but a great effort is needed (Sharfman et al. 2012:102).

Heritage protection is placed low on the political agenda of most South African officials. A lack of funds, low public awareness, severely limited access, and misjudgments about the value of MUCH explain this phenomenon. A chronic shortage of funds continues to create difficulties for SAHRA as it is unable to reach all the people it wants (Gribble 1998: 119). As a result, low public awareness of MUCH is still a problem. MUCH sites are out of reach of most South Africans. The vast majority do not dive or cannot travel to visit the sites. As a result, MUCH is of little concern to them. Although the perception of MUCH is changing thanks to SAHRA's efforts, some groups still see shipwrecks and underwater sites as possible locations of wealth that should be extracted and sold. This commercialized view is the primary driver behind illegal salvage and needs to be altered if MUCH preservations are to make significant progress (Gribble 2002:555). Finally, many South Africans do not view local MUCH as an issue of concern. They are the remains of vessels belonging to other nations and should not be managed by South Africans. The management of these sites is viewed by the public as the responsibility of foreign governments (Sharfman et al. 2012:95).

Other possible issues in South African MUCH management include the presence of a large number of warships. With legislation like the Submerged Military Craft Act (SMCA) of 2005 and the Protection of Military Remains Act of 1986, many countries will have a vested interest in protecting any wrecked military vessels. This could complicate matters, but the international

partnerships built up by SAHRA should assist in the removal of this obstacle (Dromgoole 2013:134-138).

As state owned vessels, both *Bato* and *Brunswick* present a complex legal dilemma. In case of the former, it is a clear cut matter of Dutch sovereignty over a warship (Dromgoole 2013:136–138). As an operational warship, Dutch sovereignty extends to *Bato*'s remains despite her location in South African territorial waters. Conventions exist, however, that allow South African authorities, like SAHRA, to take over care of the Dutch remains. Examples are found in the treatment of *La Belle* between the USA and France and the HMS *Erebus* and HMS *Terror* cared for by Canada on behalf of Great Britain (Dromgoole 2013:141–142). As such, it would be possible for South Africa to take over care of *Bato*'s remains. Care is guaranteed under shipwreck preserves and trails. *Brunswick* does not fall under the same protection due to its commercial role. Investigation of HEIC practices reveals that ships were often privately owned by several shareholders. Thus, they do not warrant official legal protection by Great Britain (MacGregor 1980:172, Sutton 1981:17–25). International law, including the United Nations Convention on the Law of the Sea (UNCLOS), dictates that any state owned vessels operating for commercial purposes are treated the same as privately owned merchant vessels (Dromgoole 2013:137).

What is the Best MUCH Management Option for Bato and Brunswick?

Shipwreck preserves and trails are the best option for the continued preservation of *Bato* and *Brunswick*. They are a viable option for wrecks that are aesthetically enjoyable (Frigerio 2013:314). Both of the shipwrecks discussed here are easily spotted on the seafloor and offer an abundance of structural features and marine life for divers. Shipwrecks need to be conceptually understandable and appreciable (Frigerio 2013). The detailed National Register created by SAHRA has provided the public with both historical and archaeological data on both shipwrecks. The shipwrecks must be

close to the coast and easily accessible (Frigerio 2013). *Bato* and *Brunswick* are located within 200 meters of the coast and are easily accessible to shore divers. Finally, the shipwrecks must be legally sustainable (Frigerio 2013). Under the National Heritage Resources Act of 1999, SAHRA officially administers all shipwreck older than sixty years. This secures legal rights and ownership of all shipwrecks and their contents.

Shipwreck preserves fall in line with the trends and issues of South African MICH management. International, national, and regional co-operation is key to the creation of shipwreck preserves in South Africa. The ratification of the 2001 UNESCO Convention creates a platform for preservation according to international standards, focusing on *in situ* preservation. The Living Museums in the Sea Projects in the Dominican Republic demonstrates that *in situ* preservation is vital carrying out research in shipwreck preserves or Marine Protected Areas (MPAs). In this project, Indiana University (IU) adopted a multidisciplinary approach that preserves both MICH and the local biodiversity. The biology efforts are focused on a rare species of Elkhorn coral that is growing in the MPAs. Annual monitoring of sites for structural and natural integrity has allowed for the creation of documentation of rare marine species and the investigation of important MICH sites like the Captain Kidd Wreck (Beeker et al. 2014). This multipronged approach would be ideally suited to South African waters.

UNESCO has its own, international, program of shipwreck trails known as The Slave Route (UNESCO 2009). The trail has three stated objectives. First, educates a global population on the slave trade through multidisciplinary scientific works. Second, the trails highlights contemporary effects of the slave trade and slavery in general. Third, it encourages peaceful dialogue and coexistence between current peoples through reflection on the present effects of the slave trade. The creation of a UNESCO shipwreck trail and preserve is already underway in Bermuda (Bermuda

Department of Tourism 2012). Although the Bermudian model focuses on terrestrial remains, maritime archaeology projects are underway or are already completed as part of The Slave Route Project. From 2006 to 2013, four investigations occurred on a slavery site called *Utile*, a French slaver in the employ of the French East India Company (GRAN 2013). The captain abandoned illegally purchased slaves on an island near Mauritius and did not return to pick them up until 1776, a full 15 years later. Maritime archaeologists are investigating a landscape associated with marooned slaves. Potential exists for the inclusion of Simons Town, and other South African sites, within the Slave Route Project. Alternatively, authorities could design a shipwreck route focused on the current effects of imperialism on contemporary society. Both *Bato* and *Brunswick* fit appropriately into this topic.

The Netherlands and the United States of America are already established as key partners in MUCH management. That tradition should extend to the preservation of *Bato*, especially when her role as a Dutch warship is taken into account. The major challenge lies in convincing British stakeholders to take part in the struggle for *Brunswick*'s survival. However, the lack of information existing about Napoleonic British East Indiamen should convince some stakeholders. Other shipwrecks are already under South African ownerships and do not require extensive foreign investment.

National and regional partnerships exist in the form of SAHRA, Iziko Museums, and the Simons Town Museum. The Iziko Maritime Centre serves as the regional maritime museum and provides coverage of important shipwrecks in the area. Some focus is given to the colonial role of Dutch and British ships. The Centre also features a Conservation Laboratory that cares for a large collection of *Bato*'s and *Brunswick*'s artifacts. A lasting partnership already exists between Iziko and SAHRA. The local Simons Town Museum should form a part of this partnership. Its location

near the two shipwreck places it in the ideal position to serve as educator to the public of local shipwrecks. The museum already holds several documents on archaeological and salvage efforts concerning *Bato* and *Brunswick*. In partnership with the Simons Town Historical Society, it could serve as a base for public outreach operations.

Public co-operations and involvement are key to SAHRA's goals and the smooth working of shipwreck preserves. If SAHRA seeks the help of the local dive community, it is possible to create a policy of public enforcement of MUCH legislation. If a community is convinced that MUCH can contribute to their livelihoods in a significant way, they become stakeholders and will seek to protect this resources. The income generated by tourism will provide a boost to the local economy and a reason for locals to ensure their livelihood is protected.

Florida's Underwater Archaeological Preserves are used as a model for the benefits of increased public co-operation. After some convincing, local communities contributed preserve nominations and a list of shipwrecks to be included within the preserve. As a result, communities developed feelings of pride about their maritime heritage and gain a stake in preserving it. Beyond, this the financial benefits of such projects are considerable. In Florida, shipwreck preserves have generated over three million dollars to the local economy (Spirek and Scott-Ireton 2003:95-106). The two problems of a stagnating economy and poor MUCH management were solved convincingly.

Numerous dive shops exist around Simons Town. The most prevalent of these is Pisces Divers, located near the Simons Town train station and used during the ECU investigation of 2014. Conversations with Mike Nortje, Staff Instructor, and Wendy Crowther, Social Media Specialist and Dive Master, reveal the breadth of knowledge held by local divers. Shipwrecks are held in particularly high regard. They feature second only to sites featuring seals and sharks in Cape Town.

By far, one of the most popular shipwrecks is SAS *Pietermaritzburg*. Other shipwrecks, including *Clan Stuart* are also popular destinations. There is clearly a realization of the link between shipwreck preservation and income at Pisces Divers. An awareness also exists to stop the illegal looting and salvage of any shipwreck sites. As more divers use Pisces Divers, an awareness and appreciation of shipwrecks will develop amongst the general public. Such awareness combats a general lack of interest in wider South Africa. The dive shop also trains young divers and impart their values concerning MUCH. A feeling of local ownerships will also lower the requirement for official law enforcement. Local business and populace would feel responsible for the protection of MUCH.

A shipwreck preserve and trail is not limited to underwater sites only. Terrestrial components should be included. This is of particular importance in South Africa as many people feel disconnected from maritime heritage due their inability to dive or travel. In the Dominican Republic, IU founded several components of a preserve that marked significant maritime activity on land or were the site of historical landings or settlements. Coupled with signs displaying shipwreck locations, these resources allowed non-divers to enjoy and appreciated MUCH as well.

Opportunities for such projects abound in and around Simons Town.

Shipwreck Routes in South Africa

Work is underway to create a shipwreck trail west of East London known as the Jikeleza Shipwreck Route. The project aims to exploit local shipwrecks to improve tourism. The route is focused around six shipwrecks: *Nuovo Abele* (1874), *Alma* (1878), *Pondo* (1902), *Senhora De Atalaia Do Pinheiro* (1647), and *Santo Alberto* (1593). It is completely terrestrial in nature and focuses on beach walks and survival camps. Plaques are set up at each site to tell the basic history of the wreck. The information focuses on the ship's nationality, its design, the wrecking event, and

the number of lives lost. The Wild Coast Jikeleza Association has partner with SAHRA and the National Heritage Council to fund the plaques in 2014. The estimated cost of produced the plaques is R 62,200 (Kockott 2013:28). The design includes designate logos, information, an illustration, and a QR code for access to more information (Kockott 2013).

The creation of the shipwreck route is only in a preliminary phase. So far, efforts have been targeted at gauging local interest in shipwrecks through interviews. The support of the MUCH Unit is secured for the next financial year. The local population is extremely interested in the maritime history and heritage of the area. Various organized beach trips and tours have convinced locals of the need to preserve it. Landowners are even willing to allow access to their land for the benefit of the shipwreck route. This is particularly true of the Cairn family and access to *Atalaia Do Pinheiro*. They reserved a portion of their land for the plaque and a small public trail (Kockott 2013:12).

The route is included on local tourist maps and is advertised throughout the region. Plans exist to add more shipwrecks to the route if it proves a success. Over one hundred shipwrecks have been tagged in the area as possible candidates (Kockott 2013: 29). Unfortunately, this route does not exploit the benefits that diving tourism could bring to the local community. It is solely focused on the terrestrial and does not include the maritime aspect. A true shipwreck route should include both sides.

Several economic benefits will accompany the creation of the Jikeleza Shipwreck Route. Increased tourism shall encourage investment in infrastructure to continue the growth of the industry. Local populations will certainly benefit from new roads as the secure a future source of income. Furthermore, the construction and maintenance of shipwreck trails will create employment opportunities for the local population and encourage local involvement in preserving maritime heritage (Wild Coast Jikeleza Route 2013). Shipwreck guides will be trained and employed by local

organizations. A source funding program has been put in place to ensure the continued maintenance of local infrastructure (Kockot 2013).

A similar trail can be set up in and around Simons Town. *Bato* and *Brunswick* could form the focus of a False Bay Shipwreck Trail. There are 33 other shipwrecks in the Simons Bay area that could also be incorporated into a shipwreck trail (SAHRA 2014). Other shipwrecks, like *Clan Stuart* and *SAS Pietermaritzburg*, should also be included in the shipwreck trail. *Clan Stuart* is easily accessible from shore and the boilers protrude above water and are easily visible from shore. *SAS Pietermaritzburg* is a navy ship that was part of the D-Day invasion on 6 June 1944. Its inclusion expands the impact of a naval shipwreck preserve. Currently, the dive community is served primarily by Pisces Divers. They do not advocate the collection of artifacts from shipwrecks and attempt to raise awareness of the issue with the public. Despite the area already being designated an MPA, the focus in biological preservation and enforcement is focused on that aspect instead of cultural heritage (WWF 2009). By convincing the local community to protect the local MPA, any illegal salvage activity will be halted and additional enforcement capabilities will not be required.

Simons Town is the main base of the South African Navy (SAN). Officially, the town has served as a navy port since 1815. However, it was used as winter anchorage by Dutch VOC and navy fleets long before that. As a result, the town is very cosmopolitan in nature and invests a great deal of pride in its relationship with the navy. The Simons Town museum, for instance, is staffed by British sailors proud to call the town their home. A significant number of ex-servicemen have retired in the area and have a definite interest in preserving their naval heritage.

Simons Town overflows with naval and maritime history. Merchant and military ships called at the port during its continued existence. Monuments to important ships, naval personnel,

and military mascots are visible throughout the town, especially along its Historic Mile. Anchors are visible on Jubilee Square. Cemeteries are viewed on the top of the hills surrounding the town. Just Nuisance, a Great Dane serving as mascot for the Royal Navy, is immortalized in a brass statue in several locations. Store names like Nelson's Cellar and Trafalgar Pub speak to the importance of the town's naval heritage. Such sites and monuments should be included in all-encompassing shipwreck trail. Both maritime and terrestrial components will be included as a result.

Two local historical societies are already very active within the community: the Simon's Town Historical Society and the South African Naval Heritage Society. The Historical Society is very active in preserving the historic fabric of the town. Their efforts include the continued maintenance of an historic grave yard and the registration of historic buildings, sites, and objects. They have also placed plaques around Town that highlight important buildings, events, or national and international celebrities (Simons Town Historical Society 2009). The Society is also affiliated with the Simons Town Museum.

The Historical Society's most relevant project is the Phoenix Project, started September 1997. Due to the designation of Simons Town as a White Group Area, many original inhabitants were forced to live elsewhere. This completely destroyed the cosmopolitan nature of the town. Prior to this, Muslims, Indians, native Africans, whites, and Asians had all lived amongst each other. Most had arrived through enlistment in the Dutch, British Royal, or South African Navy and married local women. The sailors decided to settle in the area after marriage, resulting in a multinational local population. Project Phoenix seeks to document the previously cosmopolitan nature of the town and so aid the preservation of the town. This project is currently in its Second Phase (Simons Town Museum 2009). The results of Project Phoenix can be used to convince the public of South Africa that the preservation of MUCH is in everyone's interest. MUCH does not

belong only to foreign powers, but is an integral part of South African history. Without its storied maritime history, South Africa would look very different today.

The South African Naval Heritage Society works to highlight the relationship between SAN and local populations. To this end, it runs the South African Naval Museum and highlights the interaction between South African naval personnel and locals (South African Naval Museum 2013). It also works jointly with the Simons Town Historical Society to catalogue a number of old documents and plans. The recording and cataloguing of these documents will open up further research avenues that can be highlighted in historic tours of the town (Simons Town Historical Society 2009).

There are also two active museums in the area: the Simons Town Museum and the South African Naval Museum. Both emphasize the local history and the relationship between the town and naval activity in Simons Town, focusing on the lives of relatives and friends of naval personnel. Simons Town Historic Mile speaks to the naval character of the community. Combined with the many shipwrecks in its bay, the museums and historical fabric of the town provide the cultural heritage needed for a good shipwreck route.

The mixture of colder water from the Atlantic and warm water from the Indian Ocean has created a diverse mixture of flora and fauna around the Cape Peninsula. This is exemplified in a biodiversity study performed on *Brunswick* in 2011 (Harding 2013:103-104). A number of unique species were documented including the Black Nudibranch (*Tambja capensis*), Puffadder Shark (*Haploblepharus edwardsii*), Leopard Catshark (*Poroderma pantherium*), and Pyjama Catshark (*Poroderma africanum*). The protection of these unique creatures is vital to the natural ecosystem surrounding Simons Town. The two shipwrecks act as shallow reefs and house a variety of marine life, greatly helping the local ecosystem.

SAHRA will be able to convince the people of Simons Town to protect their naval and natural heritage once it is made clear to them how important diving tourism is to their economy. Many divers start out on easy shipwrecks like *Brunswick* and *Bato* (Wreckseekers 2010:26). Once these have been established as part of the shipwreck route, the locals will have a stake ensuring their continued preservation. The most effective methods for accomplishing would be to host workshops or lectures at the local historical societies and hold several NAS courses in the area that are focused on local issues.

Partnership with SAHRA will also necessitate the creation of youth education programs. Fortunately, some local schools are already including shipwrecks within their curriculum. The Sun Valley Primary School has organized a program that allows students to investigate the many aspects of the Cape's history. In Term 2, the students are taken on a field trip to the Kakapo shipwreck and educated about the maritime heritage of the region (Sun Valley Primary School 2014). It is possible to organize an excursion to Simons Town and include it within the curriculum as well.

Shipwreck trails and preserves are the best solution for the continued preservation of *Bato* and *Brunswick*. Local support and involvement by dive shops and historical societies provides added protection to the shipwrecks without the need for additional law enforcement. A common theme of navy and empire guarantees the creation of local stakeholders. A network of museums, dive shops, and town monuments allows for easy inclusion of maritime and terrestrial sites. The addition of shipwrecks close to shore means access to the trail should be available to more people. Finally, the large preservation network allows for the creation of educational programs that will guarantee preservation by younger generations.

References

Addison, Thomas and John Know Laughton (editor)

1901 Extracts from the Journal of Thomas Addison, of East India Company's Service, 1801-1830. *Publications of the Navy Records Society* 20:33-374.

Adkins, Roy and Lesley Adkins

2006 *The War for All the Oceans From Nelson at the Nile to Napoleon at Waterloo*. Abacus, London, UK.

Albion, Robert

1926 *Forests and Sea Power: The Timber Problem of the Royal Navy, 1652-1862*. Naval Institute Press, Annapolis, MD.

1952 The Timber Problem of the Royal Navy, 1652-1862. *The Mariner's Mirror* 38(1):4-22.

Beeker, Charles D., Matthew J. Maus, and Frederick H. Hanselmann (editors)

2014 Living Museums in the Sea Methodology for the Investigation and Management of Submerged Cultural Resources and the Associated Biodiversity.

Bingeman, John M., John P. Bethell, Peter Goodwin, and Arthur T. Mack

2000 Copper and other sheathing in the Royal Navy. *The International Journal of Nautical Archaeology* 29(2):218-229.

Black, Jeremy

2004 *The British Seaborne Empire*. Yale University Press, New Haven, CT.

2009 *Naval Power A History of Warfare and the Sea from 1500*. Palgrave MacMillan, New York, NY.

Bermuda Department of Tourism

2012 *African Diaspora Heritage Trail*. Bermuda Department of Tourism, Hamilton, Bermuda.

Boshoff, Willem and Johan Fourie

2008 Explaining Ship Traffic Fluctuations at the early Cape Settlement 1652-1793. *South African Journal of Economic History* 23: 1-27.

Boshoff, Jaco, J. P. Schmid, C. K. Wainman, C. E. Kruyshaar, K. Kruyshaar, and T. Durden

1995 Progress Report: Survey of the Brunswick Wreck Permit No:8/94/06/002/30. Report, National Monument Council, Cape Town, South Africa.

Booy, Arie

2013 *Werelwijd Voortvarend Marine 525 Jaar (Globally Advancing Navy 525 Years)*. Koninklijke Marine (Royal Navy), Den Helder, NL.

Boudriot, Jean

1986 *The Seventy-Four Gun Ship A Practical Treatise on the Art of Naval Architecture, Volume 1, Hull Construction*. Naval Institute Press, Annapolis, MD.

1986b *The Seventy-Four Gun Ship A Practical Treatise on the Art of Naval Architecture, Volume 2, Fitting Out the Hull*. Naval Institute Press, Annapolis, MD.

1987 *The Seventy-Four Gun Ship A Practical Treatise on the Art of Naval Architecture, Volume 3, Masts – Sails – Rigging*. Naval Institute Press, Annapolis, MD.

Boxer, C. R.

1965 *The Dutch Seaborne Empire: 1600-1800*. Alfred A. Knopf, New York, NY.

Bruijn, Jaap R.

1993 *The Dutch Navy of the Seventeenth and Eighteenth Centuries*. University of South Carolina Press, Columbia, SC.

Cain, P. J. and A. G. Hopkins

2002 *British Imperialism, 1688-2000*. Longman, Harlow, UK.

The Cape Town Gazette and African Advertiser

1806a Articles of Capitulation. *The Cape Town Gazette and African Advertiser* 25 January:1-2. Cape Town, South Africa.

1806b Kieseletter & Co. *The Cape Town Gazette and African Advertiser* 7 June:2. Cape Town, South Africa.

Clowes, William Laird.

1997 *The Royal Navy, A History from the Earliest Times to 1900, Vol. 5*. Chatham Publishing, London, UK.

Comte, Pieter Le

1842 *Praktikale Zeevaartkunde en Theoretische Kennis*. G. Hulst van Keulen, Amsterdam, NL.

Davenport, T. R. H.

1977 *South Africa A Modern History*, 2nd edition. MacMillan. South Africa, Johannesburg, South Africa.

DeGarmo, Paul E.

1974 *Materials and Processes in Manufacturing*, 4th edition. Macmillan Publishing Co., Inc., New York, NY.

de Jonge, Johannes Cornelis

1861a *Geschiedenis van het Nederlandsche zeewezen: vijfde deel, eerste stuk* (History of the Dutch Sea Creature, Vol. 5, Part 1). A. C. Kruseman, Haarlem, Netherlands.

1861b *Geschiedenis van het Nederlandsche zeewezen: vijfde deel, tweede stuk* (History of the Dutch Sea Creature, Vol. 5, Part 2). A. C. Kruseman, Haarlem, Netherlands.

de Vries, Jan and Ad van der Woude

1997 *The First Modern Economy Success, failure, and perseverance of the Dutch economy, 1500–1815*. Cambridge University Press, Cambridge, UK.

Dilley, Harry

2012 *VOC Ship BATO Cannons*. Simons Town Town Council, Simons Town, South Africa.

Dodds, James and James Moore

1984 *Building the Wooden Fighting Ship*. Chatham Publishing, London, UK.

Domingues–Delmas, Marta, Jeroen F. Benders, and Gert L. G. A. Kortekaas

2011 Timber supply in Groningen (northeast Netherlands) during the early modern period (16th-17th centuries). *Tree Rings, Art, Archaeology: Proceedings of an international Conference*, Pascale Fraiture, editor, pp. 151–174. Royal Institute for Cultural Heritage, Vol. 7. Brussels, Belgium.

Dromgoole, Sarah

2013 *Underwater Cultural Heritage and International Law*. Cambridge University Press, Cambridge, UK.

Fairhurst, L., C.G. Attwood, M.D. Durholtz, and C.L. Moloney

2007 Life history of the steentjie *SpondylIOSOMA emarginatum* (Cuvier 1830) in Langebaan Lagoon, South Africa. *African Journal of Marine Science* 29(1):79–92.

Frigerio, Alberto

2013 *The Underwater Cultural Heritage: a Comparative Analysis of International Perspectives, Laws, and Methods of Management*. PhD Thesis, IMT Institute for Advanced Studies, Lucca, Italy.

Gardiner, Robert

1997 *Campaign of Trafalgar: 1803 – 1805*. Mercury Books, London, United Kingdom.

Gawronski, Jerzy, Bas Kist, and Odilia Stokvis-van Boetzelaer

1992 *Hollandia Compendium: A Contribution to the History, Archaeology, Classification and Lexicography of a 150 ft. Dutch East Indiaman (1740-1750)*. Elsevier Science, Amsterdam, Netherlands.

Goodwin, Peter

1987 *The Construction and Fitting of the English Man of War: 1650-1850*. Naval Institute Press, Annapolis, MD.

1998 The Influence of Iron in Ship Construction: 1660 to 1830. *The Mariner's Mirror* 84(1):26-40.

Grace, Richard J.

2004 Jardine William. *Oxford Dictionary of National Biography*. Oxford University Press, Oxford, United Kingdom. <<http://www.oxforddnb.com.jproxy.lib.ecu.edu/view/article/37595?docPos=1>>. Accessed 20 November 2014.

Green, Henry and Robert Wigram

1881 *Chronicles of Blackwall Yard Part 1*. Whitehead, Morris and Lowe, London, UK.

Gribble, John

1998 Keep our heads above water- the development of shipwreck management strategies in South Africa. *Bulletin of the Australian Institute for Maritime Archaeology* (22):119-124.

2002 Past, Present, and Future of Maritime Archaeology in South Africa. In *International Handbook of Underwater Archaeology*, Carol V. Ruppé and Janet F. Barstad, editors, pp. 553-570. Plenum Publishers, New York City.

Groupe de Recherche en Archéologie Navale (Maritime Archaeology Research Group) [GRAN]
2013 Lancement de la 4ème campagne de fouilles archéologiques sur l'île de Tromelin (Launch of the fourth archaeological excavation on the Island of Tromelin). GRAN
<<http://archeonavale.org/gran2012/index.php/2012-02-13-18-51-03/mission-2013>>. Accessed 10 February 2014.

Harding, Richard

1999 *Seapower and Naval Warfare, 1650-1830*. University College of London Press, London, UK.

Harding, Jake

2013 *The Brunswick: An archaeological assessment of the wreck and its surrounding context*. Honors Thesis, Department of Archaeology, University of Cape Town.

Hardy, Horatio Charles

1811 *A Register of Ships, Employed in the Service of the Honorable the United East India Company, from the Year 1760 to 1810, With an Appendix, Containing a Variety of Particulars, and Useful Information Interesting to Those Concerned with East India Commerce*. Black, Parry, and Kingsbury, London, United Kingdom.

Henry, Chris

2004 *Napoleonic Naval Armaments, 1792-1815*. Osprey Publishing Ltd., Oxford, UK.

Hoving, A. J.

2005 *In Tekening Gebracht: de achttiende-eeuwse scheepsbouwers en hun ontwerpmethoden* (Drawn Up: 18th Century Shipbuilders and Their Construction Methods). De Bataafse Leeuw, Amsterdam, NL.

Hutchison, Ragnhild

2012 The Norwegian and Baltic Timber Trade to Britain 1780-1835 and its Interconnections. *Scandinavian Journal of History* 37(5):578-599.

Inikori, Joseph E.

1996 Measuring the unmeasured hazards of the Atlantic slave trade: documents relating to the British trade. *Revue française d'histoire d'outre-mer* 83(3):53-92.

Israel, Jonathan

1995 *The Dutch Republic Its Rise, Greatness, and Fall 1477-1806*. Clarendon Press, Oxford, UK.

Jobling, Jim

1982 *The Arniston, 1815*. Report to National Monuments Council.

Kockott, Claire

2013 *The Wild Coast Jikeleza Shipwreck Route Phase 1 - Research and Design*. Wild Coast Jikeleza Association, National Heritage Council South Africa.

Konstam, Angus

2001 *British Napoleonic Ship-of-the-Line*. Osprey Publishing Ltd., Oxford, UK.

Lavery, Brian

1983 *The Ship of the Line, Volume 1, The Development of the Battlefleet 1650-1850*. Naval Institute Press, Annapolis, MD.

1984 *The Ship of the Line, Volume 2, Design, Construction and Fittings*. Naval Institute Press, Annapolis, MD.

Louis, William Roger

1998 *The Oxford History of the British Empire, Vol. 2, The Eighteenth Century*. Oxford University Press, Oxford, UK.

MacGregor, David

1980 *Merchant Sailing Ships: 1775-1815*. Naval Institute Press, Annapolis, MD.

Marcus, G. J.

1971 *A Naval History of England, Vol. 2, The Age of Nelson*. George Allen & Unwin Ltd., London, UK.

McCarthy, Mike

1996 Ships fastenings: a preliminary study revisited. *The International Journal of Nautical Archaeology* 25(3):177–206.

2005 *Ships' Fastenings From Sewn Boat to Steamship*. Texas A&M University Press, College Station, TX.

Miller, Duncan

1997 Archaeometallurgical Studies in Maritime Archaeology at the Cape of Good Hope. *Southern African Field Archaeology* 6:26–37.

Moore, Bob and Henk van Nierop (editors)

2003 *Colonial Empires Compared Britain and the Netherlands, 1750-1850*. Ashgate Publishing Limited, Aldershot, England.

Nationaal Archief, Den Haag, Archief Marine, Aanhangsel II, nummer toegang 2.01.29.03, inventarisnummer 8

Nationaal Archief, Den Haag, Archief Marine, Aanhangsel II, nummer toegang 2.01.29.03, inventarisnummer 126

Nationaal Archief, Den Haag, Collectie 036 Janssens, 1700-1906, nummer toegang 2.21.092, inventarisnummer 61

Nationaal Archief, Den Haag, Collectie 036 Janssens, 1700-1906, nummer toegang 2.21.092, inventarisnummer 67

Nationaal Archief, Den Haag, Collectie 036 Janssens, 1700-1906, nummer toegang 2.21.092, inventarisnummer 70

Nationaal Archief, Den Haag, Archief Marine, Aanhangsel II, nummer toegang 2.01.29.03, inventarisnummer 108

Nationaal Archief, Den Haag, Archief Marine, Aanhangsel II, nummer toegang 2.01.29.03, inventarisnummer 109

Nationaal Archief, Den Haag, Archief Marine, Aanhangsel II, nummer toegang 2.01.29.03, inventarisnummer 110

Nationaal Archief, Den Haag, Archief Marine, Aanhangsel II, nummer toegang 2.01.29.03, inventarisnummer 119

Nationaal Archief, Den Haag, Departement van Marine: Monsterrollen, nummer toegang 2.01.30, inventarisnummer 173

Nationaal Archief, Den Haag, Departement van Marine: Monsterrollen, nummer toegang 2.01.30, inventarisnummer 256

Nationaal Archief, Den Haag, Departement van Marine: Monsterrollen, nummer toegang 2.01.30, inventarisnummer 314

Nationaal Archief, Den Haag, J.W. Janssens - Kaarten en Tekeningen, nummer toegang 4.JSF, inventarisnummer 66

Nationaal Archief, Den Haag, J.W. Janssens - Kaarten en Tekeningen, nummer toegang 4.JSF, inventarisnummer 13

Octopus

1998a A BATO Holland hadjhajófeltárása (Exploration of Dutch Warship *Bato*). Octopus Group, Budapest, Hungary <<http://deepresearch.hu/hu/project/bato.asp>>. Accessed 20 November 2014.

1998b “Bato” Dutch Warship (1806) Simon’s Bay Project 1996 – 1997 Survey and Excavation Documentation. Octopus Maritime Archaeological Research Association, Hungary.

Ollivier, Blaise

1992 *18th Century Shipbuilding Remarks on the Navies of the English & the Dutch from Observations made at their Dockyards in 1737*. Jean Boudriot Publications, Rotherfield, England.

Paine, Lincoln

2013 *The Sea and Civilization A Maritime History of the World*. Alfred A. Knopf, New York, NY.

Project Sandalwood

1995 *Depth Profile of Wreck*. National Monuments Council, Cape Town, South Africa.

Potgieter, T.D.

2000 Maritime Defence and the South African Navy to the cancellation of the Simon's Town agreement. *South African Journal of Military Studies* 30(2):159–182.

Raven, G. J. A. and N. A. M. Rodger (editors)

1990 *Navies and Armies The Anglo-Dutch Relationship in War and Peace 1688-1988*. John Donald Publishers Ltd., Edinburgh, UK.

Rijksmuseum

2014a Halfmodel van een linesschip van 74 stukken, Anonymous, c. 1782 (Half Model of a Ship of the Line of 74 Guns, Anonymous, c. 1782). Rijksmuseum, Amsterdam, Netherlands <<https://www.rijksmuseum.nl/en/collection/NG-MC-267>>. Accessed 27 November 2014.

2014b Halfmodel van het achterschip van een linesschip van 74 stukken, anonym, ca. 1795 – ca. 1799 (Half model of the stern of a 74-gun ship of the line, Anonymous, c. 1795-1799).

Rijksmuseum, Amsterdam, Netherlands <[https://www.rijksmuseum.nl/en/search/objecten?ps=12&f.classification.people.sort=Staten+Generaal+\(schip\)&ii=1#/NG-MC-91,1](https://www.rijksmuseum.nl/en/search/objecten?ps=12&f.classification.people.sort=Staten+Generaal+(schip)&ii=1#/NG-MC-91,1)>. Accessed 27 November 2014.

Rodger, N. A. M.

2004 *The Command of the Ocean A Naval History of Britain 1649–1815*. W. W. Norton & Company, New York, NY.

Rodgers, Bradley A.

2004 *The Archaeologist's Manual for Conservation: A Guide to Non-Toxic, Minimal Intervention Artifact Stabilization*. Kluwer Academic/Plenum Publishers, New York, NY.

Rt. Hon. Geoffrey Rippon Q.C., M.P.

1970 South Africa and naval strategy. *The Round Table: The Commonwealth Journal of International Affairs* 60(239):303–309.

Sharfman, Jonathan, Jaco Boshoff, and Robert Parthesius

2012 Maritime and Underwater Cultural Heritage in South Africa: The Development of Relevant Management Strategies in the Historical Maritime Context of the Southern Tip of Africa. *Journal of Maritime Archaeology* 7(1): 87-109.

Simons Town Historical Society

2009 Projects. <http://www.simonstown.org/projects.html>. Accessed April 28 2014.

Simons Town Museum

2009 Project Phoenix. http://www.simonstown.com/museum/stm_phoenix.htm. Accessed April 27 2014.

South African Heritage Resources Agency [SAHRA]

- 2004 *SAHRA Annual Report*. Department of Arts and Culture, Pretoria, South Africa.
2005 *SAHRA Annual Report*. Department of Arts and Culture, Pretoria, South Africa.
2006 *SAHRA Annual Report*. Department of Arts and Culture, Pretoria, South Africa.
2007 *SAHRA Annual Report*. Department of Arts and Culture, Pretoria, South Africa.
2008 *SAHRA Annual Report*. Department of Arts and Culture, Pretoria, South Africa.
2009 *SAHRA Annual Report*. Department of Arts and Culture, Pretoria, South Africa.
2010 *SAHRA Annual Report*. Department of Arts and Culture, Pretoria, South Africa.
2011a *SAHRA Annual Report*. Department of Arts and Culture, Pretoria, South Africa.
2011b *Towards Best Practices in Maritime Underwater Cultural Heritage in South Africa*. Department of Arts and Culture, Pretoria, South Africa.
2012 *SAHRA Annual Report*. Department of Arts and Culture, Pretoria, South Africa.
2013 *SAHRA Annual Report*. Department of Arts and Culture, Pretoria, South Africa.
2014 SAHRA Shipwreck Database. Cape Town, South Africa.

South African Naval Museum

2013 SAN Heritage Society. <http://simonstown.com/navalmuseum/sanheritage.htm>. Accessed April 27 2014.

Spirek, James and Della Scott-Ireton

2003 *Submerged Cultural Resource Management: Preserving our Sunken Maritime Heritage*. Plenum Publishers, New York, NY

Staniforth, Mark

1985 The Introduction and Use of Copper Sheathing: A History. *Bulletin of the Australian Institute for Maritime Archaeology* 9:21–46.

Stammers, Michael K.

2001 Iron knees in wooden vessels—an attempt at a typology. *The International Journal of Nautical Archaeology* 30(1):115–121.

Steenkamp, Willem

2012 *Assegais, Drums and Dragoons: A Military and Social History of the Cape 1510-1806*. Jonathan Ball Publishers, Johannesburg, South Africa.

Stokesbury, James

1983 *Navy and Empire*. William Morrow and Company, Inc., New York, NY.

Sun Valley Primary School

2014 Grade 5 Theme for 2013 - My place in Cape Town.
<http://www.sunvalleyprimary.co.za/site/academic/grade_5>. Accessed April 26 2014.

Sutton, Jean

1981 *Lords of the East*. Conway Maritime Press, London, UK.

Turner, L. C. F.

1966 The Cape of Good Hope and Anglo-French rivalry 1778-1796. *Historical Studies: Australia and New Zealand* 12(46):166–185.

Underwriters

1794 *Lloyd's Register*. Gregg Press Limited, London, United Kingdom.

Unger, Richard W.

1970 *Dutch Shipbuilding before 1800 Ships and Guilds*. Van Gorcum, Assen, NL.

United Nations Educational, Scientific, and Cultural Organization [UNESCO]

2009 *The Slave Route Reconciling the duty to remember and historical truth*. UNESCO Division of Cultural Policies and Intercultural Dialogue, Culture Sector, Paris, France.

2012 UNESCO Foundation Course on Underwater Cultural Heritage at Port Royal, Jamaica (5-30 November 2012). <<http://www.unesco.org/new/en/culture/themes/underwater-cultural-heritage/research-and-training/capacity-building/port-royal-jamaica-2012/>>. Accessed April 28 2014.

van Daalen, S. and J. van der Beek

2004 Dendroprovenancing ship's timbers. A pilot study on a Dutch 18th century 'ventjager'. *Proceedings of the Dendrosymposium 2003, May 1st – 3rd 2003*, Jansma E, Bräuning A, Gärtner H, Schleser G, editors, pp. 123–130. Vol. 2. Utrecht, NL.

Visser, John Halley

2004 *The Simon's Bay Rudders: The Documentation and Conservation of Underwater Cultural Heritage*. Master's Thesis, Department of Archaeology, University of Cape Town, Cape Town, RSA.

Werz, Bruno

2011 Southern African Shipwreck Archaeology. In *The Oxford Handbook of Maritime Archaeology*, Alexis Catsambis, Ben Ford, and Donny L. Hamilton, editors, pp. 473-494. Oxford University Press, Oxford, UK.

Wikitravel

2012a Diving the Cape Peninsula and False Bay/HNMS Bato.

<http://wikitravel.org/en/Diving_the_Cape_Peninsula_and_False_Bay/HNMS_Bato> Accessed April 5, 2014.

2012b Diving the Cape Peninsula and False Bay/Brunswick.

<http://wikitravel.org/en/Diving_the_Cape_Peninsula_and_False_Bay/Brunswick> Accessed April 5, 2014.

Wild Coast Jikeleza Route

2013 Wild Coast Jikeleza Shipwreck Route.

http://www.wildcoastjikeleza.co.za/index.php?option=com_content&view=category&layout=blog&id=61&Itemid=138. Accessed April 28 2014.

World Wildlife Fund [WWF]

2009 Table Mountain MPA. WWF South Africa, Cape Town, South Africa

<http://www.wwf.org.za/what_we_do/marine/mpas/our_mpa_s/?1295/Table-Mountain-MPA>.

Accessed 10 February 2014.

Wreckseekers

2010 Local casualties of the Napoleonic Wars. *Submerge* 19:24–26.

Appendix A: Permits

CaseNo:

[Investigations of Bato Shipwreck in Simonstown Bay](#)

Heritage Authority:

- [SAHRA](#)
- **PermitID:** 1845 **PermitHolder:** [Lynn Harris](#) [Ivor Roderick Mollema](#)
- **PermitTo:**

[Lynn Harris](#) **PermitDate:**

Wednesday, June 18, 2014 to Thursday, June 18, 2015

NHRA: [35\(4\)](#)

Activities:

- [Pre-disturbance survey](#)
- [Sampling](#)

Conditions:

This permit is issued to Lynn Harris and Ivor Mollema for the pre-disturbance survey of the Bato shipwreck off Long Beach, Simon's Town.

Conditions:

1. If the permit holder is not present on the site at all times then the heritage authority must be provided with the names and qualifications of the authorised representatives.
2. Adequate recording methods as specified in the Regulations and Guidelines pertaining to the National Heritage Resources Act 25 of 1999 must be employed. The positions of all datum points from the wreck must be marked on an accurate plan of the site, which must also include a title, date, north arrow and scale.
3. Work must be limited to the exploration (pre-disturbance survey) in order to determine the identity, condition and extent of the site, "Bato". This permit does not allow for excavation or the removal of material from the wreck site.
4. The permit holder will be allowed to collect wood samples no larger than 1cmx1cmx1cm as stipulated in the project proposal from areas where this will have no adverse impact on the site. Sample location is to be recorded, mapped and photographed and provided in the report to the heritage authority. Please note that this permit does not give the permit holder permission to export any samples out of South Africa.
5. This permit gives the holder the sole right to work on the site for the duration of the permit period.
6. A detailed log book must be kept to record daily progress, the mapping and location of finds, features of the wreck and sea and weather conditions.
7. A report on the results of the pre-disturbance survey must be submitted to the heritage authority issuing this permit on or before the 18 December 2014 and a final report is due on or before 18 June 2015. Reprints of all published papers or copies of theses and/or reports resulting from this work must be lodged with the heritage authority.
8. If satisfactory progress reports are not received, this permit may be cancelled. If a published report has not appeared within three years of the lapsing of this permit, the report required in terms of the permit will be made available to researchers on request.
9. It is the responsibility of the permit holder to protect the site during work and ensure it is stabilized after work has been completed on site to the satisfaction of the heritage authority.
10. It is the responsibility of the permit holder to obtain permission from the landowner for each visit, and conditions of access imposed by the landowner must be observed.
11. The heritage authority shall not be liable for any losses, damages or injuries to persons or properties as a result of any activities in connection with this permit.
12. The heritage authority reserves the right to cancel this permit by notice to the permit holder

Brunswick shipwreck in Simonstown Bay

CaseNo:

[Brunswick shipwreck in Simonstown Bay](#)

HeritageAuthority:

- [SAHRA](#)

PermitID:

1844

PermitHolder:

[Lynn Harris](#)

[Ivor Roderick Mollema](#)

PermitTo:

[Lynn Harris](#)

PermitDate:

Wednesday, June 18, 2014 to Thursday, June 18, 2015

NHRA:

- [35\(4\)](#)

Activities:

- [Pre-disturbance survey](#)
- [Sampling](#)

Conditions:

This permit is issued to Lynn Harris and Ivor Mollema for the pre-disturbance survey of the Brunswick shipwreck off Long Beach, Simon's Town.

Conditions:

1. If the permit holder is not present on the site at all times then the heritage authority must be provided with the names and qualifications of the authorised representatives.
2. Adequate recording methods as specified in the Regulations and Guidelines pertaining to the National Heritage Resources Act 25 of 1999 must be employed. The positions of all datum points from the wreck must be marked on an accurate plan of the site, which must also include a title, date, north arrow and scale.
3. Work must be limited to the exploration (pre-disturbance survey) in order to determine the identity, condition and extent of the site, "Brunswick". This permit does not allow for excavation or the removal of material from the wreck site.
4. The permit holder will be allowed to collect wood samples no larger than 1cmx1cmx1cm as stipulated in the project proposal from areas where this will have no adverse impact on the site. Sample location is to be recorded, mapped and photographed and provided in the report to the heritage authority. Please note that this permit does not give the permit holder permission to export any samples out of South Africa.
5. This permit gives the holder the sole right to work on the site for the duration of the permit period.
6. A detailed log book must be kept to record daily progress, the mapping and location of finds, features of the wreck and sea and weather conditions.
7. A report on the results of the pre-disturbance survey must be submitted to the heritage authority issuing this permit on or before the 18 December 2014 and a final report is due on or before 18 June 2015. Reprints of all published papers or copies of theses and/or reports resulting from this work must be lodged with the heritage authority.
8. If satisfactory progress reports are not received, this permit may be cancelled. If a published report has not appeared within three years of the lapsing of this permit, the report required in terms of the permit will be made available to researchers on request.
9. It is the responsibility of the permit holder to protect the site during work and ensure it is stabilized after work has been completed on site to the satisfaction of the heritage authority.
10. It is the responsibility of the permit holder to obtain permission from the landowner for each visit, and conditions of access imposed by the landowner must be observed.
11. The heritage authority shall not be liable for any losses, damages or injuries to persons or properties as a result of any activities in connection with this permit.
12. The heritage authority reserves the right to cancel this permit by notice to the permit holder.

Appendix B: Full *Bato* Scantling List

Frame #	Sided	Moulded	Length to Reef	Space to Next Frame
F1	16	29	155	too far away ^a
F2	30	25	102	too far away
F3		NOT LOCATED		
F4	22	33	120	too far away
F5	25	16	94	too far away
F6	30	23	overgrown	19
F7	24	19	overgrown	too far away
F8	42	22	110	too far away
F9	overgrown	overgrown	122	too far away
F10	overgrown	overgrown	overgrown	overgrown
F11	26	27	93	2.5
F12	29	17	28	2
F13	29	14	60 from joint	too far away
F14		NOT LOCATED		
F15	24	10	overgrown	1
F16	24	14	overgrown	2
F17	25	5	27	2
F18	25	2	50	2
F19	25	2	62	2
F20	25	2	50	2
F21	25	18	53	3
F22	25	11	46	2
F23	25	10	22	3
F24	29	23	25	16
F25	15	18	35	too far away
F26	25	17	55	too far away
F27	22	21	57	7
F28	27	25	75	1
F29	26	10	55	7
F30	20	15	61	too far away
F31	10	18	44	2
F32	26	24	60	2
F33	25	21	45	2
F34	30	10	29	2
F35	26	33	31	3
F36	28	34	55	3
F37	27	40	38	2
F38	25	31	30	1

F39	26	24	59	2
F40	24	21	45	3
F41	27	28	89	too far away
F42	28	30	153	1
F43	22	31	40	26
F44	23	24	74	3
F45	24	25	87	too far away
F46	36	8	162	1
F47	21	6	163	14
F48	38	4	142	2
F49	43	4	161	too far away
F50	37	4	143	1
F51	29	8	160	too far away
F52		NOT LOCATED		
F53	47	33	199	3
F54	21	29	365	67
F55	34	26	196	76
F56	20	15	191	too far away
F57	12	8	290	19
F58	26	21	198	too far away
F59		NOT LOCATED		
F60	37	37	120	last tagged frame

^aSpace marked as “too far away” were located over 150 cm away.

Appendix C: Full Species List

Bato

Scientific Name	Common Name
<i>Poroderma africanum</i>	pyjama catshark
<i>Jasus lalandii</i>	West Coast rock lobster
<i>Elysia</i> sp.	Plant-sucking nudibranch
<i>Sepia vermiculata</i>	Common cuttlefish
<i>Patiria granifera</i>	Red sea star
<i>Marthasterias glacialis</i>	Spiny sea star
<i>Halaelurus natalensis</i>	Tiger catshark
<i>Clinus venustris</i>	Speckled klipfish
<i>Pachymetopon blochii</i>	Hottentot
<i>Clinus nematopterus</i>	Chinese klipfish
<i>Arctocephalus pusillus pusillus</i>	South African fur seal
<i>SpondylIOSoma emarginatum</i>	Steentjie

Brunswick

Scientific Name	Common Name
<i>Elysia</i> sp.	Plant-sucking nudibranch
<i>Sepia vermiculata</i>	Common cuttlefish
<i>Patiria granifera</i>	Red sea star
<i>Marthasterias glacialis</i>	Spiny sea star
<i>Halaelurus natalensis</i>	Tiger catshark
<i>Clinus venustris</i>	Speckled klipfish
<i>Pachymetopon blochii</i>	Hottentot
<i>Clinus nematopterus</i>	Chinese klipfish
<i>Arctocephalus pusillus pusillus</i>	South African fur seal
<i>SpondylIOSoma emarginatum</i>	Steentjie
<i>Choromytilus meridionalis</i>	Black mussel

Appendix D: Wood Sample Microscope Plates

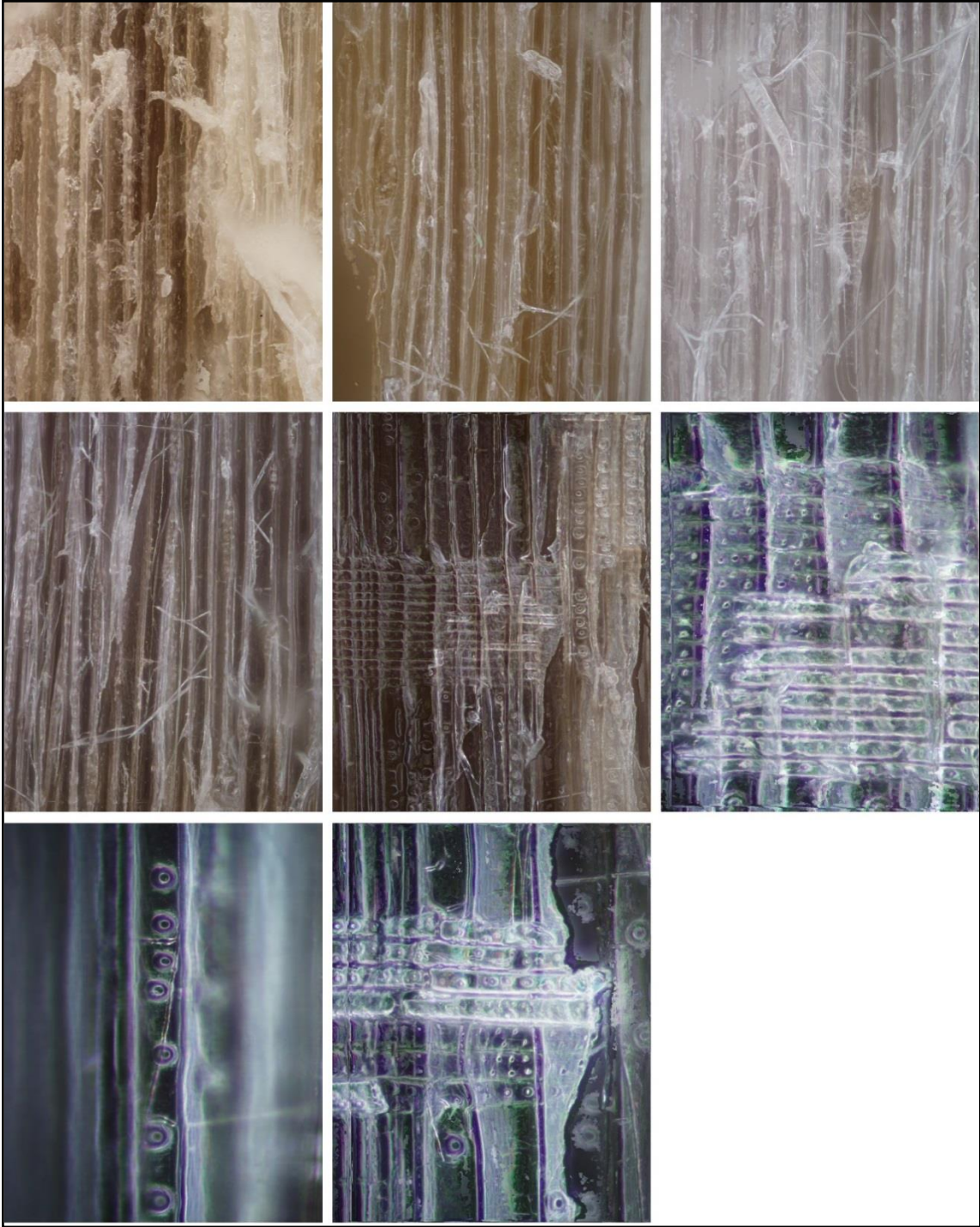


FIGURE 31. Microscopic Plates from BRWS9 (Marion Bamford, University of the Witswatersrand).



FIGURE 32. Microscopic plates from WS4 (Marion Bamford, University of the Witwatersrand).



FIGURE 33. Microscopic slides from WS8 (Marion Bamford, University of the Witwatersrand).

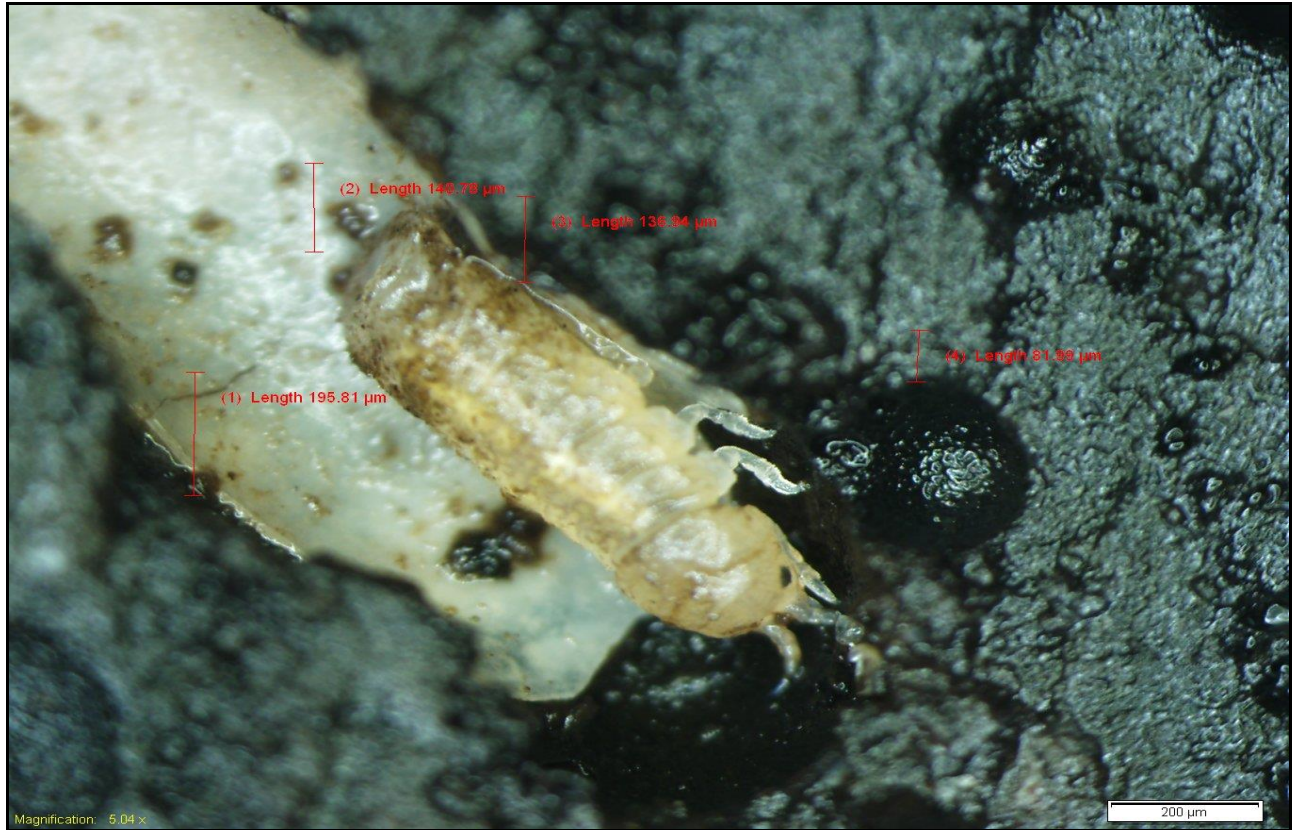


FIGURE 34. Borer discovered in BRWS2 (Marion Bamford, University of the Witswatersrand).

Appendix E: Harteke Journal Excerpt

Worsdag 8 Int 2^o mal De Wind feriaal Labbes en et
 Trovans Luyt moijetter, Morgen om 7 uer roseten
 Tye ayter Holgande Zin van De Blijten Postten
 Dierk iint Sagen in Exprede Coomende Londen
 Londen omg Roep an de Waal om te Meoren met
 De Zelve Sagen reth allarm Stan a. de Waal
 Krogen Tijding om De mieliteren an Bord waaren
 Derak an de Waal te Leeden en als te vor nichon
 In De Distolokeeren wat goetel manns gaederen
 waaren In te Schips te Drukken te Lappen en
 te vor Branden, te Helk Helk 44 g den Pindigs
 Luyt 4 uer, En, Krogen over die mieliteren maet
 te volgen, na te Drukken gejas waaren Raaken
 Schips in Brande vlijten met de Slup na de
 Calk Baaje alger Hej ons Bij de Treysens
 Luyden en te Spuligton na Kothentot Hobb-
 mosten mardeeren - - -

J. Harteke
 P. Schuurman

FIGURE 35. Final excerpt of Harteke's logbook dictating *Bato's* demise on 9 January 1806 (NL-HaNA, Marine suppl. 2, 2.01.29.03, inv.nr. 110).