SHIPWRECKS FROM THE HISTÓRIA TRÁGICO-MARÍTIMA

A Thesis

by

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ABSTRACT

This thesis catalogs the Portuguese ships that wrecked while sailing the India Route, the passage between India and Portugal popularized in the 16th and 17th centuries. The focus will be on ships lost along the African coast as both historical documents and archaeological finds have accrued in association with these wrecks. By combining these sources, this thesis will describe the cultural context and physical evidence of these wrecks. Much of the historical evidence originates from the *História Trágico-Marítima*, originally published in Portuguese, with excerpts later translated into English by Charles Ralph Boxer, George Theal, Charles Ley, and Josiah Blackmore. Additionally, the material will be supported by a GIS visualization of known India Route wreck locations, namely in the form of point maps displaying the locations of the wrecks in reference to their geographic location and to each other. By creating a catalog with source materials drawn from both historical accounts and archaeological evidence I plan to weave together a cohesive understanding of Portuguese shipwrecks lost along the India Route.

DEDICATION

I dedicate my thesis to my family for their unwavering support during my educational career.

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Dr. Castro provided commentary and feedback for the interpretation of textual sources discussed within Chapter II. As well, the data analyzed for Chapter III was provided by Dr. Filipe Castro. Table 1 depicted within Chapter III was gathered by Dr. Castro for use on the Nautical Archaeology Digital Library.

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CHAPTER I

INTRODUCTION

This thesis aims to catalog the Portuguese ships that wrecked along the India Route, with a focus on those that had their accounts published in popular literature. Both historical documents and archaeological material have accrued in association with these wrecks. By combining these historical and archaeological sources this thesis will describe both the stories and physical evidence of these wrecks. The historical material will focus on accounts published in the *História Trágico-Marítima*, which was originally published in Portuguese and later partially translated into English by Charles Ralph Boxer, George Theal, Charles Ley, and Josiah Blackmore. By creating a catalog that sources material from both historical accounts and archaeological evidence, I plan to weave together a cohesive understanding of Portuguese India Route shipwrecks through an all-encompassing holistic lens. This dual approach will give insight into the cargoes these ships carried, how these disastrous voyages unfolded and how many crew and passengers eventually lost their lives. In addition to combining historical accounts and archaeological evidence I have also created visualizations of the wreck locations along the India Route in the form of simple point maps. These visualizations are aimed at creating a better understanding of the geographic locations where these wrecks happened, potentially allowing for a better understanding of how they happened as well.

The second chapter of this thesis contains the history of the India Route from its beginnings under Prince Henry the Navigator to its economic boom and eventual collapse. This chapter focuses on the important historical figures, events, and policies that marked the seaborn Portuguese empire between the 15^{th} – 17^{th} centuries. The third chapter describes shipwrecks

along the Portuguese India Route, known in Portuguese as the *Carreira da Índia*. Specifically, this chapter details the reasons behind the losses along the mercantile route; it draws on provides a list of known shipwrecks from the Portuguese India Route gathered within the Nautical Archaeology Digital Library. The fourth chapter discusses the *História Trágico-Marítima*, by Bernardo Gomes de Brito which was originally published in two volumes between 1735 and 1736. This work of literature combined most of the official accounts of the shipwrecks along the Portuguese India Route. It has seen much popularity since its original publishing and has subsequently been translated into English by the historians, mentioned above. Chapters five through 10 detail the accounts and material culture of shipwrecks from the Portuguese India Route, all of which meet the criteria of having been included within the *História Trágico-Marítima* and containing adequate archaeological evidence. The final chapter provides a summary of the thesis by reiterating the main points discussed in the paper.

CHAPTER II

THE CARREIRA DA ÍNDIA

According to Portuguese historian Vitorino Magalhães Godinho, the conquest of the port city of Ceuta in north Africa by King John I (1385-1433) in 1415 is generally considered to be the start of the Portuguese expansion overseas (Godinho, 1991: 183). Sponsored by Prince Henry the Navigator (1394-1460) and funded by Italian backers, Portuguese sailors soon began to travel down the western coast of Africa purchasing slaves, peppers, ivory, and gold from locals in exchange for cloth, manufactured goods, and wheat, among other things (Castro, 2001: 10-11; Duffy 1955: 4). As noted by James Duffy, Henry pushed Portugal's national purpose towards expanding their empire until his death in 1460. In Duffy's book *Shipwreck & Empire,* he quotes 15th century historian Gomes de Zurara's five primary reasons why Henry wanted to explore the lands of "Guinea": "to obtain knowledge of the region; to set up trading stations with any Christians found dwelling there; to discover the extent of Islam's spread; to find allies to join in the Portuguese battle against Islam; and finally to propagate the Christian faith" (de Zurara *et* al., 1896-96: 27-29, as cited in Duffy, 1955: 5). These religious motives would echo for the next two centuries, demonstrated by not only the constant travel of Portuguese missionaries to the East and is most blatantly obvious by the Portuguese attempts to locate the kingdom of the fabled Prester John, during the early period of Portuguese expansion. Prester John, the legendary prince of Christendom in the East was said to have maintained the Christian faith for himself and his people against Islamic incursions (Strandes, 1961: 3).

Towards the end of the 15th century, the Portuguese believed that they had reached the court of Prester John. In 1487, two Portuguese emissaries fluent in Arabic, Pêro da Covilhã and

Afonso de Paiva disguised themselves as honey merchants and journeyed to Alexandria in Egypt via the Greek Isles. From here they went on to Cairo, Tor, Suakin, and Aden. Once in Aden the pair separated. Covilhã went on to India, while Paiva headed to Abyssinia, now Ethiopia, in search of Prester John. In Goa, Calicut, and Cananor (Kannur), Covilhã gathered much information on the spice trade before traveling to Sofala in eastern Africa. At this point, the two spies had arranged to rendezvous back in Cairo, but upon his arrival, Covilhã learned that his companion Afonso de Paiva had perished. Whereupon Covilhã was contacted by two secret messengers of the Portuguese crown, to whom Covilhã submitted reports of what he had gathered thus far. He subsequently received orders to venture to Ormuz, the trading center of the Persian Gulf, and to accomplish Paiva's assignment of contacting Prester John. Completing both tasks, Covilhã eventually reached the court of Emperor Alexander of Abyssinia, whom the Portuguese believed to be Prester John. While it is said that Covilhã was treated hospitably by the emperor he was forbidden from ever leaving, and he eventually died at an old age in Abyssinia, (Brandãos, 1897, as cited in Strandes, 1961: 5-6). Whether or not Emperor Alexander was the legendary Prester John is doubtful. However, Covilhã's discoveries would catalyze Portuguese expansion for years to come.

Aside from the intentions of spreading the Christian faith, Duffy points out an additional reason for Henry's interest in the exploration of the East: building an economic empire for Portugal. As well, Henry's ambitions would become the foundation of Portuguese belief and policy for centuries to come (Duffy, 1955: 5). Too few in numbers to conquer and occupy foreign lands, throughout the 15th century, the Portuguese constantly expanded their commercial empire. During the middle of the century the islands of the near Atlantic were explored and colonized. In the 1420s and 1430's the islands of Madeira and Porto Santo were settled, in the

1440s the Portuguese colonized the Azorean archipelago, which was followed by the Cape Verde Islands in the 1460's. Sugar production in Madeira aided Portuguese profits, and in 1482 they founded a trading fort at São Jorge da Mina, in the Gulf of Guinea, bolstering the trade of slaves and gold (de Oliveira Marques, 1998, as cited in Castro, 2001: 11). Under King João II the Portuguese empire reached even greater heights of exploration toward the end of the 15th century. Diogo Cão's two voyages in 1482 and 1484 helped propel Portuguese expeditions further south, down the coast of western Africa and emboldened future explorations. On his first voyage, Cão reached the mouth of the Congo and eventually present-day Angola, placing stone markers referred to as padrões on the shores he visited. Padrões were inscribed with dates and names indicating the places that the explorers had set foot. On his second voyage, Cão ventured 1,500 miles (2414 km) further south than his original expedition, reaching Cape Cross (Duffy, 1955: 5). After Cão's successful explorations, João II sent forth two more expeditions in 1487, one by land and another by sea. The land-based expedition was that of Pêro da Covilhã and Afonso de Paiva was mentioned previously. The sea-based voyage was undertaken by Bartolomeu Dias (Duffy, 1955: 6).

Commanding a small three-ship fleet of two *caravelas* and one *naveta* (small *nau*) and emboldened by the success of his predecessors, Bartolomeu Dias, attempted to surpass the literal milestones set previously by Diogo Cão. In 1487 Dias's fleet reached the Bay of St. Helena, however, a storm soon erupted forcing the ships to sail in a south-westerly direction for 14 days. When the storm subsided, the fleet changed course due east, towards what they believed was the shore. After several days without sighting land, the Portuguese changed course to the north whereupon they reached a bay filled with cattle, which they subsequently named Angra dos Vaqueiros, believed to now be the location of Flesh Bay. Unknowingly, the explorers had

managed to round the South African cape, being the first Europeans to do so. Venturing further north, the Portuguese reached Rio do Infante, believed to be the Great Fish River. Upon reaching what would be known as the Island of Santa Cruz, the Portuguese erected a memorial pillar, padrão, in what is now Algoa Bay. Unfortunately for Dias, the Rio do Infante would be the furthest he would be able to venture on this trip, as the crew had become discouraged and exhausted by the storms and urged Dias to return to Portugal. Upon Dias's arrival home, João II rejected their naming of the southern tip of Africa as the "Cape of Storms", instead christening it the "Cape of Good Hope" (Strandes, 1961: 6-7).

10 years later, during the reign of King Manuel I, Vasco da Gama sailed for the East diverting from the traditional coastal route used by his predecessors. Instead, da Gamma turned his fleet into the uncharted waters of the South Atlantic, not touching land till he was near the Cape. He eventually rounded it in November of 1497, avoiding the storms that had assaulted Dias's fleet. Sailing north up the coast of eastern Africa, da Gama's fleet reached the ports of Mozambique, Mombasa, and Malindi. Under the navigation of a native pilot, da Gama eventually voyaged to southwest India's coast of Malabar. Here the Portuguese remained in Calicut for three months before returning to Lisbon in September of 1499 (Duffy, 1955: 6-7). By reaching Calicut da Gama opened a "fast and comparatively cheap maritime route to the Far-East that would carry a trade in spices, silks, fine cottons, and drugs, a designation that encompassed a large number of products, from dye woods to perfumes" (Castro, 2001: 11). A year later, Pedro Alvares Cabral voyaged to Brazil and Madagascar, and a base was erected at Cochin, India. Unfortunately, while rounding the Cape of Good Hope several Portuguese ships were destroyed in a storm, including the vessel in which Bartolomeu Dias was sailing (Duffy, 1955: 7).

As pointed out by Dr. Filipe Vieira de Castro in *The Pepper Wreck: A Portuguese Indiaman at the Mouth of the Tagus River,*

> by 1500 Lisbon was a rich and rather cosmopolitan city with a small population of around fifty thousand. It was praised for its newly built "Rua Nova dos Mercadores," literally "new street of the merchants," which offered all sorts of exotic products to Europeans from its exquisite shops, and for its rich royal palace – the famous Paço da Ribeira – with its beautiful Renaissance portico leading to the river, from which the commercial activity of the harbor could be enjoyed. Sophisticated and expensive, the court of King Manuel I (1495-1521) organized lavish events for its local and foreign visitors, such as parades of his elephants and wild beasts, or the celebrated fight between an elephant and a rhinoceros that was staged to amuse the queen in one of the palace's yards in 1515 (Bedini, 1998, as cited in Castro, 2001:11).

In 1505, King Manuel sent his first viceroy, Dom Francisco de Almeida, to India. While there, Almeida strengthened native alliances, went to war with Islamic traders, and set up fortifications at Cochin, Cananor, and at Kilwa, on the eastern coast of Africa. Kilwa's influence stretched from Sofala to Mombasa, and by proxy the island town of Mozambique, while Sofala was an important site for the gold trade (Duffy, 1955: 7; Strandes, 1961: 35, 304, 312). Fortifications in Mombasa, however, would not begin until 1593 at Forte Jesus de Mombaça (Strandes, 1961: 144). Almeida's successor was Afonso de Albuquerque, who acted as Governor of India from 1509 to 1516. In the seven years that de Albuquerque was acting governor, he generally expanded the Portuguese empire on the Indian subcontinent. During this time, de Albuquerque captured the city of Goa, turning it into the main Portuguese trading hub on the Indian coast. In 1511 de Albuquerque captured and fortified Malacca, he also discovered the Moluccas (Maluku Islands), made alliances with Siam and Java and began to venture into the China Sea. Before his death, de Albuquerque also squashed a rebellion in Goa and successfully fortified the city Hormuz (Duffy, 1955: 8).

In 1546 the principality of Diu allowed the Portuguese to build a fortress in their city after the new Governor of India, Dom João de Castro, rallied a successful defense of the city

from an assault by the Moguls (Duffy, 1955: 8-9). In the mid-16th century, the Portuguese acted as a commercial intermediary between China and Japan, as China refused maritime trade with Japan at this time due to damages done to the Chinese by Japanese pirates. The Portuguese eventually establishing a trading colony at Macao, on the coast of China (Boxer, 1989: 2, as cited in Castro, 2001: 12; Duffy, 1955: 9). However, this mutually beneficial relationship with China was not without its struggles. Before the Portuguese expansion into India, China had limited its trade with India and Java to only dealing at Malacca. The reasons for the restrictions are varied, some are believed to have been political, some competitive, as Chinese junks could not compete with rival ships, and others may have been born out of xenophobic beliefs used to discourage piracy (Meilink-Roelofsz, 1962: 74-75; Chang, 1933: 95, as cited in Diffie and Winius, 1977: 382-383).

Whatever the reasons for Chinese mercantile restriction at this time, the Portuguese saw an opportunity to benefit from an untapped market. In 1515 King Manuel had three captains under Lopo Soares de Albergaria enter China and make trade arrangements. After reaching Goa in 1516, de Albergaria assigned Captain Fernão Pires de Andrade to lead the expedition and Jorge Álvares to command one of the ships (Barros, 1777-78, as cited in Diffie and Winius, 1977: 383). In 1517 de Andrade reached the mouth of the Pearl River, eventually receiving permission to carry on to Canton, guided by local pilots. However, to the detriment of the Portuguese, de Andrade fired a booming salute upon reaching Canton, insulting his hosts who believed guns should only be used during combat. After this minor setback, de Andrade was begrudgingly forgiven, and negotiations eventually began. However, de Andrade's mistake would not be the last nor the worst insult committed by the Portuguese against their hosts. Fernão Pires de Andrade's brother Simão Pires de Andrade, made a disastrous mistake at Tun-

men in the Pearl River estuary in 1519. Without permission, Simão commanded a fort to be built and began to "impress local Chinese into labor gangs; he built gallows and hanged a sailor; and he forcibly hindered Siamese, Cambodian, and other foreign traders from landing their cargoes until the Portuguese had sold theirs. Finally, he even appears to have bought some Chinese children offered to him as slaves" (Chang, 1933: 97-98, as cited in Diffie and Winius, 1977: 383-384). Simão's actions soured the Portuguese relations with the Chinese and in September of 1521, not long after the death of the old emperor, the imperial court ordered that all the Portuguese must leave China. This command was not well received by the Portuguese and over the following year, they found themselves in an intense naval engagement with the Chinese, resulting in the sinking of six Portuguese ships and the imprisonment of 42 Portuguese soldiers (Chang, 1933: 54-55, as cited in Diffie and Winius, 1977: 385). However, this mercantile ban on the Portuguese was not to the liking of the Chinese upper class. In Chinese ports outside of Canton, such as in Ningpo, Chüan-chu, and Changchou, the Portuguese were able to smuggle in goods by hiring Indian traders to front for them while they remained below deck. Eventually, mercantile forces in China pressured the crown to allow Portuguese operations in China to become legitimized and they were granted imperial permission to found a trading colony at Macao in 1557 (Diffie and Winius, 1977: 386-388).

Japanese relations with the Portuguese were much smoother than with the Chinese. In 1543, a group of Portuguese traders off the coast of China were thrown off course by a typhoon and ended up at the island of Tanegashima, south of Kyushu, Japan. The Portuguese were supposedly welcomed with open arms and quickly returned to Malacca after selling all their wares for silver (Couto, 1777-78, as cited in Diffie and Winius, 1977: 394). By the following year, the Portuguese began returning to Tanegashima in large numbers. Within the next decade,

the Japanese at Tanegashima had learned firearms manufacture from the Portuguese and by 1580 the fort of Mogi was granted to the Portuguese Jesuit mission in Nagasaki, cementing Portuguese trade in the area (Diffie and Winius, 1977: 395, 402-403).

The key to Portuguese expansion and its subsequent economic maritime dominance in the East during the 16th century was their initial improvements in sailing technology beginning in the 15th century. Three types of vessels are associated with Portuguese expansion, from their initial era of discovery along the coast of Africa to the latter years of their overseas empire: the *caravela*, the *nao* (carrack), and the *galleon* (Duffy, 1955: 49). Originating in the 13th century the caravel was the primary ship used by Portugal's initial expeditions along the coast of western Africa and eventual trips around the Cape of Good Hope. *Caravelas* were light, highly maneuverable, rarely exceeded 200 tons, carried a crew of 25 to 150 men, and due to its light draft, could cling to the coastline. Lateen sails allowed a better performance sailing into the wind than square sails. Importantly, James Duffy notes that the use of *caravelas* allowed for minimal losses during the early days of Portuguese discovery (Duffy, 1955: 49-50). In *The Portuguese Period in East Africa,* Justus Strandes describes the *caravels* carefully selected and designed to the specifications of Bartolomeu Dias in 1497:

> The fleet consisted of four ships, two of which, the flagship *São Gabriel* and the *São Rafael,* were new. The timber for these ships had been carefully selected and long before had been cut and laid ready for use. The others comprised a caravel (*caravela*), the *Berrio,* which was purchased, and a supply ship which was to be dispensed with as soon as its services were no longer necessary. The dimensions of the *São Gabriel* were estimated at a later date as being about 19.5 meters at the load line, and about 25.6 meters at its point of greatest length, about 8.5 meters at its breath and with a draught of 3.3 meters aft and 2.60 meters forward. Tonnage of the *São Gabriel* is said to have been 120 tons (178 tons carrying capacity), that of the *São Rafael* 100 tons, of the *Berrio* 50 tons and of the auxiliary vessel 200 tons, but shipbuilding experts now suppose that the capacity of the two main ships must have been about 250 to 300 registered tons. Both the principle ships were three masted. Each carried two square sails on the main and foremasts and a lateen sail on the mizzen; in addition they also carried an extra square sail

> suspended on the bowsprit. On the fore and after decks there were high superstructures; flags were flown from the mainmast. (d'Oliveira, 1892: 8; Ravenstein, 1898: 157, as cited in Strandes, 1961: 12)

Strandes continues about the equipment present on the ships:

> The ships were exhaustively equipped, and attention was especially drawn to a feature which now would be taken for granted on any voyage, namely the provision of a double set of sails and rigging. Strong armament and plenty of ammunition was provided, the *São Gabriel* carrying 20 cannon… Each ship carried a doctor, and some supplies of food were reckoned as being sufficient for three years. The equipment and tackle of each ship was so designed as to be interchangeable with that of the other ships. Many tons of presents were also carried, ranging from cheap beads, bells and knives to valuable weapons, silver vessels and rich garments. Coinage of every realm… and there was no lack of stocks of goods such as copper, coral, quicksilver and woolen goods, for which there was reputed to be a market in India. Similar to that shown in the choice of equipment was experienced in the choice of crews and captains… The total crew comprised 148 men. (Stanley, 1869: 26, 68, as cited in Strandes, 1961: 12-13)

The caution, care, and preparedness shown to the ship, supplies, and crew of de Gama's fleet would be a stark contrast of the voyages to come in the later years of the Portuguese seaborne empire. The following description of the condition of Portuguese ships on the India Route is taken from Duffy's *Shipwreck & Empire*, a concise source for this subject that deserved our attention, but required a critical reading, as this book is dated and Duffy proposes a simplistic narrative where Portuguese greed pushed the empire to design unseaworthy ships out of lesser materials during the 16th and 17th centuries in an attempt to maximize profits. As Duffy puts it, to take advantage of the profits of their new empire the Portuguese replaced caravels with either *naos* or galleons, which were larger and less seaworthy. The truth is that long voyages require large ships and caravels did not have capacity to carry crews and victuals for the six-month trip to Asia. The three-masted *nao* first appeared in the first half of the 15th century as a commercial transport ship. King João II was possessed by the idea of creating a 1,000-ton carrack, larger than any ship at the time. At the turn of the 16th century, such large ships became routine as the

caravels fell out of favor as they were not fit for long seafaring voyages. As an overextended small country, with its forest depleted, Portugal began to prefer heavier *naos* and galleons, better fit for the long trips, able to carry more people, cargo and armament, and cheaper to sail than a fleet of small ships. Duffy cites Charles Ralph Boxer when mentioning that the biggest distinction between the two ships was that *naos* were built as cargo ships, while galleons were warships pressed into mercantile service. According to Duffy, the most important factor to note is that these ships were larger and clumsier than their caravel predecessors and that the Portuguese had the habit of making them perpetually bigger (Duffy, 1955: 49-50). Again, reality is more complex. The larger galleons built in the mid-16th century did not fair as well as the king had anticipated: the great galleons *S. João* and *S. Bento* sunk in 1552 and 1554, and the size of the average Indiaman was supposedly limited between to around 450 tons until nearly the end of the century, by King Sebastian (1554-1578) (Duffy, 1955: 52-53, 56; Castro, 2001: 58). And caravels were armed and transformed and continued to be used into the early 17th century, rigged with four masts and sometimes with two decks (Castro, 2001: 33).

Writing without a deep knowledge of the Portuguese political and economic reality, Duffy proposed that under intense pressure to meet cargo specifications the Portuguese shipyards of Lisbon, Oporto, Goa, Damão, and Cochin hastily made their ships ever larger and were granted few tactical advantages. As Duffy points out the Portuguese ships appeared as deadweight in comparison to their contemporary European competitors – not mentioning that these competitors were not plowing the long and dangerous India Route – who, for that reason, favored maneuverability, reliability, and heavily armed (Duffy, 1955: 50-51). Later, under the dual crown reign of King Philip II of Spain, royal control over commerce led to a series of global reforms that allowed the construction of larger vessels. Duffy exaggerates the situation and

proposes that merchants ignored any safety restrictions, bumping the burden on some ships up to 1000 or even 1500 tons (Duffy, 1955: 52). Once again, the situation is not that simple. Under Habsburg rule, Portugal found itself at war with England and Holland, and the India Route was regularly defunded to provide means for the Spanish war in the Netherlands (Castro, 2001: 22-24). It is not true, as Duffy argues, that a disregard for regulations demonstrates how Portuguese merchants in India were more concerned with potential profit rather than the lives of sailors, undeterred by the higher rates of sinking among larger ships as opposed to smaller vessels (Duffy, 1955: 53). The Habsburg period – from 1580 to 1640 – was a period of war and lack of resources in Portugal, and one of the consequences of this situation was lack of means to organize and plan the India Route annual fleets.

The next problem discussed by Duffy concerned the greed and negligence which caused improperly stored and overloaded cargo, which resulted in a great loss of Portuguese vessels to and from India. According to Duffy, this was a result of a Portuguese preference for maximizing as much profit as possible which pushed merchants and officials to hastily overload ships to the point where they at times listed before even leaving port (Duffy, 1955: 53). However, blame for overloading the ships cannot entirely be placed upon the shoulders of greedy merchants, as Duffy points out this abuse was everyone's fault, merchants, nobles, officers, and sailors overloaded ships with their own provisions and valuables, usually in a haphazardly manner, ignoring the resulting stability issues (Duffy, 1955: 54-55).

While ships were often overloaded with cargo they were usually without proper supplies and provisions, and were especially lacking in materials needed for mid-voyage repairs. For instance, Duffy lists examples of ships lacking secondary sails, and in the case that spare sails were present they were typically rotten (Duffy, 1955: 56). The Portuguese also often lacked

materials to repair or replace rudders or repair hulls of vessels if they became fractured during the trips. As mentioned above, Spain was at war on three oceans and many captains, harbor-masters, and shipwrights had to reuse old and deficient parts such as pumps or rudders to make ends meet. As pointed out by Duffy, the *São João Baptista* from the *História Trágico-Marítima* is a perfect example of this issue, as she was equipped with a rotten rudder and given pumps made for a smaller vessel. In some cases, the ships did not have extra anchors or lacked basic supplies such as lead, candles, food, and caulking materials. Eventually, this lack would be reflected in the most important resource aboard ships, a lack of men. Portugal was a small country, trying to maintain a global trade network against all odds, and there were shortages of hands in the fields, in the cities, aboard the ships, and all over the empire. Missing the point again, Duffy speculates that the high rates of shipwrecks and onboard idleness may have deterred men from voyaging on the India Route towards the end of Portuguese domination in the East (Duffy, 1955: 57).

The overloading – inevitable as the number of ships available for the India Route became smaller - and the insufficient supplies aboard the vessels of the Portuguese India Route became obvious when the ships leaked in the middle of a six-month trip. Leaks were considered normal to sailors all over the world. There was no technology to ensure that a hull was watertight during the six months passage of the long route from Portugal to Asia when strong storms were inevitable. These problems were amplified as the ships aged and became in dire need of repairs, often spelling disaster when the crews could not check the leaks or pump out excess water.

Basing his book on anecdotal narratives than on a deep understanding of the 16th century, Duffy puts undue importance on English sources and their politically-inspired Portuguese-disparaging narratives. One should keep in mind that at the end of the 16th century over 80% of

the Portuguese voyages to the Far East – the longest commercial route in the world – were successful and tremendously profitable (pers. comm. Filipe Castro).

Duffy goes on to cite certain instances where leaks caused tons of pepper to burst forth from the holds and subsequently clog the pumps with pepper, rendering them inoperable. Pepper holds were caulked, however, and these occurrences were not the rule (Castro, 2001: 18). As connected by Duffy, both issues contributed to the fate of the *Santo Alberto* in the *História Trágico-Marítima* (Duffy, 1955: 58-59). In instances where ships were able to limp home, surviving storms and pirates, they often reached port in terrible condition. These problems were further facilitated by a lack of care and repairs given to the ships. As Duffy writes, "it seems that the tasks of cleaning and repairing the bedraggled naos involved more time and money than the Portuguese were willing to give" (Duffy, 1955: 60). Duffy proceeds to cite João Baptista Lavanha, who accused officials of greed and incompetence, repairing ships carelessly and knowingly overlooking numerous defects. Lavanha criticizes professionals who had to build the ships on time with second rate timber and outfit them in spite of the lack of funds and stores, mentioning the wood used to repair the ships was cut out of season and not properly cured, rotting as soon as it got wet (de Brito 1736: 227, as cited in Duffy, 1955: 60). Ships built and repaired under such conditions had their lifespans reduced significantly, averaging around three or four trips total; in contrast, ships built in better conditions rounded the Cape of Good Hope up to 17 times (Duffy, 1955: 60).

Another issue related to ship repair that allegedly plagued Portuguese ships along the India Route was sometimes blamed on the practice of *querena Italiana. Querena Italiana* was a method of caulking a ship that originated from the Mediterranean and involved leading a ship into a shallow beach where she is initially placed and caulked on her starboard side, then

careened onto her port side and caulked there. Due to the heavy weight placed on the ship's side timbers and because she was still wet when caulked, this method was said to crack the timbers and prohibited the caulking from drying (Duffy, 1955: 60-61). Duffy points out that this ill-advised form of ship repair was in the *História Trágico-Marítima*, within the story of the *Santiago* and *Chagas* (1602) (Duffy, 1955: 61).

Duffy concludes his chapter on the Portuguese Indiaman ships by stating the precise number of ships lost on the Portuguese India Route between 1550 and 1650 may never be known, as ships that simply disappeared between Goa and Lisbon were not always recorded. Duffy estimates that the number of major ships lost is somewhere between 100 and 130, however, as pointed out by Castro, a 1998 study claimed that 219 shipwrecks had occurred on the Portuguese India Route between 1498 and 1650 (Duffy, 1955: 63; Guinote *et al*., 1998: 105 as cited in Castro, 2001). Duffy further states, that from 1550-1560 at least 18 ships were wrecked; from 1585-1592 out of 66 ships, another 18 were wrecked, four were burned, and two were captured; from 1620-1623 out of 34 ships, eight were wrecked, two were captured, nine were forced to go back to port. In total, less than half of the ships intended to sail seem to have completed their voyages from either Goa or Lisbon (Duffy, 1955: 63). As repeated numerous times by Duffy, these factors of ever-larger ships, overloading, improper supplies, and poor repairs culminated in a significant number of shipwrecks, all of which are recorded in almost every story within the *História Trágico-Marítima* (Duffy, 1955: 64). When we look at the state of the western seafaring in the early modern period, however, the Portuguese appear as a small country that managed to control an immense commercial empire, map much of the planet, and develop ships that were reliable, built by competent shipwrights, and managed by a

tremendously well-organized bureaucracy that was capable of build and maintain fortresses in four continents and run an immense trade network for the best part of two centuries.

In his book, *The Pepper Wreck: A Portuguese Indiaman at the Mouth of the Tagus River*, Castro does an excellent job breaking down the major forms of cargo that overloaded the hulls of the Portuguese Indiaman ships. As Castro puts it, these classifications can be broken down into four categories: *Drogas, fazendas, miudezas,* and *pedraria* (Castro, 2001: 13). *Drogas* (drugs) were spices such as pepper, cinnamon, and ginger, as well as camphor, china wood, incense, ivory, sandalwood, and ebony. *Fazenda* (cloth) was comprised of cotton cloth, silk, thread, and slaves, cotton was traded for slaves along the coast of Northern Africa. *Miudezas* (odds and ends) included a variety of assorted items, such as chests, writing desks, and oils. *Pedraria* (gems) incorporated semiprecious and precious gemstones, like pearls, rubies, and diamonds (Boyajian, 1993: 44, as cited in Castro, 2001: 13-16).

According to Castro Portuguese private trade in Asia made an average annual profit of about five million *cruzados* towards the end of the 16th century and comprised about 90% of the route's commerce. The king himself enjoyed a profit of just under half a million cruzados (Castro, 2001: 12). However, Castro continues, the expenses needed to maintain the Portuguese India Route may have cost more than the earned profits (Sérgio, 1985: 95-107, as cited in Castro, 2001: 12). Such expenses included the building and maintenance of the factories and fortresses within the constantly expanding empire, which by the 1570s numbered more than 50. Such facilities were necessary as they protected Portuguese trade abroad and ensured that the routes were maintained (Castro, 2001: 12-13).

Castro initially describes the Portuguese India Route as a royal monopoly, where the king initially permitted very few private ships from trading. This principle fluctuated, however, as

private ships could operate under royal authorization and by payment of a royal tax; they frequented the route until 1521 (Guinote *et al.,* 1998: 63-67; Subrahmanymam, 1993, as cited in Castro, 2001: 13). From 1521 to 1570, restrictions changed and nearly all active trading vessels were owned by the crown (Guinote *et al.,* 1998: 63-67, as cited in Castro, 2001: 13). However, under the reign of King Sebastian (1568-1578), contracts could be obtained by private merchants to send a select number of ships for a specific length of time. During Habsburg rule (1580-1640) the laws fluctuated again, making private merchants a key part of the trade. Castro goes on to note that the merchandise transacted through the Portuguese India Route was overseen by the *Casa da India*. The *Casa da India* was a bureaucratic body comprised of public workers who received, appraised, stored, and sold the crown's merchandise. Additionally, the *Casa* paid the ship's crews, oversaw the loading and unloading of ships, and inspected vessels for contraband (Boyajian, 1993: 3, 136-137, as cited in Castro, 2001: 13). Aside from the *Casa da India* the crown also managed the largest shipyard in Lisbon, the *Ribeira das Naus*. The *Ribeira das Naus* contained naval yards, warehouses, a gun powder factory, and a foundry (da Fonesca, 1990: 1-9, as cited in Castro, 2001: 13).

Castro also details the paths the ships took along the *Carreira da India* in detail. The voyage started in Lisbon and was initially comprised of a straight-line path southwest through the Canary Islands and the Cape Verde archipelagos, sailing along with the north-west trade winds. Continuing past the equator towards the coast of Brazil, from here the route continued to a latitude of 4° south. The ships then sailed in an arc rounding the tip of southern Africa at a latitude of 38° south. Typically, ships left Lisbon in March or April and tried to round the Cape in July. After rounding the Cape, the ships either sailed east of São Lourenço (Madagascar), in what is called the outside passage or headed towards Mozambique through the treacherous

Mozambique Channel, in what is called the inside passage. The second route – forced by the monsoon – usually required ships to winter in Mozambique, however, sailors preferred to avoid this as it hiked up the cost of the journey and delayed overall affairs. This stop was unavoidable at times, as it helped to stave off disease and starvation aboard ships. If everything went as planned and the cape was rounded by the end of July the ships took the inside route past Mozambique towards the Comoro Islands, and from there to the Queimados Islets, and then to Goa or Cochin, arriving between August and September. If the Cape of Good Hope was rounded too late, the ships took the outside route around São Lourenço to avoid the storms of the South African coast common during winter. On this secondary route ships sailed northeast to the islands of João Lisboa, Pedro Mascarenhas, or Diogo Rodrigues, and across the 16th parallel to Goa and the Queimados Islets. Castro notes that these voyages averaged around six months in length and after arriving in India the vessels either had repairs done or were sent to Asia, loaded up on cargo then headed back to Lisbon. (Castro, 2001: 17-18).

Pepper was arguably the most important commodity to be exchanged. The Dutch traveler Jan Huygen Van Linschoten provides us with a description of pepper loading, which Castro breaks down within his text. According to Castro:

> The pepper was stored in the ship's two lower decks, in small holds built over a wooden platform, which rested immediately above the ballast. These holds occupied almost the entire area of the two lower decks with the exception of the clearance area beneath the main hatch. After being filled, closed, and their lids caulked, the holds were all numbered and the quantities loaded in each one carefully noted. The clearance space beneath and around the main hatch was then used to store water, wine, timber, and small items necessary for maintaining the ship during the voyage. (Linschoten, 1970: 225, as cited in Castro, 2001: 18)

The rest of the cargo was then brought aboard, and because the king's pepper took up most of the space, this was stored in just about any space possible: in corners, on the weather

deck, and occasionally hanging from ropes outside the ship (Linschoten, 1970: 225, as cited in Castro, 2001: 18).

After staying in the harbor at Goa for around three months, the Portuguese ships started their journey back to Lisbon. *Torna-viagem*, as the homebound voyage is called, was much more dangerous than the outbound trip, it was during this leg of the journey that ships suffered from overloading and other previously mentioned neglect and shortages (Castro, 2001: 18). Ships left Goa or Cochin in either December or January and headed for Mozambique or used the outside route to sail directly for the Cape. If the former route was taken ships could load up on supplies at Mozambique, which was necessary if they did not reach the island of St. Helena after rounding the Cape of Good Hope. Typically, ships taking the inside route planned to depart from Mozambique by January and round the Cape before the winter storms arrived in late May. If the outside route was chosen ships instead sailed from Cochin to the coast of India at Cape Comorin and then on to the Maldives. The ships then followed a south-westerly route via the southeast trade winds toward the Island of Diogo Rodrigues, the banks of the Garajaus, and then to the Cape of Good Hope, still attempting to round the Cape before the onset of winter storms. Delays in the acquisition of cargo were common due to the variations in the harvest seasons, and usually caused ships to remain in India until February (Castro, 2001: 21). After the Cape was rounded ships either headed for St. Helena or by the 17th century tried to avoid it completely, due to the potential presence of Dutch and English pirates. From here the Portuguese sailed to the northwest using the southeast trade winds toward the island of Fernando de Noronha off the coast of Brazil. At that point the ships sailed north with the northeast trade winds, eventually turning east toward the Azores and Lisbon (Castro, 2001: 21-22).

The Portuguese Seaborne empire and the *Carreira da India* began to fall apart towards the ends of the 16th century. After the death of King Sebastian in 1580, Portugal fell under the dominion of Spanish King Philip II of Habsburg, making him King Philip I of Portugal. This realignment of power threw Portugal into a religious war encompassing much of the 17th century. The conflict meant that the Dutch could no longer trade with the Portuguese and put Portugal's other European trade at risk of piracy at the hands of the English, Dutch, and French. Most importantly, this war forced Dutch merchants to seek out their own trade routes to India, thus making them the competitors of the Portuguese. By the end of the 16th century, Dutch merchants could be found in India, Madagascar, The Cape Verde Islands, Venezuela, the lower Amazon, and Guiana. The Spanish king was unable to defend Portugal's overseas empire from these new threats, causing it to gradually wither. This insufficiency was further damaged by Spain's shifting of their Portuguese traders over to the New World. Although, as mentioned by Castro, the *Carreira da India* still held strong during the first couple decades of the 17th century, but the strain was increasing (Castro, 2001: 22).

However, in 1602 the Dutch founded the *Vereenigde Oostindische Compagnie* (VOC), and placed it in charge of the trade routes in Asia. The VOC spread rapidly, posing a serious threat to the Portuguese, especially as the two countries were now at war with one another. This tension culminated in 1605, when the word of a Dutch blockade of Goa reached Lisbon and Madrid (Castro, 2001: 22-23). With the Dutch now in India, the Portuguese were forced to spend larger amounts of money defending their fortresses and to change their routes to avoid conflict. In 1604, a peace treaty was signed between Spain and England, decreasing English piracy along the India Route, however at the same time, the Dutch persisted in increasing activity in the India trade, which inevitably climaxed in a Dutch blockade of Goa spanning 23 days in September and

October of 1605 (Monteiro, 1994: 28, as cited in Castro, 2001: 23). In the last decade under the reign of Philip II and during the first few years of Philip III, the Portuguese experienced a consistent loss of resources and money from Spain's wars with England and the Netherlands. By 1622, English and Persian forces captured Ormuz, then in 1642 the Dutch successfully removed Portuguese forces from Angola and Benguela in western Africa. Four years later the Dutch captured the Portuguese factory at São Jorge da Mina, and a year later helped expel the Portuguese from Japan. In 1630 Dutch forces invaded north-eastern Brazil and were not beaten back until 1654 (Castro, 2001: 24).

Finally, in 1640 a rebellion erupted in Lisbon after the Spanish taxed the Portuguese nobility to raise funds for Brazil's protection. With England's support, Portugal regained its independence later that year, although this would not be recognized by the Spanish crown until 1667, under King Charles II. However, by then Portugal was economically drained, though the *Carreira da India* was soon reestablished and the route continued until the last days of sailing ships. By the time of its revival, the India Route fell short when compared to the revenues Portugal made in contemporary Africa or Brazil (Castro, 2001: 24).

CHAPTER III

SHIPWRECKS ALONG THE CARREIRA DA ÍNDIA

As previously mentioned, 219 vessels were lost along the *Carreira da India* (fig 1) between the 15th and 17th century. Many more were lost along local Asian trade routes, most of them without a trace. These numbers are difficult to verify because the records of the Portuguese Armadas have discrepancies (Couto and Barros, 1777-78). As noted in the prior chapter, the causes for these losses consist of several factors that coalesced to create a perfect storm, in some cases quite literally, which led to an inevitable loss of life and property among these trade routes.

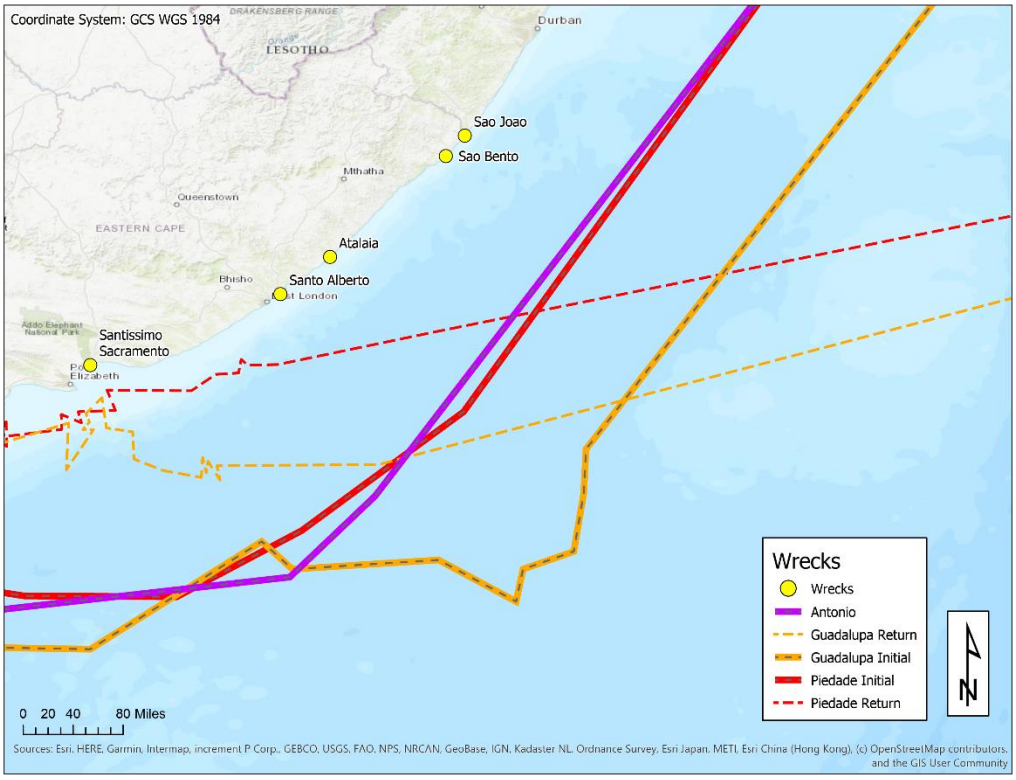

Fig 1. Map of known routes and wreck locations.

Anglo-Saxon literature tends to treat these losses with disdain, parroting the accounts of the Portuguese, always politically motivated and repeating the 17th century racist narratives of the religious wars. A serious study of the causes of these losses has yet to be done, and mid-20th century authors like Duffy or Boxer are all we have for now. On their passage back to Lisbon from India, ships suffered ailments from the processes of careening, overloading, rotten/recycled elements, late arrival at the latitude of the Cape during peak storm season, and inadequately stocked necessities and instruments (Duffy, 1955: 51; Boxer, 1959: 115-117; Stuckenberg, 1986: 10). It is not conclusively known if these vessels were safe, stable, or kept well under storms or battle. Until there are reliable models which can be tested under scientific studies, all we have are the historical narratives. Portuguese, Spanish, and English sources suggest that difficulties in handling most likely played a role in the demise of these vessels too, as well as the desire for profit, the need for safety, and the scale of economies in construction, all conspired to increase the size of Portuguese vessels. Simultaneously, as alluded to previously, it seems that large cumbersome galleons designed to hold many guns were often forced into service as merchant ships (Boxer, 1969: 207). According to the chronicles, it has been proposed that the typical pattern of events was for these poorly-made, overladen, and ill-equipped ships to be damaged in a storm while approaching Algoa Bay, in southeastern Africa and then be driven north along the coast until they were eventually wrecked or beached; this is why most of the recorded wreck sites occur between Algoa Bay and East London. All but one of the wrecks happened while the ship was on its homeward voyage (Stuckenberg, 1986: 10).

The purpose of the present thesis is not, however, to evaluate the plausibility of these accounts, nor to engage in a critical analysis of the biases evident in the available literature, and I will leave this subject to another, much-needed project. Below is a description of some of the

shipwrecks described in the 18th century compilation of shipwreck accounts published by Bernardo Gomes de Brito, *História Trágico-Marítima*, and descriptions of the archaeological remains of a selected group of shipwrecks tentatively identified as India Route ships (de Brito, 1735-36).

A publication by Dr. Brian R. Stuckenberg in 1986 discusses a series of problems associated with the identification of particular Portuguese India-route ships. These issues include techniques involved in identifying and dating these wrecks, such as establishing the nationality of a ship based on insignias and on rare occasions coins. As for the dating of the wrecks, cannon, insignias, and coins can again be used; however, in addition, stylistic Chinese porcelain can also be used to date them (Stuckenberg, 1986: 9). Unfortunately, as Stuckenberg points out, these methods of identifying shipwrecks are circumstantial. The analysis of historical accounts in conjunction with material remains of these wrecks is of great importance if they are to be correctly identified (Stuckenberg, 1986: 7-14).

Identified and Tentatively Identified India Route Shipwrecks

In this section, I have drawn from Dr. Castro's work in the Nautical Archaeology Digital Library (https://nadl.tamu.edu/) a community archaeology project to which I have contributed. This digital library is intended as a source of basic information on shipwrecks around the world and collects results from the collaboration of scholars from more than 30 countries.

Presently there are 61 known shipwrecks tentatively associated with the Portuguese India Route (Table 1), of which perhaps more than 50 may correspond to ships whose loss has been recorded in the Armadas' relations (Couto and Barros, 1777-78; Maldonado, 1985). This list includes ships that were used by the Portuguese in their *Estado da India*, sometimes bought,

other times seized, or purposely built, either in Portugal on in one of the shipyards established by the Portuguese in Brazil and the East. The overwhelming majority of these 61 sites were looted and then salvaged by treasure hunters and for that reason scant information is available (pers. comm. Filipe Castro). I opted for mentioning them all and anticipate that in the future at least some of these shipwreck sites will be surveyed.

Table 1
India Route Shipwrecks. Courtesy of Filipe Castro, entries following (Duarte, 2012: 63-86).

Name	**Date**	**Lat.**	**Long.**	**Comments**
Al Halaniyat	1503	17.514978	56.0716	Tentatively identified as one of the ships of Brás and Vicente Sodré.
ANG-004	1512	-16.1965	40.137333	Tentatively identified as *Sto. António.*
Ngomeni	1524	-2.973989	40.229592	Tentatively identified as *S. Jorge.*
Etoile	1527	-25.4146	44.250208	Salvaged in the early 21st century.
Bom Jesus	1533	-28.459692	16.242108	Salvaged in the 20th century.
ANG-003	1547	-16.659	39.728167	Tentatively identified as *S. Tomé dos Burgaleses*.
IDM-008	c. 1550	-15.026867	40.7296	Tentatively identified as *S. Tomé dos Burgaleses.*
S. João	1552	-31.040356	30.232964	Salvaged in the 20th century.
S. Bento	1554	-31.326922	29.969222	Salvaged in the 20th century.
IDM-002	1558	-15.027594	40.746586	Possibly the ship *Espadarte*.
Santiago	1585	-21.515578	39.644197	Salvaged in the 20th century.
Sto. António	1589	-6.090456	52.831042	Looted and surveyed by archaeologists in the 20th century.
Santo Alberto	1593	-15.026667	40.7435	Salvaged in the 20th century.
IDM-001	c. 1600	-15.023178	40.754375	Looted ballast mound, possibly an India nau.
IDM-004	c. 1600	-15.027806	40.753594	Looted ballast mound covering timber remains, possibly an India nau.
IDM-005	c. 1600	-15.021117	40.78555	Looted ballast mound covering timber remains, possibly an India nau.

Table 1 continued.				
Name	**Date**	**Lat.**	**Long.**	**Comments**
IDM-006	c. 1600	-15.026667	40.7435	Looted ballast mound covering timber remains, possibly an India nau.
IDM-007	c. 1600	-15.027283	40.747167	Looted ballast mound covering timber remains, possibly an India nau.
IDM-013	c. 1600	-15.027767	40.755417	Ballast stones, olive jar fragments, lead shot, wood structure, and lead sheathing.
IDM-014	c. 1600	-15.026883	40.744083	Ballast stones, iron rudder pintle, wood structure, and lead sheathing.
IDM-018	c. 1600	-15.020117	40.7918	Five iron cannons, ballast stones scattering.
IDM-019	c. 1600	-15.029933	40.73085	Small anchor resting over ballast stones. Covered in 0.5 meters of mud, sand, and seashells, at a depth of 6 meter.
MOG-005	c. 1600	-15.19205	40.5748	Scattering of small ballast stones in an area of about 300 m from the beach.
NAC-003	c. 1600	-14.186767	40.72435	One iron cannon, one anchor, pile of ballast stones, martaban jar fragments, and ceramics.
NAC-006	c. 1600	-14.185217	40.741633	Large and numerous scattering of ballast stones
NAC-008	c. 1600	-14.7947	40.835817	Single large anchor, two iron cannons, ballast stones.
NAC-010	c. 1600	-14.1861111	40.7519444	One iron cannon, several concretions, a copper handle, ballast stones. Looted.
Wan-li	c. 1600	3.9657	103.507047	A local ship at the service of Portuguese traders. Salvaged by treasure hunters.
N. S. dos Mártires	1606	38.672558	-9.325653	Salvaged after the shipwreck, looted, and excavated by archaeologists.
Duarte Guerra galeon	1606	2.504961	101.708208	Looted.

Table 1 continued.				
Name	**Date**	**Lat.**	**Long.**	**Comments**
S. Salvador	1606	2.511244	101.705808	Possibly looted at the same time as the Duarte Guerra galleon.
Espiritu Santo	1608	-32.752975	28.284111	Salvaged in the 20th century.
IDM-003	1608	-15.020139	40.748028	Tentatively identified as *N. S. da Consolação*.
Madre de Deus	1610	32.737983	129.8216	Dredged at Nagasaki harbor.
N. S. da Luz	1615	38.523289	-28.635247	Salvaged after the shipwreck.
CAD-001	1619	-11.6928	40.638533	Tentatively identified as *N. S. do Pópulo*.
N. S. da Conceição	1621	38.93496	-9.422427	Possibly located on the coast of Portugal. Probably looted.
S. João Baptista	1622	-33.750592	26.566825	Salvaged in the 20th century.
IDM-017	1622	-15.049783	40.748333	Tentatively identified as *Sta. Teresa*.
MOG-003	1622	-15.503617	40.612067	Tentatively identified as *S. José*.
S. Francisco Xavier	1625	38.656638	-9.304867	Found by sport divers in 2017 and surveyed by archaeologists in 2018.
S. Bartolomeu	1627	45.168219	-1.186781	Looted.
Sta. Helena	1627	43.636042	-1.471811	Looted.
S. Gonçalo	1630	-34.052825	23.42105	Looted.
N. S. de Belém	1635	-31.633333	29.744731	Salvaged in the 20th century.
Sta. Catarina de Ribamar	1636	38.776856	-9.499728	Looted.
IDM-020	1642	-15.045117	40.787883	Tentatively identified as *S. Bento.*
Sta. Maria Madre de Deus	1643	-32.966667	28.018664	Salvaged in the 20th century.
N. S. da Atalaia do Pinheiro	1647	-32.833333	28.132628	Salvaged in the 20th century.
S. Sacramento	1647	-34.038419	25.519686	Salvaged in the 20th century.
IDM-022	c. 1650	-15.0249	40.743817	Assortment of artifacts on the seafloor, ballast stones, one silver coin, martaban fragments, one sword.

Table 1 continued.				
Name	**Date**	**Lat.**	**Long.**	**Comments**
Sunchi	c. 1650	15.446006	73.785758	Salvaged after the shipwreck and studied by archaeologists.
N. S. dos Milagres	1681	-34.804442	20.067517	Salvaged by treasure hunters.
Sto. António de Taná	1697	-4.062133	39.6808	Excavated by archaeologists.
ANG-002	1721	-16.824333	39.509667	Tentatively identified as *N. S. da Guia.*
NAC-009	1771	-14.426717	40.825433	Tentatively identified as *S. Miguel e Almas*
IDM-012	1773	-15.027667	40.758667	Tentatively identified as *N. S. do Livramento*
N. S. do Monte do Carmo	1774	-22.357566	43.122035	Salvaged by treasure hunters.
NAC-001	1789	-14.794833	40.836333	Tentatively identified as *S. António e Almas*
NAC-004	1826	-14.248367	40.774967	Tentatively identified as *S. João Baptista*.
MOG-001	1802	-15.578033	40.5247	Tentatively identified as *N. S. Madre Deus e S. José*

Of these 61 vessels (fig 2), only four are mentioned in the original two volumes of the *História Trágico-Marítima*, a popular multivolume compilation of 15th and 16th century Portuguese shipwreck narratives (Table 2). This thesis describes seven shipwrecks mentioned in detail in both the original *História Trágico-Marítima* volumes and in the unofficial third edition. The shipwrecks from the *História Trágico-Marítima* not included in this text primarily lack archaeological material.

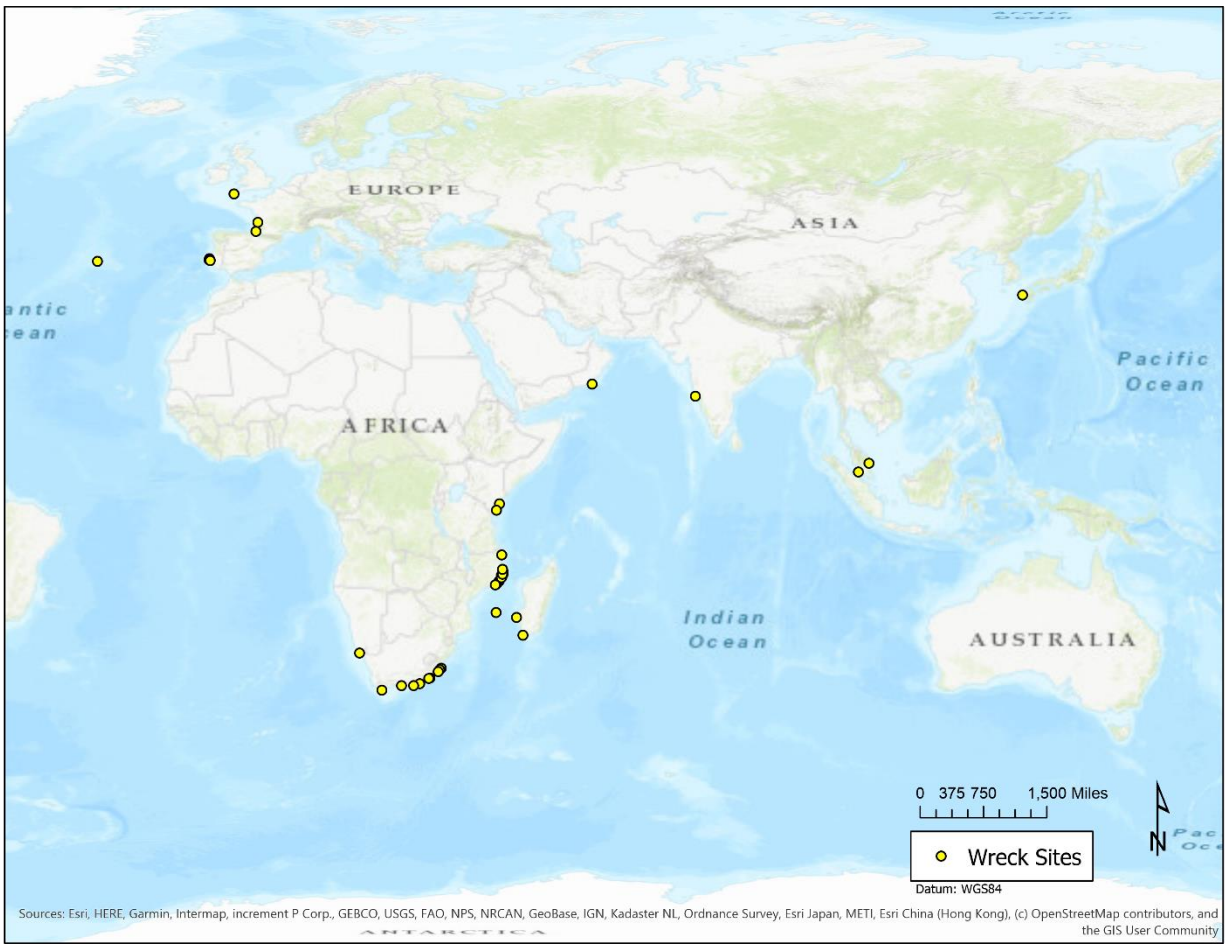

Fig 2. Map of all known Portuguese India Route wreck locations.

CHAPTER IV

THE TRAGIC HISTORY OF THE SEA

The *História Trágico-Marítima*, was originally published in two volumes, between 1735 and 1736, was written by Bernardo Gomes de Brito of Lisbon, Portugal. The *História* contains a collection of primary and secondary narrative accounts chronicling the histories of Portuguese ships between 1552 and 1602. These histories are centered around the wrecking of ships along the India Route and the tragedies endured by the survivors in their attempts to trek back to safety. Most of the ships described were on their homebound voyage from India to Lisbon, Portugal. The histories of the wrecks were primarily collected from published pamphlets that detail written accounts or interviews of survivors (Boxer, 1959). Brito's original two volumes chronologically comprise 12 different accounts.

Table 2
Shipwrecks of the *História Trágico-Marítima.* Original two volumes by de Brito, and apocryphal third volume.

Account	Author	Title
1	Unknown	*Relação da muito notável perda do Galeão Grande S. João* [1552]
2	Manuel de Mesquita Perestrelo	*Relação summaria da viagem que fez Fernão D'Alvares Cabral* [1554]
3	Manuel Rangel	*Relação do Naufrágio da nau Conceição* [1555]
4	Fr. Manuel Barradas	*Relação da viagem, e sucesso que tiveram as naus Águia, e Garça* [1559]
5	Marcos Morges	*Relação do Naufrágio da nau Santa Maria da Barca* [1559]
6	Henrique Dias	*Relação da viagem, e Naufrágio da nau S. Paulo* [1561]

Table 2 continued.		
Account	**Author**	**Title**
7	Bento Teixeira Pinto	*Naufrágio que passou Jorge de Albuquerque Coelho* [1565]
8	Manoel Godinho Cardozo	*Relação do Naufrágio da nau Santiago* [1585]
9	Diogo do Couto	*Relação do Naufrágio da Nau S.Thomé* [1589]
10	João Baptista Lavanha	*Relação do Naufrágio da nau S. Alberto* [1593]
11	Fr. Gaspar Afonso	*Relação da Viagem E sucesso que teve a nau S. Francisco* [1596]
12	"Doutor" Melchior Estácio do Amaral	*Tratado das batalhas e sucessos do Galeão Santiago* [1602] *e da nao Chagas com os inglezes entre as Ilhas dos Açores* [1594]
13	Francisco Vaz de Almada	*Tratado do successo que teve a nao S. João Baptista* [1622]
14	João Carvalho Mascaranhas	*Memoravel relacao da perda da nao Conceição* [1626]
15	Padre Frei Nuno da Conceição	*Relação do que passou a gente da nao Nossa Senhora do Bom Despacho, na viagem da India* [1630]
16	Joseph de Cabreira	*Naufrágio da nao Nossa Senhora de Belém* [1633]
17	Bento Teixeira Feio	*Relação do naufrágio que fizeram as naos Sacramento, e Nossa Senhora da Atalaia* [1647]
18	Padre António Francisco Cardim	*Relação da viagem do galeão S. Lourenço e sua perdição nos Baixos de Moxincale* [1649]

As discussed in James Duffy's *Shipwreck & Empire*, the accounts presented within the *História Trágico-Marítima* are either written by a survivor of the wreck, a historian, or by an investigator reporting on the incident, with 12 of the 18 authors being survivors (Duffy, 1955: 22). Duffy described the narratives being composed of three parts, the ship's voyage, its inevitable wrecking, and the ensuing aftermath (Duffy 1955: 23). As mentioned previously, of

the 18 stories written between 1550-1650, 12 were gathered by Bernando Gomes de Brito in 1735-1736 and published within the two original volumes of the *História Trágico-Marítima.* the original 12 accounts span the latter part of the 16th century, eight of which were printed initially during the 16th or 17th century and later republished by Gomes de Brito. Meanwhile, the remaining four accounts were drawn from manuscript by the text's editor (Duffy, 1955: 24-25).

According to Duffy, around 1735 five accounts from the *História Trágico-Marítima* were counterfeited. These versions were printed separately with the only difference between them and de Brito's originals being their pagination; as the forgeries used the same title pages as the original prints from the 16th and 17th century, instead of the title pages given by de Brito. "The five counterfeits included the *São João, Conceição* (1555), *Santiago* (1585), *Santo Alberto* (1593), and the *Santiago* (1602) *e Chagas* (1594)" (Duffy, 1955: 39). Additionally, six more stories, not originally included in de Brito's volumes were printed and sold in the 18th century. These additional narratives originally printed between 1625 and 1651 are typically considered to be the unofficial 3rd volume of the *História Trágico-Marítima* and were eventually appended to de Brito's original works in a multi-volume edition of the *História Trágico-Marítima* prepared in 1904-1909 by Gabriel Pereira (de Brito, 1904-09; Duffy, 1955: 39). The third volume includes the wrecks of the *São João Baptista, Conceição, Nossa Senhora do Bom Despacho, Nossa Senhora de Belém, Santissimo Sacramento* and *Nossa Senhora da Atalaia,* and *São Lourenço* (Duffy, 1955: 40-43).

As noted by Duffy, during the 18th century cheap literature works, mainly sensational and fictitious, could be purchased for mere pennies from just about any shop. This form of popular literature, akin to the pulp fiction of the 20th century, created a printing market referred to as "*literatura de cordel*, which may be physically characterized as a literature of pamphlets, or

folhetos volantes. The pamphlets were generally displayed hanging from a cord in the place of purchase, hence the expression "string literature"" (Duffy, 1955: 36-37). The popular literature of the *folhetos volantes* came in the form of "ballads, religious stories, historical accounts (real or imagined), sensational narratives, doggerel, or simply journalistic trivia", of which shipwreck accounts were included (Duffy, 1955: 37).

Many of the accounts were first edited and translated into English by the prolific South-African Historian George McCall Theal, who included the translated stories throughout his nine-volume chronicle, *Records of South-Eastern Africa, collected in various libraries and archive departments in Europe; originally printed for the government of the Cape Colony between 1898 and 1903.* In 1947, Charles D. Ley included several English translations of these histories within his work, *Portuguese Voyages 1498-1663*. However, the most notable of all the English translations was prepared by famed historian Charles Ralph Boxer (Ley, 1947) (Table 3).

Table 3
Translations into English of the official *História Trágico-Marítima* accounts.

Account	Title	Translation
1	*Relação da muito notável perda do Galeão Grande S. João*	Josiah Blackmore, 2001. Charles Ley, 1947. George McCall Theal, 1898.
2	*Relação summaria da viagem que fez Fernão D'Alvares Cabral*	George McCall Theal, 1898.
3	*Relação do Naufrágio da nau Conceição*	N/A
4	*Relação da viagem, e sucesso que tiveram as naus Águia, e Garça*	Charles Ralph Boxer, 2001. Charles Ralph Boxer, 1968. N/A

Table 3 contiued.		
Account	**Title**	**Translation**
6	*Relação da viagem, e Naufrágio da nau S. Paulo*	Charles Ralph Boxer, 2001. Charles Ralph Boxer, 1968. N/A
7	*Naufrágio que passou Jorge de Albuquerque Coelho*	Charles Ralph Boxer, 2001. Charles Ralph Boxer, 1968.
8	*Relação do Naufrágio da nau Santiago*	James Duffy, 1955. (Voyage) Charles Ley, 1947. (Aftermath) George McCall Theal, 1898. (Aftermath)
9	*Relação do Naufrágio da nau S.Thomé*	Charles Ralph Boxer, 1959. Charles Ralph Boxer, 2001. George McCall Theal, 1898.
10	*Relação do Naufrágio da nau S. Alberto*	Charles Ralph Boxer, 1959. Charles Ralph Boxer, 2001. George McCall Theal, 1898.
11	*Relação da Viagem E sucesso que teve a nau S. Francisco*	N/A
12	*Tratado das batalhas e sucessos do Galeão Santiago*	N/A

In 1959 Boxer published his direct English translation from the *História Trágico-Marítima, The Tragic History of the Sea*, 1589 – 1622. Boxer's original work included translations for *São Thome*, *Santo Alberto*, and *São João Baptista* (Boxer, 1959). Then again in 1968, Boxer published additional translations from the *História*, which included translations for *Águia, e Garça*, *São Paulo,* and the brazil-ship *Santo Antonio* (Boxer, 1968). In 2001, historian Josiah Blackmore edited a re-release of Boxer's *The Tragic History of the Sea*, including additional translations from Brito's collection, such as the *São João* story (Boxer, 2001).

The *História Trágico-Marítima* was seen as a source of pride for Portugal, detailing accounts of adventure, heroism, and conquest during a time of success for the European nation (Duffy, 1955: 46). Meanwhile, the *História Trágico-Marítima* garnered the attention of the public for its accounts of scandal and desperation as noted in the story of the *São João* whose captain perished dramatically along with his wife and his illegitimate child (Boxer, 2001: 4-26). This thesis, however, examines these accounts from a modern-day point of view in which they are more reflective of a struggling empire and colonial greed rather than national pride or gossip. For these stories and their shipwrecks are presented as the results of personal avarice, then displayed by accounts of cheaply built vessels, material wealth prioritized over human life, and attempts of betrayal to prolong one's own life. All of which will be seen within the histories of the shipwrecks detailed below. For modern relevance, this report focuses on the material culture associated with shipwrecks published in the most recent English edition of *The Tragic History of the Sea*. The description of the accounts will generally be focused on the voyages and resulting wrecking of the ships, with minimal detail being paid to the descriptions of the ensuing treks made by the survivors. The stories included herein contain excerpts from the wrecks of the *São João, São João Baptista, Santo Alberto, São Bento, Santiago, Santissimo Sacramento, and Nossa Senhora da Atalaia*. The wrecks of all seven have been found and all have yielded significant archeological material.

It is important to note, that two more shipwrecks that may conventionally be believed to fit among the group herein have been excluded from this current manuscript. The wrecks of *Nossa Senhora de Belém* and the *São Gonçalo* are not included within this paper as the author concluded that they did not fully meet the criteria mentioned within the introductory chapter. The *Nossa Senhora de Belém* wrecked in June of 1635 while carrying 290 passengers on her

homeward voyage to Portugal from Goa. The first narrative of its loss was written by her captain Joseph de Cabreira. Comparing known coastal geography with the landscape description given in Cabreira's account it is believed that *Nossa Senhora de Belém* wrecked near the mouth of the Mizimvubu River, at Agate Terrace. However, identification of the wreck site is tentative as there is no substantial archaeological evidence to corroborate this assertion. Artifacts found here consist only of a few cylindrical cornelian bead. One of these beads is housed in the Johannesburg, Africana Museum, while a second is stored at the Mossel Bay Museum (Bell-Cross, 1988: 66-73). While this narrative is considered to be a part of the third, unofficial volume of the *História*, it lacks substantial archaeological evidence. As such, I did not feel as if the *Nossa Senhora de Belém* met the surviving cultural materials criteria to be included in this thesis.

As for the *São Gonçalo*, she wrecked in 1630 while carrying 230 passengers from Goa to Portugal. Her account was originally published by Portuguese historian Manuel de Faria e Sousa, most likely based on the journal of one of her survivors. This account has been described by experts such as Graham Bell-Cross as "disappointingly poor" and was not formally included within the *História Trágico-Marítima*, possibly as a result of its bad description. The *São Gonçalo* is believed to have wrecked near modern-day Plettenberg Bay and for the longest time the only evidence associated with the wreck was the alleged Plettenberg Bay Stone, a large stone with Portuguese carved into one of its faces, possibly a form of *padrão* left by the survivors. The writing carved on the stone reads "Here was lost the ship *São Gonçalo* in the year 1630 they built two vessels…" (Storrar, 1988: 71). Unfortunately, the stone has weathered over time and not all the writing remains. However, in November of 1979, homeowners Johan and Ingrid Jerling discovered the campsite of the *São Gonçalo* survivors while renovating their property, initially discovering pieces of blue-and-white porcelain at the site, most likely dating from the Wanli

period (1573-1619). In total, the artifacts excavated at the campsite included thousands of blue-and-white porcelain sherds, incense sticks, a pair of mariner's dividers, a keyhole plate, lead balls, metal ornaments, two mother-of-pearl spoons, a Portuguese India copper coin, and tiny small glass agate cornelian beads (Bell-Cross, 1988: 63-65; Storrar, 1988). Patricia Storrar wrote a book on the wreck and resulting archaeological material of the *São Gonçalo, Drama at Ponta Delgada* published in 1988.

Aside from these two shipwrecks the following work examines historic accounts and material remains to aptly analyze the conditions and cargoes of Portuguese India Route ships (Table 4). This analysis allows for a well-rounded understanding of the voyages and ensuing wrecking of these ships (fig 3).

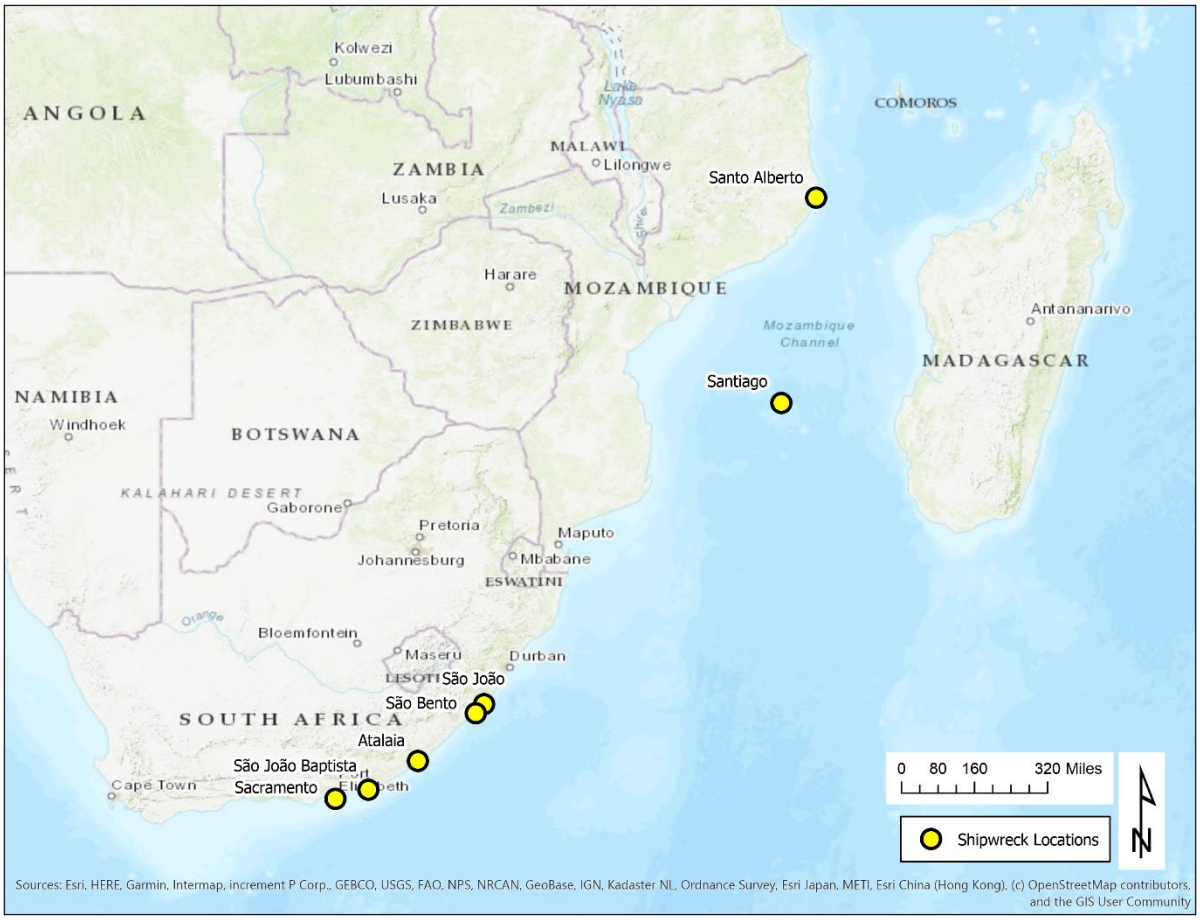

Fig 3. Map of wrecks discussed in thesis.

Table 4
Shipwrecks considered in the present work.

Volume	Title	Shipwreck
I	*Relação da muito notável perda do Galeão Grande S. João*	*São João*, 1552
II	*Relação do Naufrágio da nau S. Alberto*	*Santo Alberto*, 1593
III	*Tratado do successo que teve a nao S. João Baptista*	*São João Baptista*, 1622
II	*Relação summaria da viagem que fez Fernão D'Alvares Cabral*	*São Bento*, 1554

Table 4 continued.		
Volume	**Title**	**Shipwreck**
II	*Relação do Naufrágio da nau Santiago*	*Santiago*, 1585

CHAPTER V

THE WRECK OF *SÃO JOÃO*

The original account of the *São João* was published anonymously in 1555-1564. According to Duffy, the ship's storekeeper, Alvaro Fernandes, told the story to the anonymous author in 1544; however, he admits there is much speculation around this statement (Duffy, 1955: 27).

On February 3rd, 1552, the Portuguese Galleon *São João*, captained by Manuel de Sousa began its homeward voyage from Cochin, India to Portugal. The ship was fully loaded with cargo including an inventory of around 7,000 *quintals* of pepper. On March 11th, the *São João* was sailing north-northwest, 25 leagues from the Cape of Good Hope, when she was assaulted by a storm from the west, forcing the crew to sail her close to East-African shore to protect her cargo at all costs, as they had no sails to spare. The crew headed landward with the sails of the foremast half-furled, fearing they would lose foresail if it were used on its own. Approximately, 130 leagues from the Cape the wind changed to the northeast forcing the ship to turn south by southwest. Winds coming from both the east and the west caused the galleon to flood with so much water that she was on the verge of sinking. This storm continued for three days until it calmed, soon after the carpenter discovered that the storm had removed three pintles from the rudder putting the remainder of the voyage in grave danger. The captain ordered the condition of the rudder to be kept a secret aboard the ship to not lower morale. Soon after strong winds tore the mainsail from the yard while the waves hit the ship with such force that they caused the beams and rigging on the port side to rupture into pieces. In a desperate attempt to regain control of the ship the crew cut down the remains of the mast and yard to make a new mast on the stump

from a section of spar. They attached yards to create a makeshift storm sail and foremast. However, this provisional setup was quickly destroyed by the wind while the waves soon tore away the rotten rudder. When the mainmast fell from its place it knocked the bowsprit over, lodging it inside the ship. Lacking a mast, sails, and rudder the crew desperately tried to head for shore (Boxer, 2001: 4-7).

The next 10 days were spent attempting to create a makeshift rudder from various parts of the ship, and sails from textiles. The new rudder proved entirely useless as the measurements did not fit the original and was quickly lost to the sea. Luckily, land was finally sighted around the 7th of June and a small boat was sent on a scouting mission to find a safe area on which to lay anchor. The plan was to tie landlines from the shore to the ship and take a small boat in alternating trips, transporting passengers and cargo from the ship to the beach. From there they intended to build a temporary fort from barrels and build a small caravel from leftover ship parts to send a message to the closest Portuguese fortress, at Sofala on the East coast of Africa. However, after the third trip across, the *São João* began to slowly sink with only 30 people onshore. On the third day of the exodus, the pilot who was still onboard the *São João* noticed the sea line had been cut and it would not be long before the rest of the ship broke up against the coast. He and 40 others quickly boarded a lifeboat and sailed to shore where the boat crashed on the beach, while all the passengers landed without harm. At this point, more than 500 individuals were still on the ship, including 200 Portuguese and 300 slaves. The ship was allowed to drift towards the beach, where it went aground, first breaking in two portions with one half from mast forward and the second from mast to the stern. Within an hour these two pieces became four, with the decks soon breaking up, allowing the cargo to float away. The remaining stranded survivors clung to the floating wreckage, most made it to shore, though about 40 Portuguese and

70 slaves reportedly drowned in the process. It is estimated that the worth of the cargo wrecked up on the beach was at least 1,000 gold pieces. The ship was recorded to have wrecked on June 7th, 1552 at 31° south (Boxer, 2001: 7-12).

Onshore there was not enough wreckage recovered to create a makeshift boat as originally intended; however, the survivors were able to build a fort from chests and barrels. The Portuguese stayed on the beach for 12 days before deciding to venture on as the wrecking of the ship was far from the end of the survivors suffering. Over the next five and half months, approximately 80 Portuguese and 100 slaves would march an estimated 300 leagues (1667 km), fording rivers and crossing marshes to reach salvation (Boxer, 2001: 10-13).

Although the shipwreck site is only 600 km from the capital of Mozambique, Lourenço Marques (Maputo), likely, the survivors walked at least twice that distance. During the march, many died from starvation, dehydration, and skirmishes with the local tribes. The situation was so dire that at times the captain offered hundreds of cruzados to anyone willing to go off and find water. The goal of the party was to reach the river previously discovered by Lourenço Marques which emptied into Boa Paz as the survivors were sure to find passing Portuguese ships in this area. Along the march the survivors ran into a mixture of friendly and hostile native tribes. For instance, after ignoring the kindness of a benevolent indigenous king, who had warned them of the dangerous nature of his neighbors, the latter supposedly tricked and robbed them of their possessions before stripping them naked. After such an event it was reported that the wife of the captain, Leonor de Sá, was so embarrassed that she buried herself in the sand and refused to move ever again, perishing in this spot. Not long after Captain Manuel de Sousa, was said to have wandered into the jungle and was never seen again. Leonor de Sá and de Sousa had already abandoned their child during the trek. Eventually eight Portuguese and 17 slaves had made it to

their river destination and were rescued by a Portuguese ivory merchant, who heard local rumors that there were Portuguese castaways in the land and sent out a search party to find them. By May 25th, 1553, the survivors finally reached Mozambique, nearly a year after the wrecking of *São João* (Boxer, 2001: 13- 26).

Material Culture of *São João*

In 1978, while investigating two potential wreck sites on the Transkei and southern Natal coast, Dr. Tim Maggs wrote to the East London museum requesting a loan of their blue and white porcelain collection from coastal areas in an attempt to determine dates for these sites. Chinese blue and white porcelain sherds have turned up at different locations along the eastern-South African coast and are now believed to be associated with the following Portuguese India Route shipwrecks: *São João* (1552), *São Bento* (1554), *São Thomé* (1589), *Santo Alberto* (1593), *São João Baptista* (1622), *São Gonçalo* (1630), *Nossa Senhora de Belém* (1635), and the *Nossa Senhora da Atalaia do Pinheiro* (1647) (Bell-Cross, 1988: 47-48). This spawned subsequent research into Portuguese-Indian literature and cultural material to aid in the identification and location of these wrecks. This research showed that the majority of the pre-1650 wrecks occurred during the ship's homebound voyage, that most were Portuguese, and that some carried cargoes of Chinese blue and white porcelain (Bell-Cross, 1988: 47). A plan was soon executed to perform a beach survey extending from the South African/Mozambique border (at latitude 26 ° 51' south) to Plettenburg Bay (at latitude 34 ° 06' south), searching for caches of Chinese blue and white porcelain and other potential shipwreck material. In conjunction with this survey, Maggs also planned the inspection of related artifacts held in private and museum collections, the study of records of wrecks thought to have happened within his research area before 1650,

the dating of recovered artifacts, and finally positive identification of cultural material from the wreck sites with wrecks described within the historical literature (Bell-Cross, 1988: 47).

Through this plan, the archaeology department of the Natal Museum in South Africa spent years collecting and recording ceramic sherds and carnelian beads that washed ashore in the vicinity of Port Edward on the Natal south coast around 31° 02'S: 30 ° 14'E (fig 4) (Maggs, 1984: 173). This investigation suggested that the site at Port Edward was the location of the wreck of *São João*. This initial identification was aided by the affirmation of the wreck location of the *São Bento* at the Miskaba site and the survivor's account depicting their visitation to the wreck site of the *São João* (Auret and Maggs, 1982; Maggs, 1984: 173). Maggs also used these historical accounts to trace the steps of the survivors of the *São Bento* to the wreck site of the *São João*. Furthermore, the porcelain fragments recovered from the Port Edward site were shown to have similar stylistic designs to those found on the Miskaba site (Maggs, 1984: 173). Since no other shipwreck on the south-east African coast produced a similar style of porcelain dating to at least the 16th century, Maggs determined that *São Bento* and *São João* were the only shipwrecks in the region (Maggs, 1984: 173). The body of the porcelain-ware was made of china-clay and china-stone or kaolin and feldspar. The blue cobalt motifs originated in the Middle East and were originally known as "Mohammed Blue". The motifs were applied to the unglazed body and then covered with a transparent feldspathic glaze before being fired at 350° Celsius, using lime and wood-ash. This process resulted in fine-grained porcelain with a semi-translucent appearance (Vernon, 1987).

In 1980, L. Harris uncovered a bronze cannon while diving on the site near Port Edward. The discovery of this cannon was thought to have confirmed the location of the wreck of São João as the canon would not have been washed far from its original location (Maggs, 1984: 174).

Further investigations to determine the location of the *São João* survivor campsite took place between 2001-2002 by the University of Pretoria in which additional examples of ceramics, carnelian beads, pepper, and cowries were recovered from the coast (Burger, 2003: 62-66).

Fig 4. Map of *São João* wreck.

True Porcelain

Due to the poor condition of porcelain from the *São João* Maggs used descriptive comparisons based on the porcelain recovered from the wreck of *São Bento*, as similar characteristics occur in both collections (Maggs, 1984: 175). The following section follows Maggs's descriptions.

Among the porcelain, hemispherical bowls are common and many include motifs of dragons, lotus scrolls, pines, and wave borders (fig 5). The dragon and lotus scroll depictions were typically found on small bowls with everted rims. A "diamond diaper border" (fig 6), known as a trellis, is also typically painted on the inside rims of these bowls and other porcelain vessels (Auret and Maggs, 1982: 12; Maggs, 1984: 176). Other notable borders on the rim sherds include motifs referred to as the "thundercloud" and the "classical scroll" (Maggs, 1984: 176). Among the true porcelain sherds, small foliate-rimmed dishes with interior "diamond-diaper borders" and exterior "floral scrolls" were recovered. Porcelain sherds determined to be base fragments contained motifs of "lions and ribbed balls". Motifs among the sherds that were too damaged to be grouped with any particular form of vessel included patterns denoted as "floral", "lotus panel border", and a "curvilinear and dot border" (Maggs, 1984: 179). Among the porcelain sherds used to date the shipwreck the Taoist trigram motif (fig 7) proved invaluable, due to the heavy influence Taoism held during the reign of the emperor Jiajing 1522-1566 (Maggs, 1984: 179). Of even greater interest were fragments containing inscriptions relating to "long life", "riches and honor" depicted within the image of a coin (fig 8); another inscription contained the character "Fu" which Maggs noted as most likely belonging to the phrase "Made at the Hall of Happiness and Good Fortune" (Chaffers, 1876: 363 – 366, as cited in Maggs, 1984: 179). The principal porcelain sherds found among the collection are two sherds containing

inscriptions of the name of the Emperor Jiajing, firmly dating the sherds to a period between 1522 and 1566, as these are the only emperor reign-marks found in the collection (Maggs, 1984: 179).

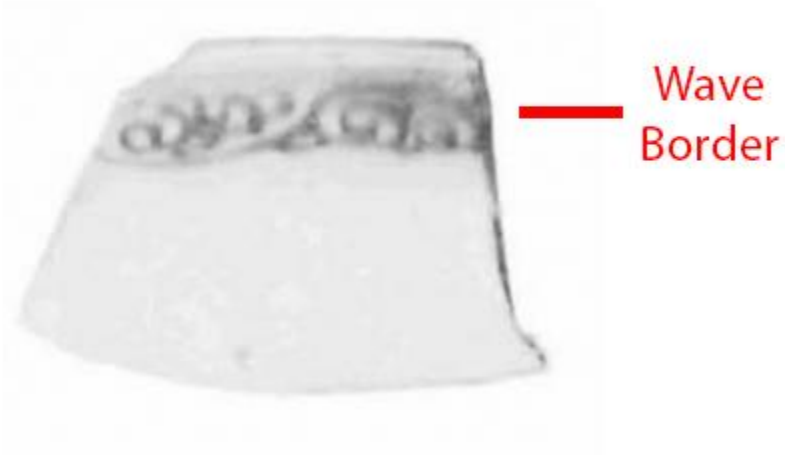

Fig 5. Wave border porcelain sherd from the *São Bento*. Adapted from (Auret and Maggs, 1982: 13).

Fig 6. Porcelain sherd with diamond diaper from *São Bento*. Adapted from (Auret and Maggs, 1982: 13).

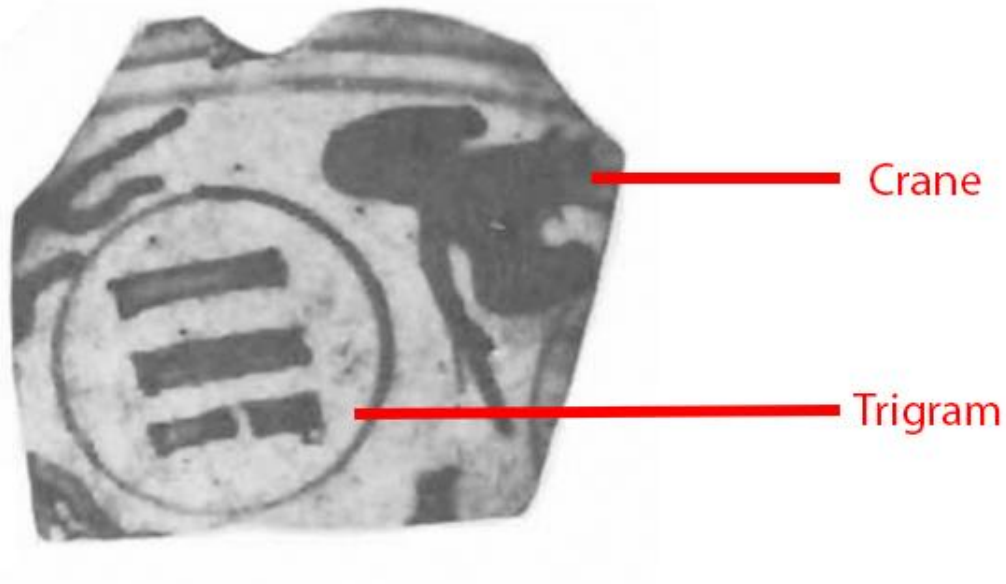

Fig 7. Porcelain sherd with Trigram motif from *São Bento*. Adapted from (Auret and Maggs, 1982: 13).

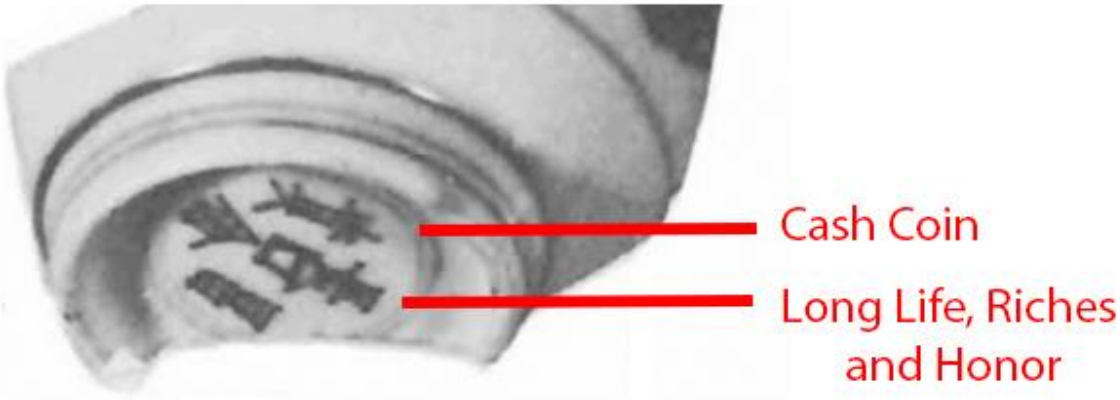

Fig 8. Foot of porcelain bowl with cash coin from *São Bento*. Adapted from (Auret and Maggs, 1982: 13).

Coarse Porcelain

The coarse porcelain found in the Port Edward area resembles the collection found among the wreck of *São Bento* in texture, color, glaze and pigment, brushwork, and motifs. Most of the vessels within this group are classified as small fluted dishes with foliate rims, while some are found undecorated most have motifs similar to the types mentioned among the true porcelain grouping (Maggs, 1984: 179). Within the center of these dishes' motifs of the mythical animal, '*ch'i-lin* (Qilin), could be identified (fig 9). This type of dish is dated to the late 15th to 16th century and exported by Chinese manufacturers to South East Asia (Maggs, 1984: 179). Based on the foot rims it was determined that a range of sizes must have been present among this group of ceramics (Maggs, 1984: 179).

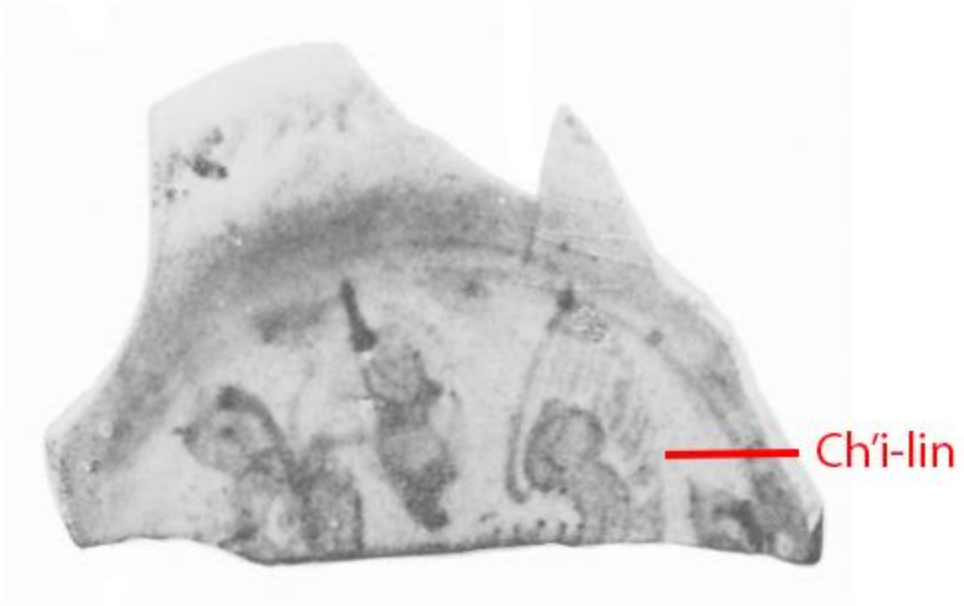

Fig 9. Porcelain with *ch'i-lin* motif from *São Bento*. Adapted from (Auret and Maggs, 1982: 33).

Porcelain Groupings

As discussed in E. Burger's 2003 thesis, *Reinvestigating the Wreck of the sixteenth century Portuguese Galleon São João: a historical archaeological perspective*, a study published in 2001 by Valerie Esterhuizen from the University of Pretoria established that the porcelain sherds recovered from the *São João* wreck site could be placed into three groups based on clay quality, the color of cobalt used, and style of motifs (Esterhuizen, 2001: 77-95, as cited in Burger 2003: 64-65). The first class, "Group A", constitutes the porcelain within the collection of the highest quality. Described as refined porcelain having intense white and bright blue motifs, which were expertly painted, depicting detailed imagery of flowers, fruit, berries, leaves, and birds such as peacocks. "Groups B and C" are listed as being heavier than the "Group A" sherds meaning they are believed to be found in closer proximity to the wreck site (Esterhuizen, 2001:

77-95, as cited in Burger, 2003: 64-65). With a large clustering of these larger sherds found in the rocks of Ivy Point, possibly indicating the foundering of the ship in this area of Port Edward (Burger, 2003: 65). Features of "Group B." include porcelain of a degraded color and rough texture, having a greyish color with a pink hue. The motifs of this group seem less neat while the cobalt is at times a dark blue color. The motifs of "Group C" are similar to those found in "Group B"; however, their techniques appear rushed, as the outlines are darker than that of the wash and occasionally no outline is apparent at all. The thickly applied glaze bestows a green tint to the porcelain with some pieces containing visible cracks (Esterhuizen, 2001: 77-95, as cited in Burger, 2003: 66). Similar examples to those of the latter group are found in porcelain recovered from Kilwa and Madagascar (Esterhuizen, 2001: 84, as cited in Burger, 2003: 66).

Earthenware

As with the porcelain recovered from this area, the earthenware was also deemed to be similar to the examples from the *São Bento* collection. The earthenware was denoted as being of course texture and fired at a high temperature (Maggs, 1984: 180). One sherd from the Port Edward collection is from a large jar with four strap handles, a type of ceramic that was also recovered from both the *São Bento* and the *Santiago*. Another contained stripes from a lighter colored clay implemented in a rectangular pattern similar to a jar from the *Santiago* wreck (Maggs, 1984: 180).

Carnelian Beads

Carnelian beads are denoted as being made of semi-precious translucent agate, are either orange or red, and made of the mineral chalcedony. The beads played an integral role in currency

exchange in the Mediterranean, India, Africa, and the Arab trade (Bell-Cross, 1987: 20-32; Vernon, 2013: 20). The carnelian beads found in relationship to the Portuguese wrecks originate from Cambay, India, and were traded to West Africa in large quantities (Maggs, 1984: 182). Examples of these beads found among the *São Bento* and the Port Edward sites are denoted as being lozenge, bi-conical, or hexagonally shaped. Because they were traded over a long period, they were not considered helpful in ascertaining a date of the cultural material (fig 10) (Maggs, 1984: 182). Carnelian beads are significant among Portuguese shipwrecks in the 16th and 17th centuries because they are strictly associated with ships traveling on their homeward voyage back to Portugal (Bell-Cross, 1987: 22). During later excavations by the University of Pretoria at the *São João* wreck site the largest bead measured 1.2 cm x 1 cm (Burger, 2003: 68). Carnelian beads have been confirmed among the cargoes of the *São João* (1552), *São Bento* (1554), *Santo Alberto* (1593), *Santo Espirito* (1608), *São João Baptista* (1622), *São Gonçalo* (1630), *Nossa Senhora de Belém* (1635) and *Santa Maria de Deus* (1643) (Turner, 1988: 36).

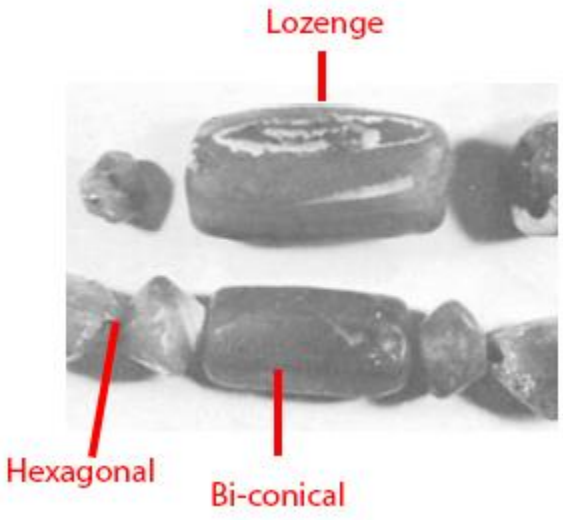

Fig 10. Carenlian beads from *São João*. Adapted from (Maggs 1984: 182).

Cannons

The remaining portion of the cannon measured 60 cm long with a barrel diameter of 6 cm at the breech (fig 11). It was identified as a breech-loading swivel-gun or part of the breech of a falconet. It is considered similar to the falconets found in the *São Bento* and *Santiago* wrecks, with measurements smaller than the guns recovered from these other ships (Maggs, 1984: 174). Upon reinvestigation of *São João* by the University of Pretoria, researchers contacted local salvors who claimed to have fragments from a small cannon and mentioned that there were still some cannons resting underwater in Port Edward (Burger, 2003: 79-80). Another cannon held in the collector's gallery at the Malan Museum was said to originate from the wreck of *São João*, as the museum owner states he purchased it from a restaurant owner in Port Edward; however, this cannon may instead belong to the *São Bento* as other information associated with it claims it was recovered from the Msikaba River which is where *São Bento* wrecked (Burger, 2003: 80 -81).

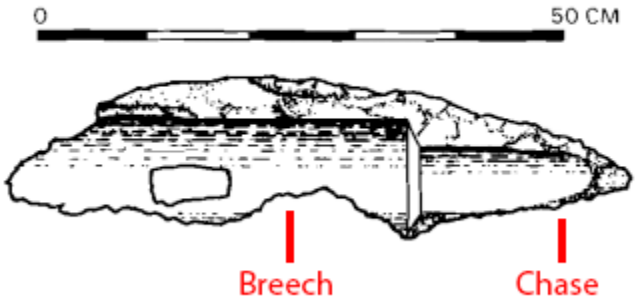

Fig 11. Cannon fragment from *São João*. Adapted from (Maggs, 1984: 174).

Campsite

The primary objective during the reinvestigation of the *São João* wreck site by the University of Pretoria was the identification of the survivor campsite (Burger, 2003). To determine the location of the survivor campsite researchers used the historical accounts from the survivors of *São João* and *São Bento,* as the account of the *São Bento's* loss mentions the location of the wreckage of the *São João*, gives superior geographic information, and is considered more reliable (Maggs, 1984: 185). Using the geographic context given within the survivor accounts of the *São João* and *São Bento* shipwrecks, in combination with accounts of campsites from other Portuguese shipwreck records, the researchers set out to determine potential campsite locations. They did so by creating a list of known campsite features to narrow down the geographic extent of the project and propose what may appear in the archaeological record (Burger, 2003: 89-95). This list of common Portuguese shipwreck campsites comprised the 10 following characteristics:

> 1. Never further than 1 km from the wreck, 2. Near water supply, 3. Survivors sought shelter, 4. Defensive structures were erected on flat surfaces, 5. Used material from wreck to build shelter, 6. The camp was divided into units, 7. Provisions were placed in the center of camp, 8. Survivors were divided into groups (in most cases into three groups), 9. Passengers were separated from the seaman, 10. A specific location was selected to bury the dead. (Burger, 2003: 94)

These efforts eventually lead researchers to narrow down the possible location of the survivor camp into five separate sites within the Port Edwards area. Archaeological surveys and excavations on each of the sites ensued and eventually, peppercorn was unearthed at one of the locations, most likely denoting it as being the position of the survivor camp (Burger, 2003: 110). This site was located at 31° 02' 18.0" S and 30° 13' 52.9" E. (Burger, 2003: 55). Notably, this location held eight of the characteristics associated with Portuguese survivor campsites prescribed by the researchers (Burger, 2003: 108).

Cowries

During the reinvestigation of the site by the University of Pretoria, five cowrie specimens of *Cypraea moneta* were collected from the beach near the wreck site (Burger, 2003: 74). As pointed out in Burger's thesis, *Cypraea moneta,* or the money cowrie, grow in tropical water temperatures, most notably in the Maldive Islands; they have purple crowns and medium-sized teeth, with white unspotted bases and margins. This species is prevalent along the coast of Mozambique, found among marine vegetation and rock fissures; however, they are rarely found along the eastern coast of South Africa and are believed to primarily arise from the holds of shipwrecks in this area (Kilburn and Rippey, 1982: 67, as cited in Burger, 2003: 73-74; Auret and Maggs, 1982: 11). The *Cypraea moneta* that washed up on the shores near Port Edward was useful in identifying the wreck site of the *São João* (Burger, 2003: 73). The shells, between 1 and 1.5 cm in length, were sent to a lab to undergo light isotope analysis (Burger, 2003: 73-74). The test proved that the *Cypraea moneta* collected were not indigenous to the area, and because these cowries are not present in the archaeological record in this area prior to the appearance of Portuguese merchants they must have been cargo on the *São João* (Burger, 2003: 75-76).

Peppercorn

During the reinvestigation of the *São João* shipwreck by the University of Pretoria, peppercorn was found buried at one of the sites investigated near Port Edward (Burger, 2003: 55). The survivor account from the wreck of *São João* states that the ship left Cochin with more than half the quantity of pepper the ship could carry and that an attempt was most likely made to salvage the cargo after the wrecking (Boxer, 2001: 4-10). The appearance of peppercorn during

the reinvestigations most likely denotes that the Portuguese were active in this area meaning they most likely set up camp in this location (Burger, 2003: 79).

CHAPTER VI

THE WRECK OF *SÃO BENTO*

After leaving Cochin in February of 1554 the Indiaman *São Bento* wrecked upon the coast of Transkei on April 22nd, 1554, the following is based on the account of Manuel de Mesquita Perestrelo, one of the survivors of the *São Bento* (Duffy, 1955 27-28).

São Bento's troubles began when the vessel was overtaken by a storm and its helm and rudder were damaged. At a latitude of 32 and 1/3° *São Bento* drifted toward the nearest land in sight, a sandy expanse of beach at the mouth of the Infante River. The ship grounded upon a rocky islet that lay a few hundred meters from the river's mouth (Theal, 1898: 218). This seemingly fortunate landing allowed *São Bento* to narrowly avoid the rocky shore at their intended destination. However, the relief felt by the ship's landing on this islet was short-lived, as waters around the island proved to be incredibly deep, reaching seven fathoms, a short distance offshore. Within moments of nearing the rocky island the ship struck bottom, splitting immediately, the lower portion of the hull stuck amongst the rocks while other portions broke off and washed ashore. The wreckage left the hulk of the ship level with the sea with only the ship's castles being visible above the water (Theal, 1898: 218).

The sea was so violent that the people who sought refuge amongst the projecting portions of the ship found themselves partly underwater others attached themselves to nearby barrels and planks and attempted to swim ashore. Still others who were stranded on the sinking ship cut away the shrouds on the seaward side of the mast, allowing it to fall overboard. Crew and passengers attempted to use the mast as a bridge to shore. The efforts of this group were short-lived as a series of heavy waves struck the mast throwing everyone into the sea, all but one of

which were drawn back by the waves until they were caught up in the sail, and drowned (Theal, 1898: 219).

The surface of the sea was now littered with boxes, barrels, lances, and a variety of ship parts and cargo. As the people tried to swim ashore, they found themselves battered by waves, rocks, and debris, and a great number of them drowned from injuries or exhaustion, turning the surf red with their blood. *São Bento* broke into two halves, with the forecastle comprising one portion and the stern the other. Those who could not swim sought shelter on the remaining pieces of the hull until the waves had cast them ashore (Theal, 1898: 220).

The survivors gave thanks to god for having endured the wrecking of *São Bento*, then gathered and treated the injured to the best of their abilities (Theal, 1898: 220). As soon as the tide receded these survivors waded from the rocky islet upon which they wrecked to the nearby mainland. A headcount determined that the number who perished included 44 Portuguese and over 106 slaves, leaving 322 survivors on the beach (Theal, 1898: 221; Duffy, 1955: 27).

The survivors retreated to the woods as the sun began to set, where they found a river which quenched their thirst for the first time since the wrecking. In the morning they searched the shore for clothes and supplies. The beach was covered with mangled corpses, appendages, and a variety of goods (Theal, 1898: 222). The abundance of materials that washed ashore supplied the survivors with food and goods which allowed them to regain strength and build shelters among the tree line. The survivors constructed a relatively comfortable refuge from of lavish carpets, gold cloth, and silk (Theal, 1898: 223). After this task was completed the captain commanded that the surrounding countryside be surveyed from a nearby mountain top, to discern any inhabitants and scout a safe path to cross the Infante River. Approximately a dozen men

performed this task. While this scouting party was away a group of natives was seen overlooking the Portuguese encampment but they fled before any contact was made (Theal, 1898: 223).

The next day another group of natives was spotted on the other side of the Infante River, burning pieces of the ship to extract iron fastenings. A few of the natives swam across to greet the Portuguese and were given modest gifts of cloth, iron, and any spare provisions. The natives were friendly and talkative but none of the survivors understood their language, thus little knowledge was ascertained during this encounter (Theal, 1898: 224). The following afternoon approximately 100 more natives appeared nearby armed with wooden and iron spears. The Portuguese armed themselves in turn, but the native force proved peaceful. The Portuguese rejoiced to see that the leader of the native group wore red beads around his neck resembling cornelian beads. The natives' possession of these beads meant that they must be near a river visited by merchant vessels, as this form of bead originated only from Cambay and was brought to Africa by Portuguese traders (Theal 1898: 225).

The following day the Portuguese ventured back to the shore in search of sustenance as they had been eating nothing more than coconuts. Not many provisions had washed ashore, and they found only a barrel of biscuits, 42 pounds of rice, and a few pieces of meat, all of which were soaked. In addition to the lack of supplies, the weather also tormented the Portuguese; it was now winter in the region and if they remained on the shore they would not survive (Theal, 1898: 225-226). After much debate, the survivors decided to trek north towards Sofala, following the route previously taken by Manuel de Sousa after the wreck of *São João*. To prepare for their journey the Portuguese gathered as many provisions and iron nails for trade that they could carry (Theal, 1898: 226).

The following day, April 27th, 98 Portuguese and 224 slaves set out on an interior journey towards Sofala. One-quarter of them were still seriously injured from the wreck, using sticks as crutches. They left a ship's boy and slave at the original encampment, as both suffered from broken legs and were not expected to have survived the trek. The company was armed with lances, swords, shields, and one musket with 12 charges of water damaged powder (Theal, 1898: 227). Putting themselves in single line marching order, the ship's crew carried a crucifix affixed upon a lance and a blessed banner in the front, and in the rear, a religious icon was carried by the captain along with the passengers and slaves. In the middle of the formation, unarmed members of the company helped to carry the sick and wounded (Theal, 1898: 227). After 12 days of traveling through the hills, mountains, and rivers of the region the company stumbled upon an abandoned village that contained pieces of china and other western artifacts that they were certain originated from the wreck of *São João* (Theal, 1898: 233-234). The following day, the company reached the spot where the galleon *São João* came ashore, whereupon they discovered the capstan and other timbers of the ship cast onto the rocky reef that stretched along the coast. Here the company realized that they were mistaken in attempting an interior route north and that by following the coast like the survivors of the *São João* wrecking they would have a greater chance of success. The coast had gentler terrain, less affected by the rivers of the interior, and provided resources such as oysters, which when gathered at low tide supplied the company with moderate sustenance (Theal, 1898: 234).

Months later, after enduring the grueling afflictions that accompanied treks along this treacherous coast, and with aid from friendly native guides, the remaining survivors found themselves in a native village (Theal, 1898: 227-280). They stayed here for five months, dealing with immense daily anguish, suffering from starvation, illness, and exposure as the winter storms

had depleted the area of resources. However, on November 3rd, a Portuguese ivory merchant ship entered the bay in which the village lay (Theal 1898: 280-281). Nine days later the captain of this ship landed in a port owned by Inhaca, the king of the village in which the *São Bento* survivors took refuge, and upon the king's instructions, the pilot of this ship was made aware of their presence. Three days after this the survivors were greeted with open arms by their fellow countrymen and taken into their vessel. In total, only 20 Portuguese and three slaves survived the trek to board the ship, the rest having perished along the way (Theal, 1898: 281). However, due to the harsh easterly winds, the Portuguese were not able to continue their journey home for the next five months, in the meantime, the merchant ship landed at various villages on the river attempting to trade with the locals, but was instead met with increasing violence (Theal, 1898: 282). The Portuguese raided one of the villages and captured several women, including the chief's daughters; these captives were eventually returned to maintain peace with Tembe, the king of this land (Theal, 1898: 283). When it was time for the Portuguese ship to make its way back to Mozambique, the pilot received word that two more survivors of the *São Bento* were being aided by his people and were on their way. Two days later, a Portuguese man and a slave who had been separated from the company joined the ship (Theal, 1898: 283). On March 20th, 1555, the Portuguese set sail for Mozambique. Aside from temporarily running the ship aground on a sandbank, they experienced no more tragedies along their journey, coming to port on April 2nd (Theal, 1898: 284).

The Site

In 1968 several bronze cannons were discovered by G. N. Harris near a rocky islet 400 meters from the mouth of the Miskaba River on the Pondolond coast of Transkei. Previously,

this area yielded sherds of Ming porcelain and carnelian beads, which were well known for washing up on the surrounding shore. This site was investigated by a research and salvage group from Kokstad, who eventually recovered additional cannons and artifacts from the sea around the island (Auret and Maggs, 1982: 1). The resulting report was eventually written up by archaeologists Chris Auret and Tim Maggs. Based on the archaeological evidence discussed below the wreck is clearly of the 16th century and with this information, researchers conducted a cross-historical analysis of potential ships to have wrecked in the vicinity. Only two Portuguese ships were known to have wrecked near this location during the 16th century, *São João* (1552) and *São Bento* (1554) (Auret and Maggs, 1982: 36). Using the account of survivor Manuel de Mesquita Perestrello, translated by George McCall Theal from Bernardo Gomes de Brito's, *História Trágico-Marítima*, the researchers compared the description of the landscape from the historical account to the modern scene (de Brito, 1735; Theal, 1898; Auret and Maggs, 1982: 36). With very little trouble, Auret and Maggs were able to draw clear parallels between the modern landscape and the one presented in the survivor's account, thus identifying the Miskaba site as the location of the wreck of *São Bento* (fig 12) (Auret and Maggs, 1982: 37-38).

Fig 12. Map of the wreck of *São Bento*.

The Cannons

Since the initial discovery of the wreck 18 bronze cannons were recovered from the seabed around the islet. Auret and Maggs categorized the cannons into four types: small breech-loading cannons, large breech-loading cannons, medium-sized muzzle-loading cannons, and a large muzzle-loading cannon (Auret and Maggs, 1982: 3).

Breech-Loading Cannons

Ten of the breech-loading cannons were classified within the smaller grouping and five placed into the larger group. These cannons, defined as falconets by N.V. dos Santos, of the Museu de Marinha, Lisbon, are described as having:

> A primitive breech directly to the rear of the first reinforcement ring. In the breech there are three rectangular slots while the cascabel has a circular hole through the center. This was designed to take a simple form of butt used for training and elevating the weapon. The cannon itself was not mounted on a carriage but, by means of a wishbone structure, directly onto the gunwales, lookout platforms and other vantage points of the ship. The breech-loaders were designed to take a separately charged chamber which may best be described as looking like a large beer tankard. This was inserted into the breech and locked into position by means of a tapered metal bar driven through the two rear slots. (Auret and Maggs, 1982: 3)

The description above identifies falconets as a type of swivel-gun similar to that of the English 'murderers' or the Spanish *versos* found on the 1554 Padre Island wrecks (Arnold and Weddle, 1978: 240-243). Manwayring's dictionary defines murderers as:

> A small iron or brass piece with chambers: In Merchant-men they are most used at the Bulk-heads of the forecastle, half-deck, or steerage; and they have a Pintell, which is put into a stock, and so they stand and are traversed, out of which they use Murdering-shot, to shower the Decks, when men enter, but iron Murderers ae dangerous for them which discharge them, for they will scale extremely, and endanger their eyes much with them, I have known divers hurt shooting them off. (Manwayring, 1644: 69)

While definitions of other similar swivel-guns are useful in determining classifications and giving a general description of the different types of swivel-guns recovered from wreck locations, it should be noted that swivel-guns can be vastly morphologically distinct from one another, such as falconets, *versos*, murderers, and *espingardas*. In R. D. Smith's 1988 publication *Towards a new typology for wrought iron ordnance*, he defined different forms of swivel-guns, which will be discussed briefly to highlight their (aside from basic differentiations between wrought-iron and bronze). As a base definition, Smith defines a swivel-gun as "… any

gun which can be maneuvered by means of a swivel. All swivel-guns have separate chambers" (fig 13) (Smith, 1988: 7). In his later chapter titled *Wrought-iron swivel guns* (in Mensun Bound's *The Archaeology of Ships of war*), Smith denotes the common names used in association with his original classifications and expands on additional typologies not included in his original publication with archaeological examples (Smith, 1995: 104-113). As such, Smith originally classifies swivel-guns into five major classes, SW1 through SW5, based on their general morphology (Smith, 1988: 8).

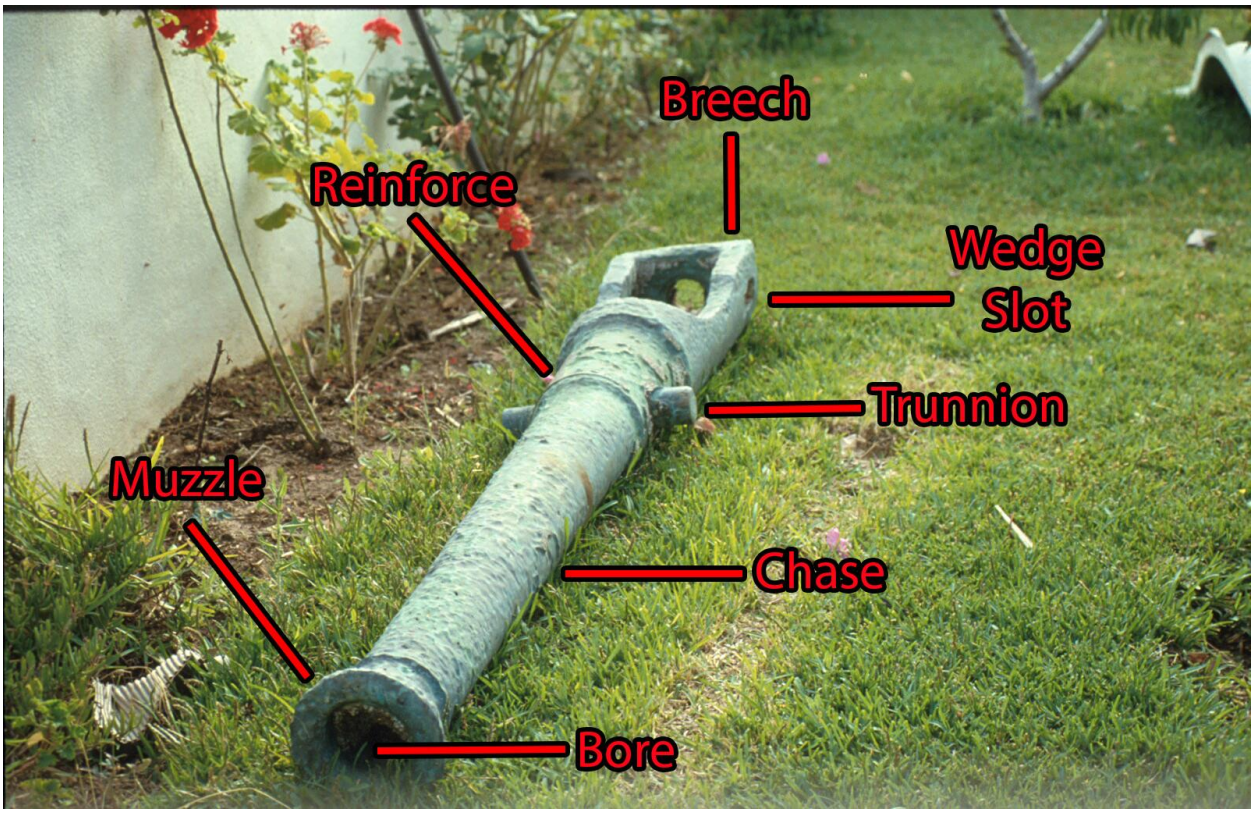

Fig 13. Bronze swivel-gun. Photo courtesy of Filipe Castro. Labels follow terminology in (Keith, 1987: 198).

Smith defines SW1 as the most common type of swivel-gun, comprised of a long narrow barrel forged using stave and hoop construction, having longitudinally running staves that are bound together using alternating bands and hoops, varying from two to three hoops on the muzzle (Smith, 1988: 6, 8). The chamber holders on these swivel-guns are open and connected to the barrel of the swivel-gun via a pair of crossways lugs and pegs or hammered lugs laid out like rivets. From here, the support bar for the chamber is either a separate segment that is placed through openings on each side of the chamber holder or is welded across the bottom of the chamber holder. The wedge for the swivel-gun was then placed into holes created on the sides of the chamber holder. The trunnions are adjoined to a hoop in front of the chamber holder and are inserted into the eyes of the swivel (Smith, 1988: 8). The swivel-gun's rear projecting aiming handle, known as a tiller, is typically constructed of a simple bar with an ornamental apex (Smith, 1988: 6, 8). It should be noted that the term chamber refers to an independent portion of the gun that is separate from the barrel into which powder was loaded (Smith, 1988: 7). SW1 is later classified in Smith's 1995 publication as a 'sling', citing an example of this type of gun on the early 18th century 'Bronze Bell' wreck, in North Wales (Wignall, 1982: 228-229, as cited in Smith, 1995: 107).

SW2 is the second most common form of swivel-gun, according to Smith. This type is forged using a similar stave and hoop construction but with a flatter, shorter barrel than the previous type of swivel-gun. The chamber holders for SW2 are less open than in SW1, and thus lacks a support bar, and are instead welded to the barrel's rear band. The holes for the wedges are formed into the sides of the chamber holder projecting just above the holder. The swivel-gun's tiller is usually short and forged in an upturned fashion. Typically, one of the hoops on the barrels of these types of swivel-guns is decorated in some sort of fashion, such as in a twisted

formation. Additionally, the tiller and chamber holder are also decorated in some form or another (Smith, 1988: 8, 11). SW2 is classified as a murderer in his 1995 publication, this type of gun was referenced earlier in a quote from Manwayring's *Seaman's Dictionary* and has been recovered from the 1609 *Mauritius* wreck (L'Hour *et al.*, 1989: 102-104, as cited in Smith, 1995: 110).

SW3 is a rare form of swivel-gun with only a few known examples. The barrel is a single piece along with the chamber holder and trunnions, the rear section of which is removed to hold the chamber, concealed by a hinged cover. The tiller is a straight continuation of the barrel with a plain apex (Smith, 1988: 11). SW4 consists of a "one-piece" or "forged-gun'" barrel containing an ordinary muzzle band and chamber holder that is integrated into the barrel and is entirely encased (Smith, 1988: 11; Roth, 1989: 194). The chamber holders are described as having a tiny iron loop at their back end, in which a wedge chain was fastened, while the holes for the wedge are forged on either side of the chamber holder (Smith, 1988: 11). Wedge chains were used to keep hold of the wedge while it was not inserted into the swivel-gun (Smith, 1988: 6). The trunnions were connected to the barrel in front of the chamber holder while the tiller is described as a simple bar originating out of the back end of the chamber holder and ending in a triangular arc (Smith, 1988: 11). SW5 is defined as being like SW4 but differing in that the trunnions are connected on the forward portion of the chamber holder, instead of the barrel. The bottom of the chamber holder is also slit in SW5, which does not occur on the others (Smith, 1988: 11). SW4 and SW5 type swivel-guns do not use hoop and stave construction techniques and are classified as 'base' in Smith's later publication. Such examples have been found in a series of 16th century wrecks sites, such as on the Padre Island wrecks, Highborn Cay, Bahia Mujeres, and Molasses Reef sites (Arnold and Weddle, 1978: 240-243; Bass, 1988: 56-65, as cited in Smith, 1995: 106).

Two additional swivel-guns were discussed in Smith's 1995 publication: the serpentine, and the *petriera a braga*. The serpentine is described as a gun with a wrought-iron barrel fastened to a wooden base. The gun's chamber is placed at the rear of the barrel and is secured by an iron wedge; the entire gun is placed on an iron swivel that is secured via a single perpendicular bolt. Smith also denotes that this is a fairly small gun with a bore measuring about five to 10 centimeters (Smith, 1995: 104). An example of this type of gun has been found on the 16th century Cattewater shipwreck (Redknap, 1984: 49-66, as cited in Smith, 1995: 105).

The *petriera a braga* is described as being a swivel-gun cast in bronze, including the trunnions, with two rear lugs to aid in securing the chamber holder. The chamber holder is rectangular and constructed of wrought iron, the front of the holder is made to be positioned around the rear of the barrel with two holes that fit over the bronze lugs on the rear barrel, the two pieces are then hammered together at this junction. The chamber holder is open on its rear and top and has a support strap welded to its bottom side. An iron tiller is also welded to the rear of the wrought iron chamber holder to aid in the gun's aim. To secure the chamber in place a wedge is driven between the rear of the chamber and the rear inner side of the chamber holder (Smith, 1995: 108-109). Examples of this type of gun were found on the, 1588 Spanish Armada wreck *Trinidad Valencera* (Flanagan, 1988: 78; Martin and Parker, 1988: 220, as cited in Smith 1995: 109).

Chambers can be grouped into two separate typologies, those constructed using staves and hoops and those made from a single piece of metal. To differentiate between chamber types Smith created two major classifications for once-piece chambers denoted as CH1 and CH2. CH1 is described as a one-piece chamber that has a slight taper from the rear to the front, with a stepped neck and a handle that has been welded on to the right side. When in use the touch hole

was in a vertical position near the handle. CH2 is similar to CH1 except that the neck tapers away from the body and the handle is occasionally placed on the left-hand side (Smith, 1988: 12).

In their publication on naval guns Ian Hogg and John Batchelor display a table published in 1547 giving the estimated weight and caliber dimensions of a falconet: Weight 500 lb, Caliber 2.0 in, Shot Weight 2 lb, and Charge Weight 2.5 lb (Hogg and Batchelor, 1978: 12). The larger five cannons in this group from *São Bento* measure 264 cm in length with bores measuring 17 cm (Auret and Maggs, 1982: 4).

The falconets contained some evidence of foundry markings; however, because they had undergone a substantial amount of abrasion the markings could not be conclusively identified. Luckily, the markings on the larger cannons were still relatively discernable and were used to determine the markings found on the falconets by analogy (fig 14). The markings on both the smaller and larger falconets were uniform, bearing a crest near the muzzle which is trailed by an 'armillary sphere', which is then followed by a shield holding the monogrammed letters CFRO (fig 15). The armillary sphere was assumed as the mark of King Manuel of Portugal (1495-1521). The armillary sphere was also used by his successors, John III (1521-1557) and Sebastian (1557-1578), to a limited degree (the armillary sphere was not used alongside the royal coat of arms during these later rules) (Do Valle 1963, as cited in Auret and Maggs, 1982: 6). One of the explanations given for the CFRO monogram is that it is the marking of a foreign gun founder who made the cannons for several countries, including Portugal; in part because the royal Portuguese coat of arms is inaccurately depicted (Do Valle 1963, as cited in Auret and Maggs, 1982: 5-6).

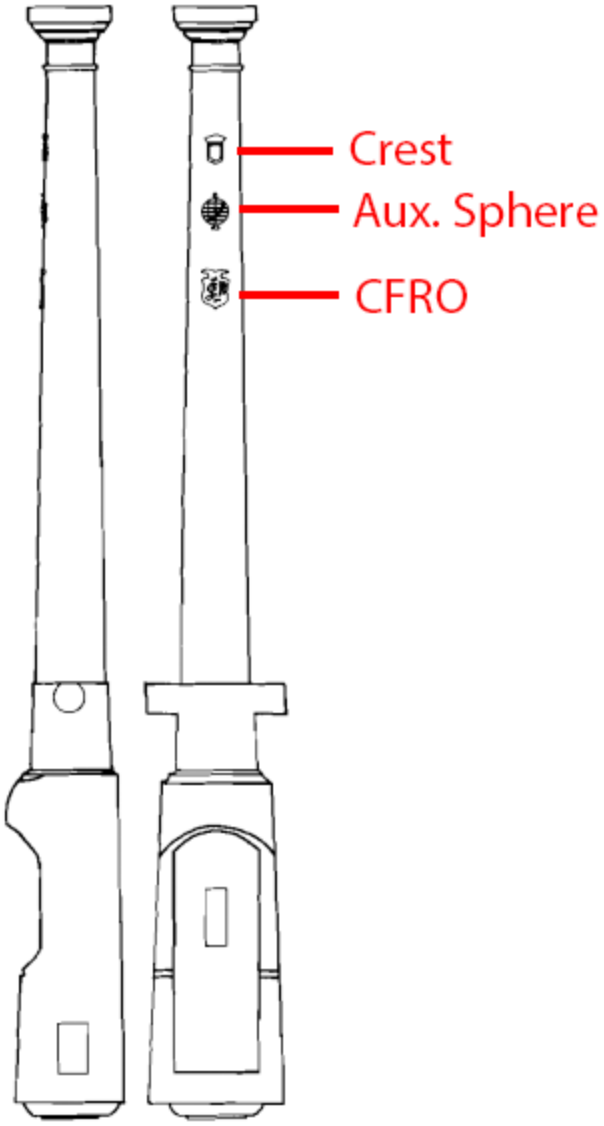

Fig 14. Falconet from *São Bento*. Adapted from (Auret and Maggs, 1982: 4)

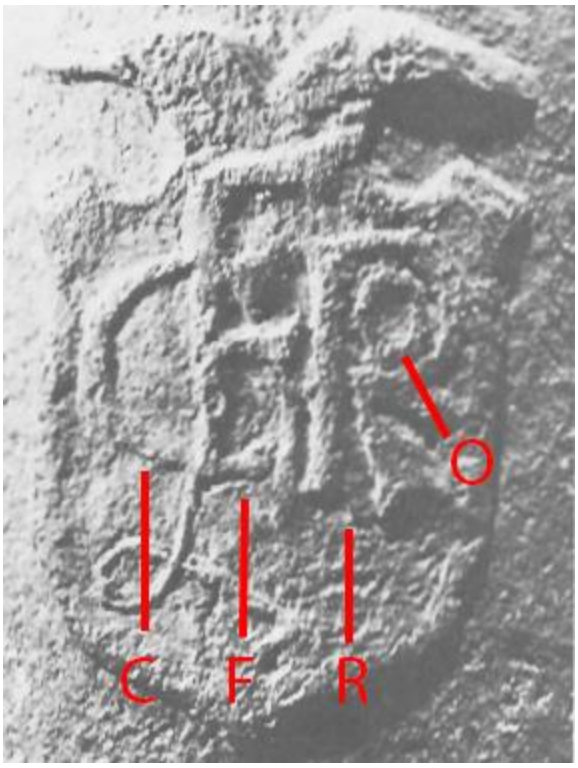

Fig 15. CFRO monogram on falconet. Adapted from (Auret and Maggs, 1982: 7).

Medium-Sized Muzzle-Loaders

Two identical medium-sized muzzle-loading cannons, were found on *São Bento's* wreck site. Each measured 236 cm in length and a bore measuring 17 cm in diameter (fig 16). Both cannons had four lifting rings, which as Auret and Maggs point out, differs from later designs with only two lifting handles, often referred to as dolphins, located above the trunnions at the balancing point for the cannon (fig 17) (Auret and Maggs, 1982: 3). The trunnions were the two cylindrical projections from the barrel at the cannon's balancing point, used for elevating the muzzle and mounting a cannon on a carriage (Hogg and Batchelor, 1978: 10). The cannons also have a single reinforce running from the front of the trunnions to the base. The base is described as being flat, and containing a loop styled in a 'twisted rope' motif, similar to the lugs holding

the lifting rings (Auret and Maggs, 1982: 4). This flat base is without a cascabel, the rounded projecting knob cast into the base of a cannon (Auret and Maggs, 1982: 4; Mauncy, 1985: 83).

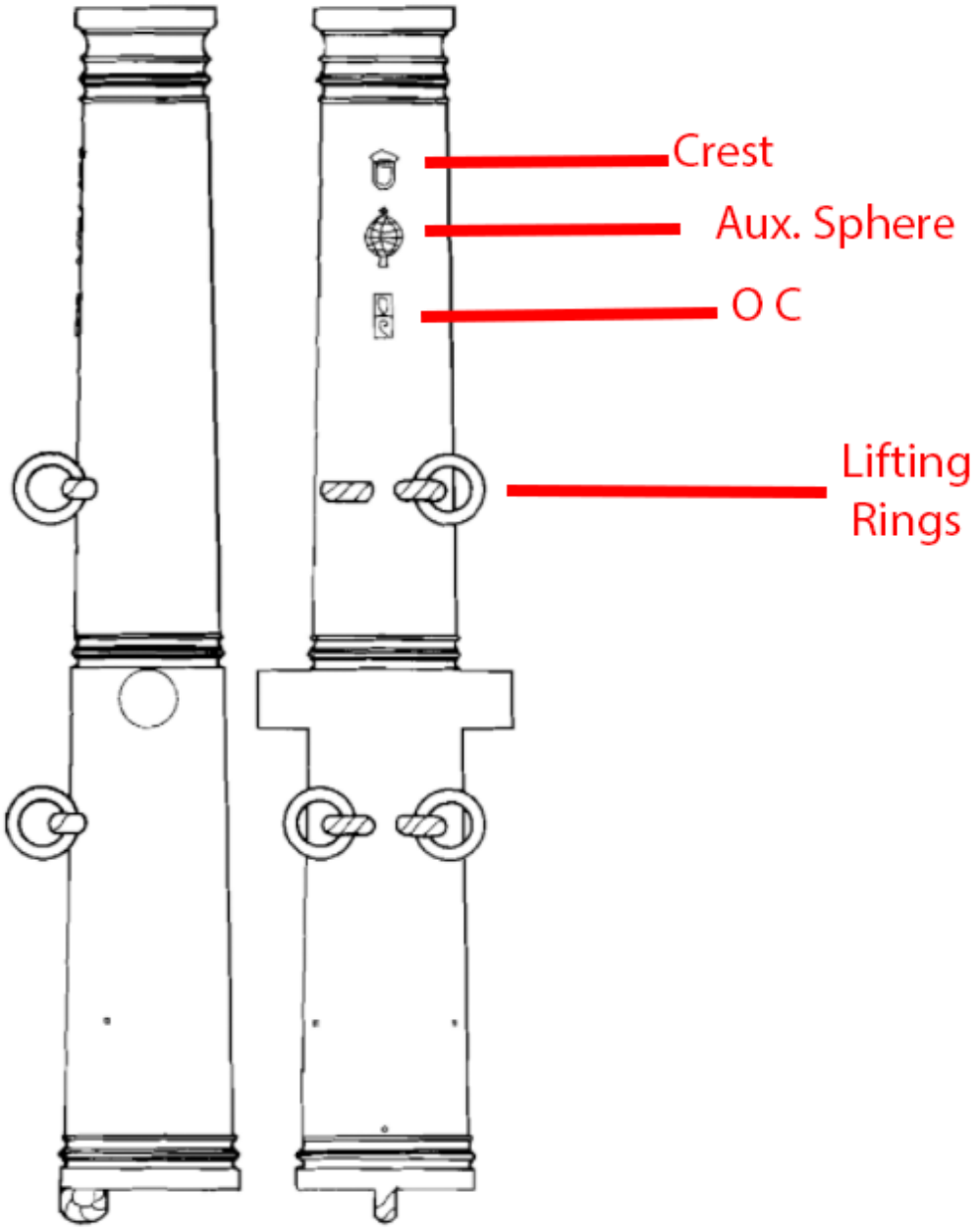

Fig 16. Medium-sized muzzle-loader from *São Bento*. Adapted from (Auret and Maggs, 1982: 4)

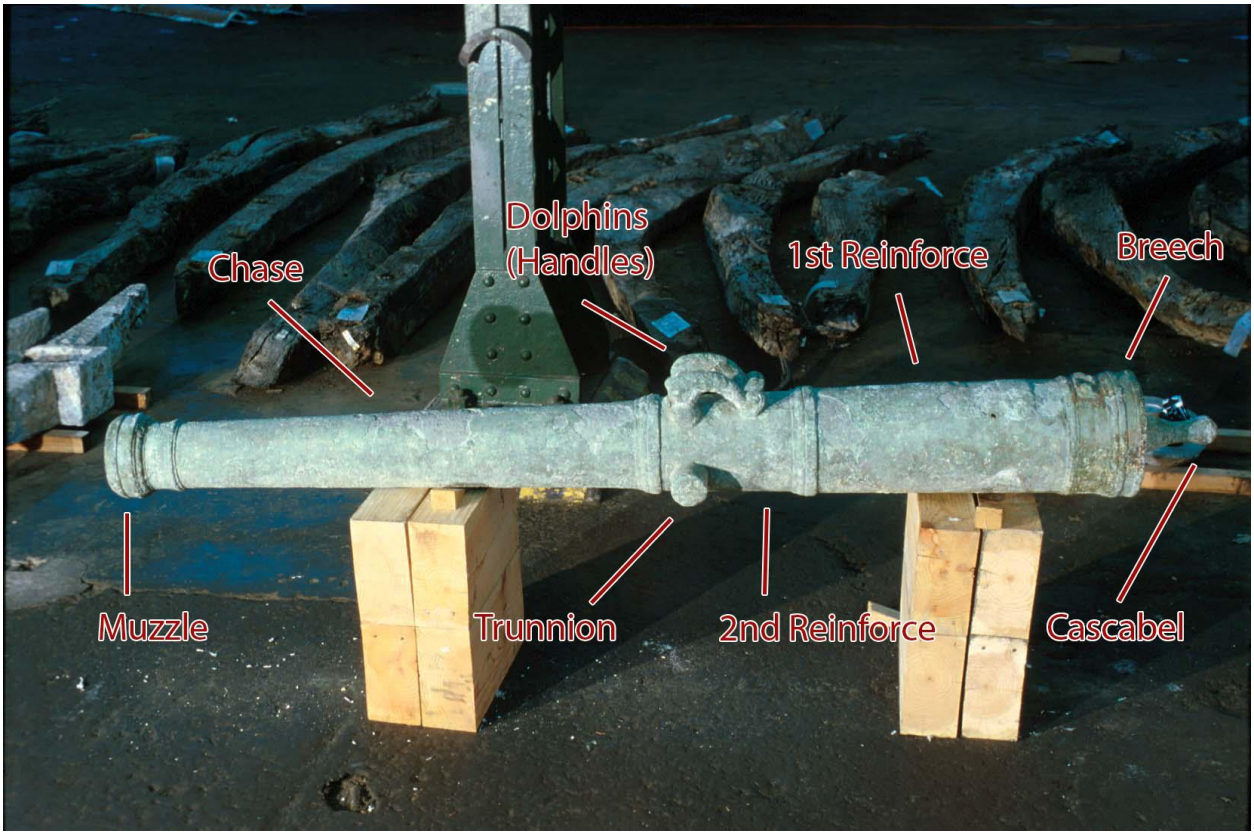

Fig 17. Cannon from *Nossa Senhora dos Mártires* (1606). Photo courtesy of Filipe Castro, labels follow terminology in (Roth, 1989: 196).

This group of cannons have crests similar to those found near the muzzles of the falconets, also accompanied by an armillary sphere; however, the third marking on these canons consists of a rectangle carrying the letters 'OC' (fig 18) (Auret and Maggs, 1982: 5). The OC marks belong to Portuguese cannon founder Sebastio Cobris, who cast cannons in Portugal for 50 years, beginning in 1514 (Do Valle, 1963, as cited in Auret and Maggs, 1982: 6). It should be noted that each group of cannon markings has a different version of the armillary sphere. This difference suggests that only the falconets were manufactured by the same source (Auret and Maggs, 1982: 6).

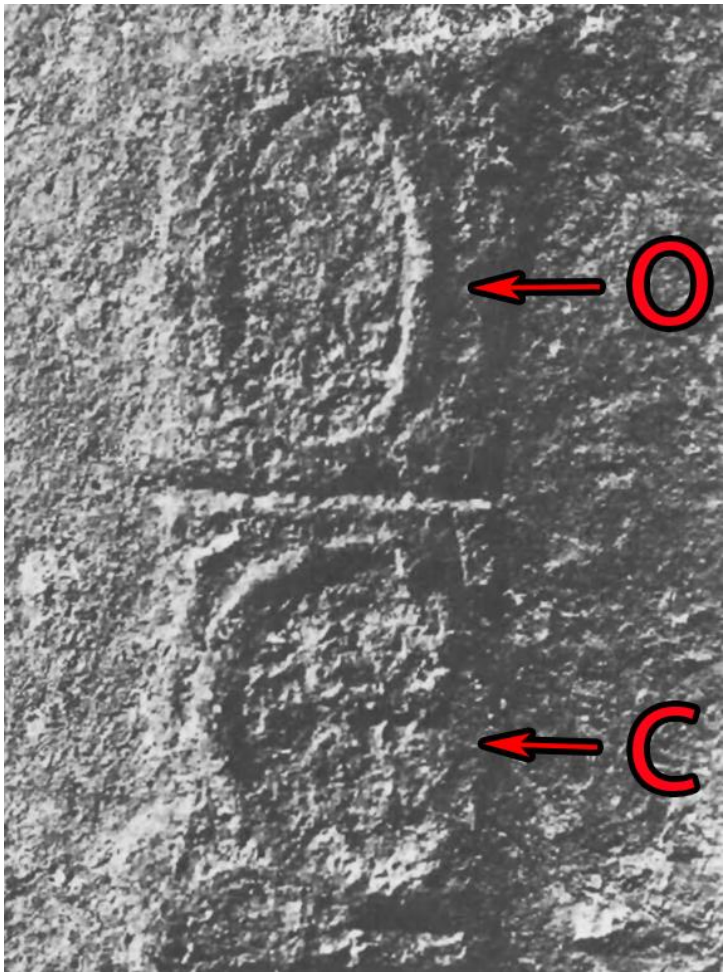

Fig 18. OC monogram on medium-sized muzzle-loader. Adapted from (Auret and Maggs, 1982: 7).

Both the medium and the large-sized muzzle-loaders contain chapelet holes, square holes in front of the base rings, these features are described below (Auret and Maggs, 1982: 6-7):

> Until the early years of the 18th century cannon were commonly cast on a core: to form the bore, a rod was placed centrally in the hollow clay gun mould and after the molten bronze had been poured and had cooled, this rod was removed, leaving a central passage which was then cleaned up by means of revolving boring tools to form the final bore. The all-important central rod was secured in the breech end of the gun mould by means of an 'armature' made of iron and called a 'crown-iron' or 'chapelet'. This had either 3 or 4 arms which were used to fix the rod firmly in the clay mould. The ends of these arms would reach nearly to the outer surface of the mould. When the molten bronze filled the mould, the rod could be removed, while the armature remained forever embedded in the breech end of the cannon. Prolonged immersion of a bronze cannon in sea water would corrode the iron

> away leaving as in this case, holes where the chapelet was. (Auret and Maggs, 1982: 6-7)

Large Muzzle-Loader

The large muzzle-loader measures 301 cm in length with a bore measuring 23 cm in diameter. Auret and Maggs note that this cannon differs from standard designs in two aspects. Like the medium-sized muzzle-loaders from the *São Bento* site, this cannon contains four lifting rings in place of the standard two dolphin handles; however, this latter cannon deviates from the former design in that the second reinforce is thicker than the initial reinforce and the chase, while also running from behind the after lifting rings past the trunnions (fig 19). Unlike the smaller cannons, the larger one does have a cascabel which although damaged does resemble a more traditional design (Auret and Maggs, 1982: 4-5). During the cleaning of this gun, a series of tightly packed materials were retrieved from its barrel including stones, 50 grams of peppercorns, money cowries, a piece of oak, two pieces of fine cane, three possible sheep rib fragments, two heavily chewed bone shards, and a portion of a coconut shell. This odd collection of objects suggest that this gun was stored in the hold when the ship sank (Auret and Maggs, 1982: 8, 11).

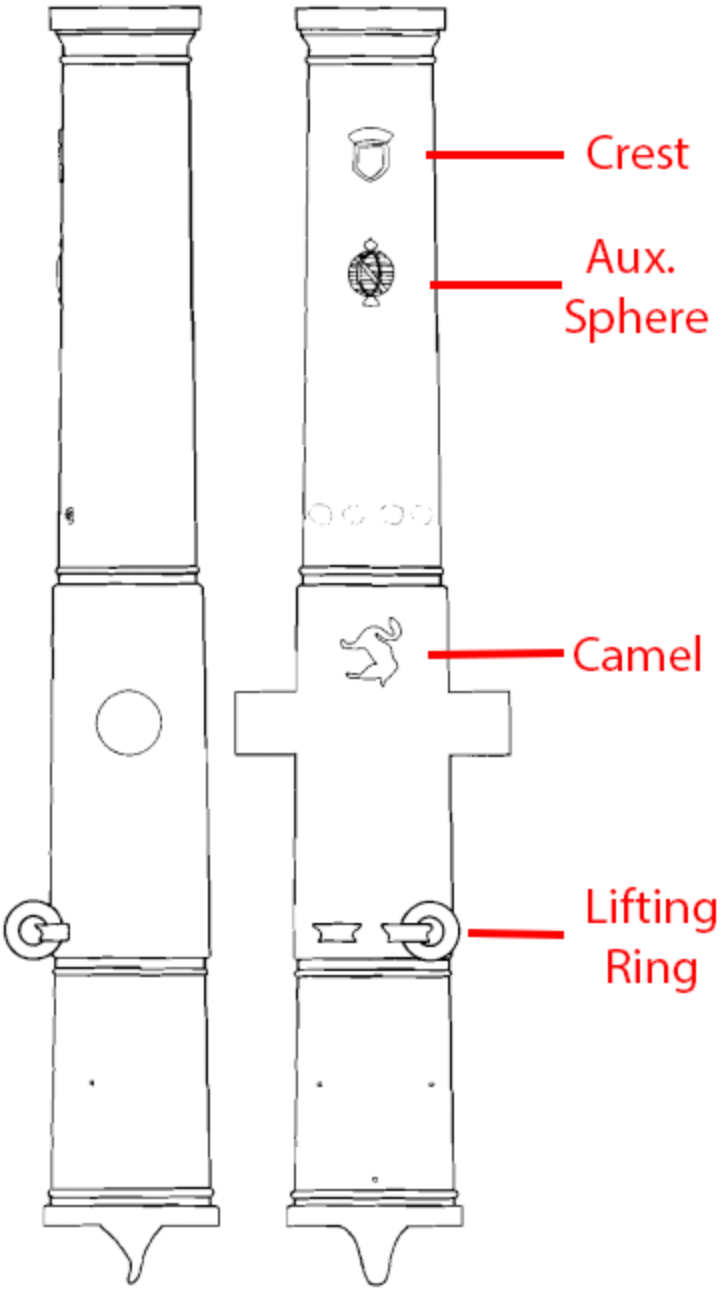

Fig 19. Large muzzle-loading cannon. Adopted from (Auret and Maggs, 1982: 4).

The large muzzle-loader exhibited only two marks, a crest followed by an armillary sphere similar to the ones found on the other cannons (Auret and Maggs, 1982: 5). This cannon,

however, had one more possible mark on the second reinforcement. Auret and Maggs suggested that this cannon is a 16th century type referred to as 'camel', possibly derived from its humped shape. They noted that the unidentifiable mark on the second reinforce of the cannon looked like a camel (Auret and Maggs, 1982: 5). The morphological characteristics of the cannons and their markings allowed Auret and Maggs to definitively label this wreck site as 16th century Portuguese (Auret and Maggs, 1982: 7).

Cannon Balls

All the cannonballs recovered from the site came in two separate sizes, the smallest being 3.5 cm in diameter and the larger being approximately 5 cm in diameter, meaning they fit the falconets. The cannonballs were of cast iron and covered in a layer of lead, and also contained either a slot or square hole penetrating through the lead sheathing. These holes indicate that the balls were part of either bar shot or chain shot, in which, before being encased in lead, two iron balls were joined with one another by a bar or a chain. At the time of the original publication no other shot sizes fitting the muzzle-loading cannons had been recovered, to which Auret and Maggs assert may indicate that they were made completely of iron and have since corroded away (Auret and Maggs, 1982: 7). Another reasoning was also put forward by A. N. Kennard, in that the large muzzle-loading cannon may have used stone shot, to which some irregular stones had been recovered in the barrel of the gun during cleaning. However, Auret and Maggs claim that it is also possible that these stones were either a part of the ship's ballast or native to the area (Auret and Maggs, 1982: 8-9).

Porcelain

Porcelain made up a significant portion of the ship's cargo, as a great quantity of it has been recovered from the site even after over four centuries since the wreck; using both museums and private collections Auret and Maggs made a wide-ranging comparison between porcelain from the wreck of *São Bento* and other well-known assemblages. J. Ayers of the Victoria and Albert Museum dated the porcelain recovered from the *São Bento* site to approximately 1530-1560. Researchers described the assemblage as consistent and probably representing cargo rather than personal belongings, as commonplace dishes and bowls appeared in large numbers. Because exported porcelain was likely acquired by Portuguese merchants within a few years of its manufacturing, and that the ship sank two months after leaving port in February of 1554, it is believed that the porcelain dates to somewhere between 1550 and 1554. Auret and Maggs support this argument by drawing attention to the 'emperor marks' found on the porcelain. While most of the porcelain pieces contained the 'emperor marks' of "Xuande" (1425-1435), the motifs of the porcelain, however, did not fit the designs of that period (fig 20). Auret and Maggs point out that using earlier 'emperor marks' such as the marks of "Xuande" on porcelain is a well-known practice of Chinese potters. A few other pieces contained the 'emperor marks' of "Zhengde" (1506-1521) (fig 21), while a single piece contained the mark of "Jiajing" (1522-1566) (fig 22). The inclusion of the Jiajing piece places the porcelain assembly after 1522, at the earliest. Additionally, the pieces are commonly depicted with a typical 16th century inscription, 'long life, honor and riches', usually in the form of a 'cash coin' (Auret and Maggs, 1982: 12).

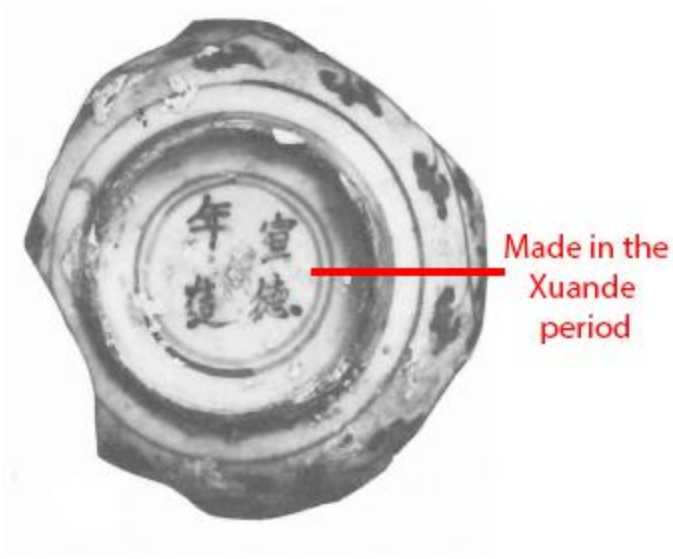

Fig 20. Xuande period inscription. Adapted from (Auret and Maggs, 1982: 14).

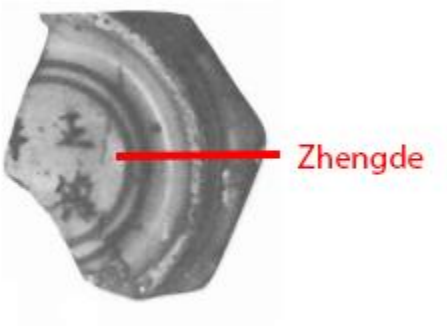

Fig 21. Zhengde period inscription. Adapted from (Auret and Maggs, 1982: 15).

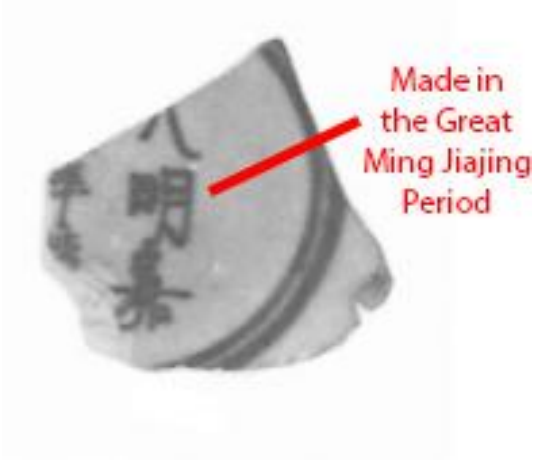

Fig 22. Jiajing inscription. Adapted from (Auret and Maggs, 1982: 30).

Auret and Maggs denote the cobalt pigment used on the porcelain as striking while also varying in color. The porcelain is typically covered in a transparent glaze that applied to the body of the porcelain quite well, except for in a few fluted dishes where there was modest 'crawling' and 'pinholing' (Auret and Maggs,1982: 12). Crawling occurs during the firing process of ceramics when the glaze separates into clumps, leaving behind patches of clay between said clumps (Hansen, 2020). Pinholing, a common surface defect, occurs erratically within the production of ceramics, in which gas-producing particles are present within glaze during the firing process, causing dimples and tiny holes to appear on the surface of the glaze (Hansen, 2020).

Hemispherical bowls varying in size were frequently recovered from the *São Bento*, their insides contain centrally circular floral motifs and a 'diamond diaper border' known as a 'trellis' or 'classical scroll', just below the rim. On their outsides, these bowls contain a plethora of different designs, including landscapes with vegetation, floral scrolls, the Taoist trigram and crane motif, waves and rocks, phoenix, and chrysanthemum scroll, and others (Auret and Maggs, 1982: 12-13). One of the trigrams and crane motifs contained the inscription 'riches, honor and

enduring spring', on the foot of the dish (Auret and Maggs, 1982: 15). Auret and Maggs denote that the trellis and Taoist motifs are distinctive of porcelain made during the Jiajing rule (Auret and Maggs, 1982: 12). A base inscription on one of the bowls denotes 'made in the Great Ming period', while another reads, 'made in the Xuande period' (Auret and Maggs, 1982: 14).

Another typical bowl in the *São Bento* assemblage is smaller than the previously mentioned bowl, albeit proportionally wider and containing an inverted rim. Typically, inside of this second type of bowl, a circular motif depicting a dragon was displayed towards the center, while the common, diamond diaper border or trellis was set below the rim. On the outside, most of these bowls contained motifs of a dragon and floral scroll (Auret and Maggs, 1982: 12). A few contained other exterior motifs such as a lotus and other floral scroll designs (Auret and Maggs, 1982: 18).

Another porcelain item commonly found in the *São Bento* collection is a type of small fluted dish containing a rim decorated in leaflike motifs or foliate. Auret and Maggs note that the flutes or grooves were press-molded, though some appear to have been cut into the porcelain as well. Most of these fluted dishes contain central motifs referred to as 'parrot in fruit tree' (fig 23), in which the fruit tree is believed to be a pomegranate tree; as with the other dishes, a few alternative decorations occur, which were not directly defined by Auret and Maggs (Auret and Maggs, 1982: 12). The inside rims of these dishes are typically stylized with either trellis patterns or what is believed to be a possible cherry motif. The outside rims of these dishes contain motifs of waves and fungus with the classical scroll design (Auret and Maggs, 1982: 16). Auret and Maggs note that complete versions of these dishes have been retrieved from the Islamic cemetery of Vohemar in northern Madagascar, which contained numerous examples of well-preserved Chinese porcelain, and whose coast had a history of Portuguese raiding during

the 16th century (Vernier and Millot, 1971: plates 88 and 89, as cited in Auret and Maggs, 1982: 16; Molet, 1972: 149-150). Some of the dishes recovered from *São Bento* are similar to these fluted dishes but are either without blue decorated underglaze and were fired with a non-transparent white glaze instead, or were decorated with blue underglaze but are missing fluting (Auret and Maggs, 1982: 16).

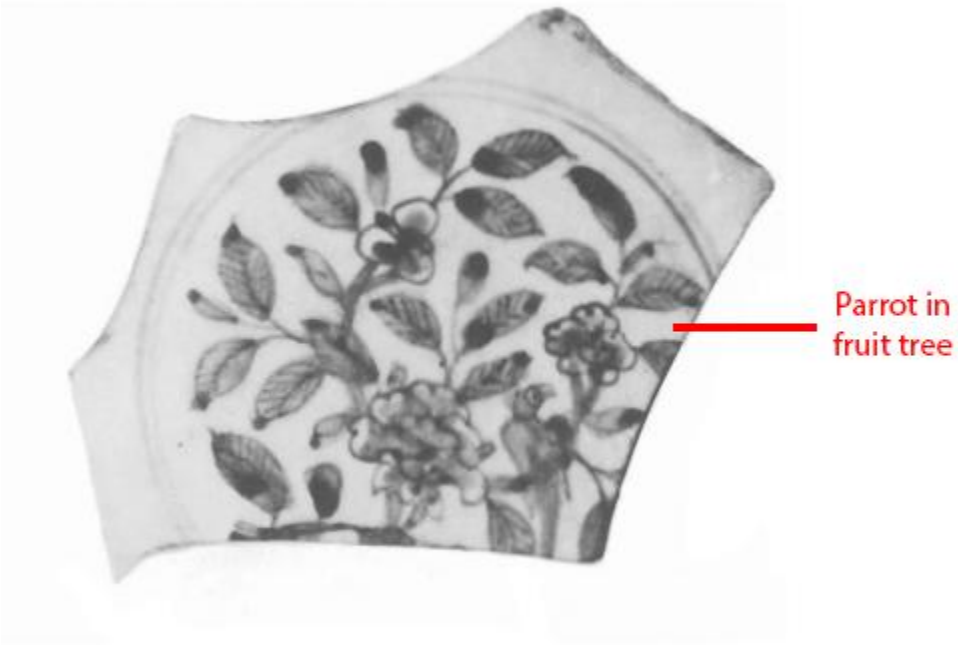

Fig 23. Parrot in possible pomegranate tree motif. Adapted from (Auret and Maggs, 1982: 20).

Several larger dishes contained foliate rims, which were theorized by Auret and Maggs to have been used to serve food. The insides of these dishes contained the Taoist trigrams alongside clouds and decorative borders, while the outsides were decorated with the classic scroll border which was accompanied by waves, rocks, dragons, and fire motifs. Other artifacts of

interest included an item referred to by the researchers as a "candlestick", with a broken candle holder portion (Auret and Maggs, 1982: 18). This porcelain candlestick was decorated with the diamond diaper border or trellis, along with fish and water plants placed above rocks and waves (Auret and Maggs, 1982: 23). Vase fragments include the neck of a "bottle-shaped" vase, pieces referred to as "hexagonal forms", one of which contained an inscription that read 'made in the Great Ming period', and a potential "*mei-p'ing*" vase neck (fig 24) (Auret and Maggs, 1982: 18, 24). *Mei-p'ing* vases are a distinct type of Chinese ceramic vase that are traditionally used to display the branches of plum blossoms; the vase is tall, originating from a narrow base that gradually spreads into a wider body, which abruptly transitions into a rounded shoulder that then converges into a narrow and short neck, containing a small opening (Welch, 2013: 17).

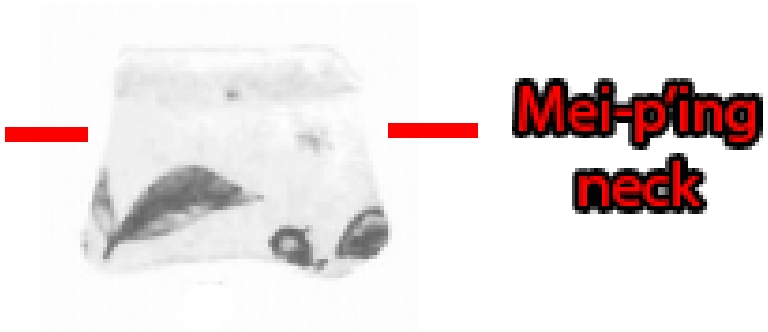

Fig 24. *Mei-p'ing* style neck fragment. Adopted from (Auret and Maggs, 1982: 23).

Variously shaped ceramic boxes were recovered from the wreck, including round boxes, boxes with bracket-shaped sides, and square-shaped boxes, the latter being the most common. The boxes had lids and stand on feet shaped like the heads of Lions of Fo or Dogs of Fo (fig 25) (Auret and Maggs, 1982: 18). Lion of Fo, also known as Dog of fo, Lion of Buddha, or Shishi, is

a decorative figure typically used as a guardian symbol for Buddhist temples and is found on a variety of Chinese pottery. The Lion of Fo is usually depicted as a snarling lion and accompanied by a mate, the male traditionally holds an orb, while the female is depicted with a cub (Encyclopædia Britannica, 2015). Auret and Maggs note that these legs were cast separately from their respective boxes and were attached after bevels had been cut into the boxes. The square boxes were decorated with lotus scrolls or floral motifs on their sides and had lids decorated with floral scrolls. Circular boxes have floral motifs on their sides and contain lids with repeating border patterns (Auret and Maggs, 1982: 18, 24). Lastly, a few pieces of 'spouted ewers' (jugs) were also recovered from the *São Bento* site (Auret and Maggs, 1982: 18).

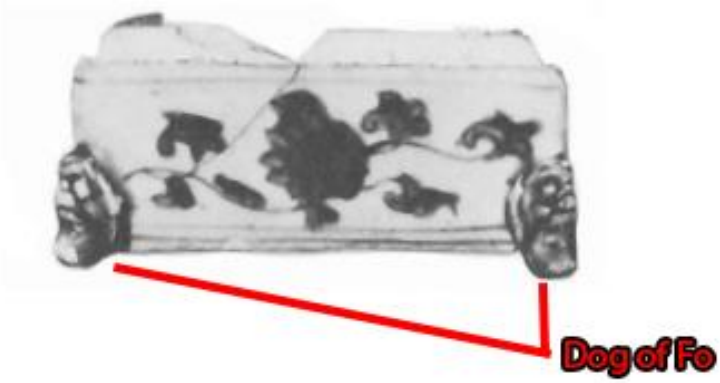

Fig 25. Porcelain box with feet resembling Dog of Fo. Adapted from (Auret and Maggs, 1982: 24).

Coarse Porcelain

According to J. Ayers of the Victoria and Albert Museum, the coarse porcelain among the collection represents a regional product most likely from southern China, an idea which coincides with claims made by E. Vernier and J. Millot of the porcelain from the Vohemar site

(Vernier and Millot, 1971: 83, as cited in Molet, 1972: 149-150). The coarse porcelain is neither true porcelain nor translucent, but instead is a 'porcellanous' form of stoneware, according to C. Woodward. The coarse porcelain is described as having a porous body and ranging in color from white to a light brownish yellow, the underglaze varied from black to an 'inky' blue. The glaze was denoted as semi-transparent with a 'pale grey-green' to brown coloring. Auret and Maggs point out that many of these pieces suffer from pinholing and crazing (Auret and Maggs, 1982: 18). Crazing refers to a flaw in ceramic glazing where small hairline cracks appear in the glazed surface and are caused by a discrepancy in thermal expansion in the body of the ceramic and the glaze. Crazing typically appears directly after firing, but can also appear many years later depending on the glaze (Hansen 2020).

The coarse porcelain is also much softer than the true porcelain, it therefore suffers from chemical weathering and has the proclivity to be broken into tinier pieces. The majority of the coarse porcelain within the *São Bento* collection is made up of fluted dishes with foliate rims, similar to the ones found among the true porcelain collection. These dishes also have motifs akin to those on the true porcelain versions, containing similar scrolls and diamond diaper border decorations. Although these pieces do contain their own unique style of border motif consisting of a row of nesting arcs, occasionally broken up with a crosshatch design at certain intervals (Auret and Maggs, 1982: 18). Because most of these porcelain shards were too broken up to have their central motifs readily identifiable Auret and Maggs compared them to examples from the Vohemar cemetery in Madagascar. Of the central motifs, the most frequently depicted the *'ch'i-lin'* (Qilin), surrounded by fire forms (Auret and Maggs, 1982: 30). The Qilin is a mythical creature known in Chinese and other East Asian cultures. It is often depicted as a hooved chimera, sporting a single horn on its forehead, a deer body, an oxtail, and a series of dragon-like

features, such as manes, beards, scales, and whiskers (Encyclopædia Britannica, 2020). The best example of a Qilin among the coarse porcelain in the collection contained the head, a fire form, part of the mane, and a shaggy tail. Most of the other sherds only depicted the tails and the front hoof. Another identifiable motif among the assemblage was of two lions with ribboned balls. There were other examples among the coarse porcelain persisting of both larger and smaller bowls, however, none of these pieces were complete enough to allow for a reconstruction (Auret and Maggs, 1982: 30).

Earthenware

Only one piece of earthenware from the *São Bento* collection contained decorations. This piece is believed to be of provincial Chinese origin and is described as a large dish having an indented pattern on its rim and a 'sgraffito' motif on its inside (Auret and Maggs, 1982: 30). Sgraffito refers to a decoration technique found in either pottery, produced by applying two layers of contrasting glaze or slip to an unfired ceramic body, or on wall décor, by applying layers of contrastingly colored plaster to a moist surface, and then, in either case, scratching the surface to reveal the underlying layer(s) (Weyer *et al*., 2015: 102). The glaze of this piece is a transparent olive-green color over a grey-buff colored body (Auret and Magss, 1982: 30). Other earthenware pieces from the collection primarily consist of jars, mainly made up of large containers with four strap-like handles and 'rolled' rims. Most of these jars are unglazed, aside from a few with a flakey dark greenish-brown glaze and are believed to most likely be of Chinese origin (Auret and Maggs, 1982: 36).

Gold Rings

14 rings of two different varieties were recovered from the area around the *São Bento* wreck site, one of the rings fits into a more basic category while the other 13 rings fit into a more intricate grouping. According to Auret and Maggs, the basic ring holds a 'cabochon' ruby while the 13 intricate rings contain a "U-shaped panel or 'quatrefoil bezel' (fig 26) on each of the four sides of the ring setting"; while this first ring holds a simple "table-cut" ruby, the other rings lack their gemstones or instead contain "table-cut" diamonds (Godfrey, 1969: 109, as cited in Auret and Maggs, 1982: 8, 10). Before the invention of gemstone cutting, cabochon was the default method in preparing gemstones. Cabochon refers to a gemstone that has been shaped and polished instead of faceted, resulting in a rounded obverse form with a flat reverse (Bonewitz, 2005). A quatrefoil refers to a decorative component that forms a symmetrical outline of four partially overlapping and equal circles, resembling a four-leafed clover, and is traditionally used in Christian symbolism and believed to symbolize something in fours (Rest, 1956: 36). These 13 complex rings were identified by A. Somer-Cox of the Victoria and Albert Museum as being either common "early or mid-sixteenth century Renaissance jewelry"; with the simpler example potentially being crafted as early as the 14th century (Auret and Maggs, 1982: 8). Auret and Maggs point out that these intricate rings were likely been coveted by the European elite of the mid-16th century, as images of the rings appear in several portraits from this period; including that of Lady Jane Grey by Master John, which has recently been reidentified to be a painting of Katherine Parr (approx. 1545), the English Court and Henry VIII by Hans Holbein (1533-1543), Dr. Léon Braunsberg by Cranach (1472-1553), and Steven van Herwijck by Mor (1519-1576) (Auret and Maggs, 1982: 8-9; James 2018). Auret and Maggs also point out that such rings do

not show up in later portraits meaning they most like went out of fashion toward the end of the 16th century (Auret and Maggs, 1982: 9).

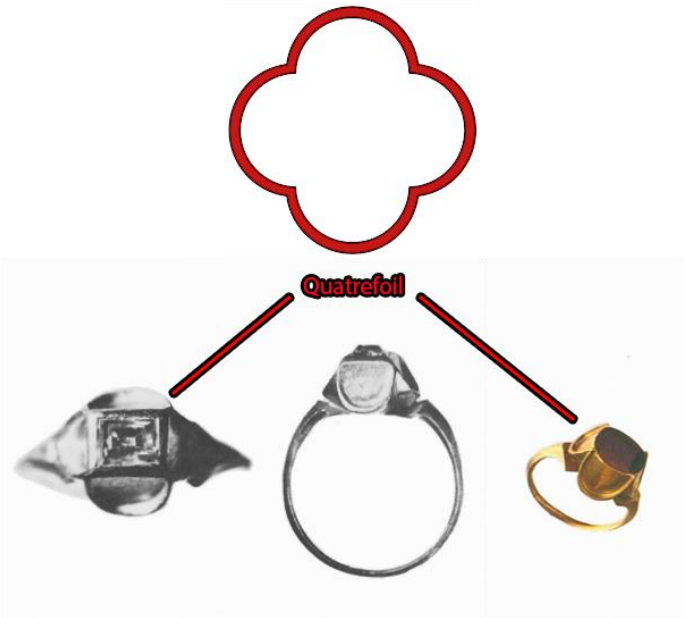

Fig 26. Rings from the *São Bento*. Adapted from (Auret and Maggs, 1982: i, 10).

Because the intricately styled rings were standardized and regularly recovered from Miskaba near the wreck site, Auret and Maggs theorize that they were part of the ship's cargo rather than personal effects. Additionally, all of the rubies from the *São Bento* were analyzed for their zircon impurities and found to have originated from Sri Lanka. Because India was the sole source of diamonds during this period, they most likely have a similar origin as well. This evidence indicates that jewelry makers in India were crafting rings intended for exportation in the European market (Auret and Maggs, 1982: 9).

Earrings

Two gold pieces were identified by Skelton of the Victoria and Albert Museum, as the lower portion of an Indian "filagree" style earring, known as Jhumka. Auret and Maggs describe the ear-rings as "two hemispherical pieces worked in gold… The larger one is set with small cabochon rubies, many of poor quality; the smaller is made up of twisted gold threads" (fig 27) (Auret and Maggs, 1982: 9). The researchers point out that while this style of earring is primarily used in the 18th century, it is possible that such earrings were also found in the 16th century (Auret and Maggs, 1982: 9). Filigree refers to a method in jewelry crafting in which wires are soldered into patterns; the wires can also be organized into braids, twist, or singularly, they may also be either beaded or plain. The most common filigree patterns consist of straight lines, spirals, and circles (Higgins and Higgins, 1980: 21).

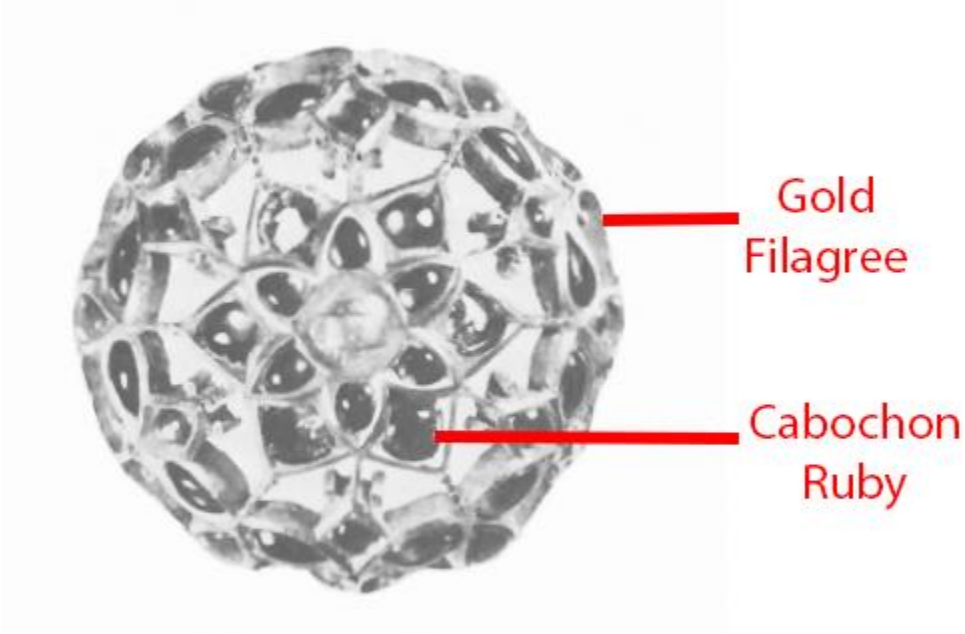

Fig 27. Earring from the *São Bento*. Adopted from (Auret and Maggs, 1982: 10).

Intaglio

The intaglio is an anonymous bust or portrait engraved into a piece of carnelian. This artifact was discovered as early as 1934 and had since been set into a ring. Intaglios were a popular trinket during the Renaissance period (Auret and Maggs, 1982: 9-10). The term intaglio is often used to refer to an engraved gem, typically these contain depictions of portraits or important symbols, and were found throughout the ancient world (Middleton, 1891: 26).

Gold Coin (Cruzado)

A single gold cruzado was recovered from the *São Bento* site, found stuck between two rocks on the island near shallow water. The coin displays the Royal Portuguese coat of arms encompassed by the legend 'I0A 111 POR ET AL R', which according to Auret and Maggs refers to "John III King of Portugal and the Algarve", who ruled from 1521 to 1557. Engraved on the reverse of the coin is a cross with the phrase 'In hoc signo vincit'. This coin places the date of the wreck no earlier than 1521 (Auret, 1977: 231-235, as cited in Auret and Maggs, 1982: 9, 11).

Carnelian Beads

Carnelian beads from Cambay, India were among the most frequently recovered artifacts from the *São Bento* site. According to Auret and Maggs these beads were traded to colonial areas (such as West Africa), by several European maritime nations, including the Portuguese. Most of the carnelian beads from the *São Bento* site are shaped like lozenges, however, other examples have been recovered as well, including a faceted biconically shaped bead, an elongated hexagonally shaped bead, and a short cylindrically shaped bead measuring 7 mm long and 12

mm in diameter (Auret and Maggs, 1982: 9). As pointed out in the *São João* section, carnelian beads, also referred to as trade-wind beads, are indicators of a homeward-bound shipwreck, as they were only present on ships returning to Europe from India (Bell-Cross, 1987: 22; Boxer 1959).

Garnet

Aside from the carnelian beads, there was a broken small faceted garnet measuring 4 mm wide and 7 mm long (Auret and Maggs, 1982: 10-11).

Money Cowries

An estimated 18.7 kg of money cowries were recovered from the barrel of the large muzzle-loading cannon, as mentioned previously. Auret and Maggs note that the cowries were packed incredibly tightly into the muzzle of the canon, which means that they had been purposely stored inside the canon, further alluding to the idea that the canon must have been stored away in the hull of the ship at the time of the wreck (Auret and Maggs, 1982: 11). As originally referenced by Auret and Maggs, money cowries originate from tropical areas in the Indian Ocean and were primarily exported to West Africa from the Maldive Islands, a trade which existed for centuries before Portuguese colonization. Money cowries were used in West Africa as a popular form of currency, hence their name; however, after the Portuguese began trading them with West Africa their value depreciated significantly (Mauny, 1961, as cited in Auret and Maggs, 1982: 11).

CHAPTER VII

THE WRECK OF *SANTIAGO*

The account of the wreck of *Santiago* was authored by Manuel Godinho Cardoso and originally published in Lisbon in 1602. Godinho Cardoso was likely not a survivor of this wreck, but possibly had close knowledge of the shipwreck acquired from interviews and conversations with survivors. Godinho Cardoso most likely gathered this information while performing a series of official investigations into the disaster. In his account, Godinho Cardoso points out that it was impossible to determine responsibility for the incident as every officer blamed one another for *Santiago's* loss. Godinho Cardoso bitterly describes the wreck of *Santiago*, often openly referring to the incompetence of Portuguese mariners (Duffy, 1955: 33). It should be noted that Godinho Cardoso's account begins with the wrecking of *Santiago*, while the voyage details expanded upon by Gomes de Brito were extracted from an unknown text, concerning the voyage from Lisbon up until the wrecking (Duffy, 1955: 177).

Captained by Fernão de Mendonça and carrying many Jesuit missionaries and the new Inquisitor General of India, Frei Tomás Pinto, *Santiago* set out from Lisbon, bound for India on April 1st, 1585. Three days into the voyage *Santiago* encountered a severe storm and was nearly lost. While this near catastrophe early in the voyage convinced many onboard the *Santiago* to favor returning to port, the storm soon subsided and the ship resumed its course. Three days after the storm subsided, two unfamiliar sails emerged on the horizon. In response, *Santiago*'s crew hastily prepared the ship for battle. This effort was done with great difficulty as the decks had been over-encumbered with a great number of crates and casks. As fortune would have it, one of the ships turned out to be a Portuguese caravela, chased by an English ship. Upon sighting

Santiago, the English ship swiftly halted its pursuit of the caravela and left the company of the Portuguese ships. Somewhere off the coast of Guinea, *Santiago* found herself becalmed for sixteen days, slowly drifting across the equator in a scorching heat by May 27th. Intermittent winds eventually prevailed and in two months *Santiago* rounded the Cape of Good Hope and began sailing north along the coast of Natal. Unfortunately, on August 5th, the winds began to die once more. Fearing that *Santiago* might be becalmed indefinitely if they were to attempt passage outside Madagascar towards Cochin, the decision was made to instead proceed directly north through the perilous Bassas da India shoals, at approximately 22° (Duffy, 1955: 115). If the winds changed and picked up before reaching the Bassas da India the *Santiago* would change course once again and sail directly to Cochin; however, if they continued their current course the plan was to make port at Mozambique for food and water, and from there sail to Goa (Duffy, 1955: 115-116).

The passengers carrying valuable cargo detested this plan and began a whisper campaign against it, as they feared that once the ship made port in Mozambique she would also be wintered there in which case they would incur a loss on the goods they wished to barter in India. By August 19th, *Santiago* continued north, approaching the shoals of Bassas da India. On this day the pilot measured the sun and calculated that the shoals approximately seven to eight leagues (38 to 44 km) to the north (Duffy, 1955: 116). That night the crew assumed they had already passed the shoals during the day when in fact, they were upon the shoals. *Santiago* struck three times and the bottom of the ship mounted the reefs (Duffy, 1955: 116-117). Two of the decks were instantly shattered to pieces, while another two decks were thrown, together with the masts and sails, onto the top of the shoals, with the mainmast breaking at the base upon impact. *Santiago* wrecked with more than 375 people on board (Duffy, 1955: 129). According to

Cardoso's account, in the ensuing chaos all those on board began to confess their sins en mass, forming a mob around the priests and filling the night air with their wails. In the light of the coming dawn, those aboard were able to gaze upon their predicament. The reef upon which they had dashed themselves was approximately twelve leagues (67 km) around and four leagues (22 km) across. At low tide it was covered in merely two to three hands of water (about 2 to 3 m); however, by high tide, there was no foothold to be found within three leagues (17 km) of the *Santiago*, aside from a group of large rocks that ran northward (Duffy, 1955: 117).

The red-colored coral was fragile but poisonous and razor-sharp, leaving bloody wounds whenever it touched human flesh (Duffy, 1955: 117-118). *Santiago* itself was fragmented into a rough triangle of floating remains consisting of the stern, bow, and one of the ship's sides. In the middle of the triangle was a pool of water that was six feet (2 m) in depth at high tide, while on the north side there was a small opening through which the survivors eventually used rafts to escape. On August 20th, the captain and 24 others gathered in the only intact small boat and attempted to sail to safety on a supposed investigative expedition, promising to return forthwith for the remaining survivors who still clung to the remains of the ship. Father Tomás Pinto was to accompany them on this journey but was persuaded to stay aboard to offer spiritual guidance to the stranded passengers and crew. To the dismay of those still aboard, the boat never returned. In a panicked effort to save themselves, many aboard the *Santiago* mistakenly decided to enter the water or cling to floating hull remains, all of whom were swept away by the ensuing undertow and drowned. For two days those aboard the shipwreck were trapped with no way to safely leave the ship, until on the third day when heavy waves broke apart the ship's side, releasing a damaged longboat. Galvanized by this momentary fortune, a group of survivors under the elected command of Duarte de Melo repaired the longboat with pieces of wood from crates, using torn

portions of their shirts and Flemish cheese for caulking, hoping to escape in it as the tide returned (Duffy, 1955: 118).

The longboat was ill-equipped in provisions, carrying only several cases of marmalade, a few kegs of preserves, cheese, a flask holding six pints of orange flower water, and a barrel of wine. As for equipping the longboat, those on board were able to rescue a pike, an oar, and a sheet. Using the oar the crew constructed a makeshift mast, from the pike they made a yard, sewing the sheet together with bits of cloth they crafted a sail, and some fishing line became a stay and halyard (Theal, 1898: 343). After repairs on the longboat were complete Father Pinto came to inspect the boat, not wanting to be abandoned a second time, he compared the boat with one of the rafts being built and decided upon entrusting the former (Duffy, 1955: 118-119). Seeing Father Pinto favoring the longboat the other panicked survivors desperately swarmed the longboat and threatened to flood it with their weight. Duarte de Melo proposed to Father Pinto that he convince the mob to relieve themselves of their weapons. Out of respect for Father Pinto, many of the men respected his wishes and dropped their arms, allowing the longboat to be pushed off from the reef at high tide with no trouble from the hundreds of survivors being left behind (Duffy, 1955: 119). It should be noted, however, that before launch Duarte de Melo was approached by some of the sailors and the boatswain's mate that their voyage could not commence until there were fewer people aboard the boat. Agreeing, Duarte de Melo sent forth five men with swords among the survivors and had seventeen of them thrown out into the sea, including men who had worked feverishly to repair the boat (Duffy, 1955: 120).

As the tide continued to rise the five rafts that had been constructed were launched with great difficulty, as those aboard were not only fighting against the reefs and waves but also defending themselves with swords against those still trapped onboard that tried to board them.

Both men and women who attempted to cling to the sides of the rafts for safety were beaten off and wounded by those already on them. The reefs were quickly littered by the men and women who were refused entry aboard the boat or rafts, many of whom began to drown as the tide came in. Two women and a great number of men tried to swim after the boat and rafts, but all drowned in the attempt. One of the individuals, a boy of only fifteen, swam nearly half a league (3 km) in chase of the boat, upon reaching it he was met with a sword in his face, which he fearlessly grabbed on to as if a rope and refused to let go until they let him onboard (Duffy, 1955: 119). By that evening the rafts passed the highest portions of the reefs where many had sought refuge from the tide. Thinking they may have renewed attempts at salvation many of the survivors climbed down into the freezing water calling out to their friends and relatives in the crowded rafts, but their cries would go unanswered, silenced by the sea (Duffy, 1955: 120).

Initially, after exiting the reef those aboard the longboat were not able to find land, after much discussion, it was decided that they would continue with their voyage and not return to the ship (Theal, 1898: 342). Around this time those onboard created an additional foresail, using another oar as the mast, swords for the yard, and shirts for the sail. Additionally, because the seawater was sprayed over the sides of the longboat, the crew crafted screens from colored cloth retrieved from the reef; using planks taken from the deck they were also able to craft a rudimentary rudder. Using a mariner's compass, the crew steered north by north-west. At this point they were extremely anxious to spot land as the longboat was taking on a vast deal of water as she was greatly exposed. The crew's daily rations consisted of a portion of marmalade and three pints of wine, heavily mixed with the saltwater that continually washed into the longboat. For the first two days, they navigated through heavy seas, until on the third day, Wednesday, the weather calmed, and the wind shifted to the north-east, making the crew change course, steering

north-west. As the currents eventually picked up, the crew dismasted the longboat and began rowing using the three oars. On the following Friday, the crew approached Sofala, signaled by whale sightings and shallow waters; however, they could not cast anchor as they only had a ten-fathom line (18 m) (Theal, 1898: 343). August 24th, the crew was able to anchor in nine-fathoms (16 m) of water at daybreak and as the morning fog dissipated, come midday, they finally sighted land, along with the smoke of native clearings (Theal, 1898: 343-344).

Suffering greatly from dehydration many aboard the longboat urged the rest to land immediately, but the experienced shipmaster amongst them encouraged the crew to continue along the coast until they reached the first islands near Mozambique. The master believed that not only would it be easier to reach Mozambique from that location, but he also believed that the longboat would go to pieces if they tried to land in their current position and he was wary of the natives. The crew followed the master's advice and for three days they cruised along the coast until they reached three fathoms (5 m) of water in which they attempted to cast anchor. For this endeavor, the crew used a copper vessel filled with seawater as the anchor weight and a portion of untwisted rope serving as a cable. This makeshift anchor did not suffice. In response, the crew rowed all night keeping the prow of the longboat to sea as to not accidentally strike her against any rocks. During the four days that followed the longboat traveled against the wind for over 40 leagues (222 km). On the third day since the crew tried to anchor the sea became violent, with the wind running south-west and the waves becoming increasingly rough. The crew decided to run ashore, lest the longboat be overcome. Surrounded by rocks and at low tide with a crosswind, the crew steered the longboat towards land. Miraculously, despite the overpowering waves and spray that covered the longboat, the crew was able to safely land the craft and all the provisions within, whereupon they planned to beach the longboat for the night and set out for the islands

near Mozambique after the sea had calmed and drinking water had been obtained (Theal, 1898: 344).

After landing, the crew investigated the interior of the land where they found ditches of water in which they used to fill up a barrel that was brought back to the longboat. Back at the beach, the crew came across a native who was willing to barter with them, trading some fish for one of their hats. Following this exchange, the Portuguese briefly sent one of their own back with the natives to their village to gather fuel. Upon their return, the Portuguese were given directions towards Quelimane, to the north-east, and Luabo, to the south-west. The following night as the Portuguese slept near the beach, the captain had laid within the chest that they had brought with them in the longboat, upon seeing this chest the natives forced themselves upon it, hoping to scrounge anything of value. Not long after, a second group of natives arrived on the scene, who after arguing with the first group plundered the longboat and surrounding area, taking swords from the beach and the sails made of cloth from the longboat. In the morning, the Portuguese left, setting off north towards Quelimane. Shortly into their trek, they were assaulted by more natives, who robbed them and stripped them naked. Portuguese who could not remove their articles quickly enough found themselves trampled in the frenzy (Theal, 1898: 345). From that instance on the Portuguese traveled up the coast weak and completely exposed (Theal, 1898: 346). Eventually, with the aid of friendly natives who were allies of the Portuguese crown, the survivors of the *Santiago* shipwreck were able to reach Luabo (Theal, 1898: 346-348). It was in this place that the survivors were warmly and hospitably welcomed by Francisco Brochado. Brochado was a former servant of the Infante Dom Luis who had spent the past 30 years as the chief warden of the river Cuama, overseeing that region's trade with Sofala. At this time, only 18 survivors of the *Santiago* were left alive (Theal, 1898: 348). Eventually, by November 16th,

most of the survivors in the company of Brochado left for the town of Sena, where the survivors arrived on November 25th (Theal, 1898: 349-353). By December 27th, the survivors left Sena for Quelimane, which they reached on January 10th. The survivors then left Quelimane for Mozambique, arriving safely on February 21st, 1586 (Theal, 1898: 354).

Wreck Site

Located in the Mozambique Channel at lat. 25° 27 S., long. 39° 45 E., the Bassas da India atoll is part of a cluster of small French-controlled islands, the Iles Esparses (fig 28). At high tide the Bassas da India becomes submerged within the channel, leaving it uninhabitable. The atoll is submerged in one to three meters of water, and during low tide the enormous circular coral reef stretches between 10 to 12 kilometers in diameter. The flatter portion of the reef is at times over a kilometer wide above the water and at low tide it creates an enclosed lagoon populated by large vertical coral outcrops. The current is described as powerful and accompanied by hazardous whirlpools; a gap on the north-east side allows water to circulate between the ocean and the lagoon during mid-ebb tide to mid-flood tide. Access to the islands is restricted as they are considered "complete integral natural preserves", acting as habitats for sea-turtle to lay their eggs. Discovered by Gaspar Gonsalves, the atoll is positioned in the center of a sailing route frequented since the early 16th century and is known for the many sunken ships in the area. Unfortunately, in 1976 the site was looted by South African divers and a great number of artifacts were subsequently sold off to a plethora of museums around the world, such as the Natal Museum in South Africa and the Lisbon Navy Museum in Portugal (Bouquet *et al*., 1990: 81-82; L'Hour *et al*., 1991: 175-176).

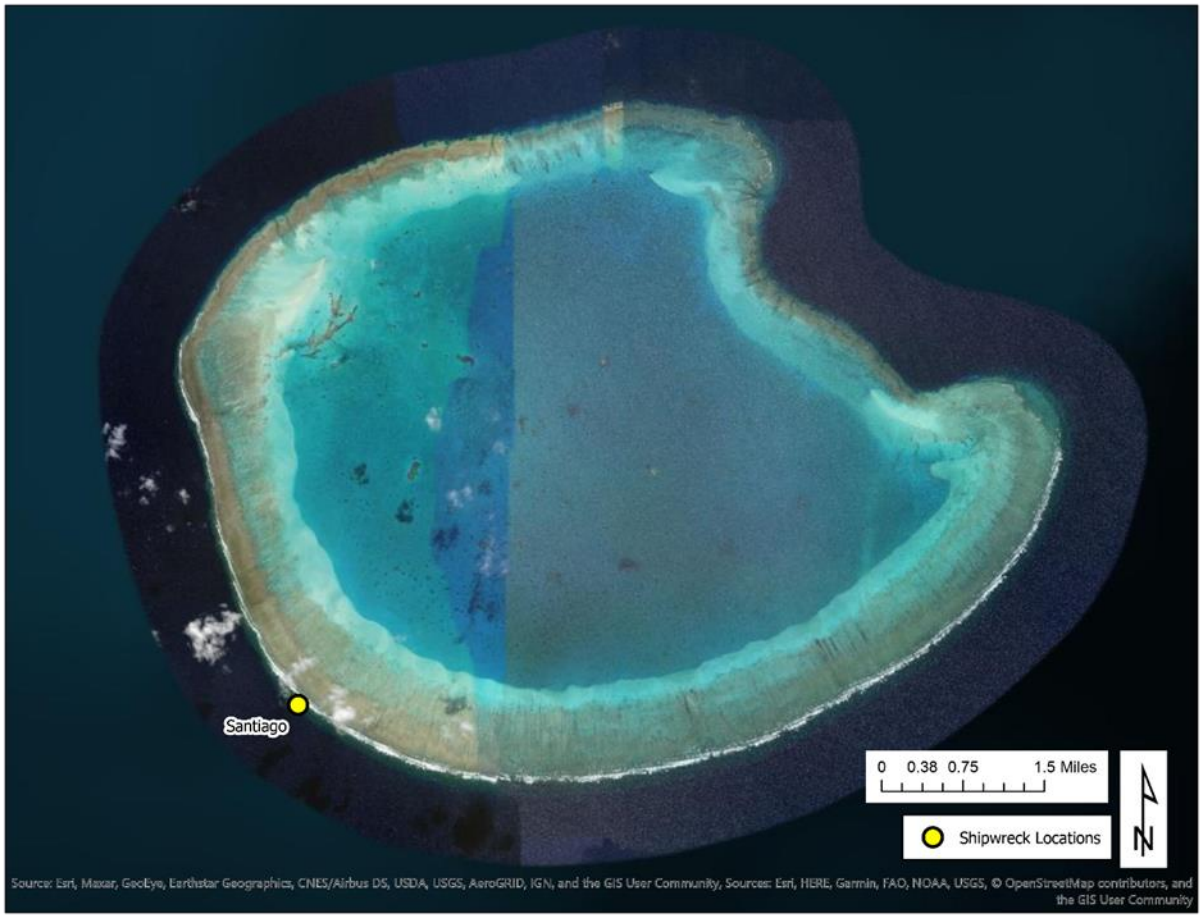

Fig 28. Map of the wreck *Santiago*.

Survey

As originally pointed out by the authors of the Bassas da India site reports, the aforementioned looting coincided with a book published in 1978 by Peter Throckmorton, *The Sea Remembers*, in which *Santiago* is identified among the wrecks at the Bassas da India atoll as early as 1977 (Throckmorton, 1987: 170, as cited in Bouquet *et al*., 1990: 83; L'Hour *et al*., 1991: 180). In response to the looting at the Bassas da India atoll, the French Ministry of Culture in partnership with American financial sponsors surveyed the atoll in September and October of 1987. The survey was designed to divide the reef into zones and consisted of two separate

methods, the first method entailed walking across portions of the atoll with the aid of metal detectors starting daily at low tide. The second survey method consisted of using magnetometer readings of the lagoon and included the use of two magnetometers which produced tens of kilometers of profiles in the center and western side of the lagoon. Surveys of the outer margins of the atoll quickly proved impractical, for the seabed reached depths as far as 300 to 400 meters deep around 200 meters from the atoll and nearly 2000 meters in depth about 1.6 kilometers away from the atoll. The southern portion of the atoll which measures 25 kilometers of the total 40-kilometer circumference is constantly barraged by deadly waves between three and seven meters in height. While a survey of the northern sector of the atoll proved relatively easy it was the hazardous southern sector that visibly proved most difficult for it was brimming with nearly flooded fissures created by the endless currents and collapsing dead coral. During the survey of the treacherous southern sector, several historical and modern shipwrecks were analyzed, including one tentatively identified as the remains of *Santiago* from 1585 (Bouquet *et al*., 1990: 82-83; L'Hour *et al*., 1991: 176 -180).

Santiago **Finds**

Described as a "relatively homogeneous site", the artifacts are clustered in a ten-meter-wide and 30-meter-long basin, containing 10 cast-iron cannons and two large iron anchors. Five additional anchors and a large gun encased in coral lay within a 50-meter radius of the artifact cluster, all of which appear to be European and from the late 16th century. Based on historical documentation and their 16th century characteristics the cannons and anchors were tentatively linked to the *Santiago*. Despite the possibility of additional artifacts potentially buried under one meter of dead coral, further excavations were not carried out at the tentative *Santiago* site for

fear of jeopardizing the lives of the divers due to the hazardous conditions of the area. Unfortunately, a lack of adequate archaeological evidence and dangerous conditions hampered investigations and has prevented a definitive identification of the site (Bouquet *et al*., 1990: 83; L'Hour *et al*., 1991: 179 -180).

Salvaged Guns

In a newsletter sent out by *The Cannon Association of South Africa* dated September 2006, twelve bronze Portuguese cannons were analyzed and described at the request of the *Centre for Portuguese Nautical Studies* (SA). Of these twelve, four were housed in the Natal Museum of South Africa and eight were stored on wooden planks in a building near an anonymous municipal establishment. Four of the guns were said to have originated from the *São Bento* while the other eight were supposedly salvaged from the *Santiago* site, all of which display the Portuguese crest and armillary sphere (de Vries, 2006: 1). The purported *Santiago* guns will be described below as they organized within the newsletter.

Durr 694 ex Santiago: Chambered perrier or stone firing cannon with "*camelo*" proportions. Notably, the first reinforce is smaller in diameter than the second, possibly reducing the weight and amount of bronze used. This gun is also missing all four lifting rings. Guns of this type typically measured between eight to 14 calibers in length (de Vries, 2006: 1).

Durr 695 ex Santiago: Culverin or "*colubrina*", this gun is described as being long in proportion to its caliber, being 27 calibers in length. The author doubts that this gun was chambered (de Vries, 2006: 1).

Durr 696 ex Santiago: Culverin or "*colubrina*", nearly identical to Durr 695, measuring 27 calibers in length. Besides the Portuguese crest and armillary sphere, this gun displays the mark of King Sebastian 1557-1578, via the phrase "SEBAS TANIVS", displayed below an "R" and above an "I" (de Vries, 2006: 1).

Durr 876 ex Santiago: "*Berço*", a swivel-gun with a 72 mm bore, containing a separate iron chamber, although the chamber was not recovered from the wreck site, most likely having corroded away. In addition to the Portuguese crest and armillary sphere, this gun contains a founder's mark containing a single letter "C" on the chase. The receiver which held the chamber is asymmetrical, the left wall measures 45 mm in thickness, while the right wall measures 58 mm in thickness. The author suggests that due to a lack of corrosion on the cavity the gun was probably cast in this manner, most likely accidentally (de Vries, 2006: 1).

Durr 878 ex Santiago: "*Pedreiro*" or stone firing gun, of 173 mm and 16.3 calibers in length. The first reinforce was of greater diameter than the second and showed no signs of whether or not it was chambered. According to the author guns of the caliber and proportions were referred to as "*camelete*". The cannon is marked as weighing 12-2-14. In addition to the Portuguese crest and armillary sphere, the gun is marked with the letters "S B T A", potentially referencing King Sebastião (de Vries, 2006: 1).

Durr 879 ex Santiago: "*Berço*", a swivel-gun with a 108 mm bore containing a separate iron chamber which likely measured 550 mm in length. At the top of the rear end of the receiver, the gun has the weight measurements 7-2-2, carved into it. Besides the Portuguese crest and armillary sphere, the gun contains the partially discernable mark of "SEBAS TANVIS" (de Vries, 2006: 2).

Durr 882 ex Santiago: "*pedreiro*" or "*camelete*", with a bore measuring 179 mm and chambered to 129 mm in length. Notably, the lifting rings on this gun are misaligned. Besides the Portuguese crest and armillary sphere, all of which are in excellent condition this gun also contains the mark of "FCRo", similar to the founder's marks belonging to some of the *São Bento* cannons (de Vries, 2006: 2).

Durr 883 ex Santiago: "*pedreiro*" or "*camelete*", with a bore of 180 mm. The weight is etched into the top of the base ring, reading 12-3-13. The author notes the caliber to bore ratio as 13.5. Besides the Portuguese crest and armillary sphere, the gun contains the partial mark of "SEBAS TANIVS", however according to the author only the last two letters of each word are still legible (de Vries, 2006: 2).

CHAPTER VIII

THE WRECK OF *SANTO ALBERTO*

The account of the *Santo Alberto* was authored by João Baptista Lavanha and primarily relies on a notebook written by the pilot of the ship, Rodrigo Migueis, and was confirmed by Captain Nuno Velho Pereira, who led the survivors back to Mozambique (Duffy, 1955: 34; Boxer, 1959; Bell-Cross, 1988: 56).

Captained by Julião de Faria Cerveira, the *Santo Alberto* left Cochin, India on January 21st, 1593 headed for Portugal. The ship sailed her course under favorable conditions until she reached a latitude of 10° South. As the ship began to round the southern tip of the island of St. Lawrence (Madagascar) she sprang a leak in the hull. Initially, this leak was not a major issue; however, at approximately, latitude 27° South a strong southern wind began, which increased the amount of water leaking into the ship. While sailing close to the wind to avoid the tip of St. Lawrence, the ship thrusted forward, resulting in the bowsprit springing and needing repairs. Despite these mounting problems the ship continued to sail towards her destination and on March 21st, at a latitude of 31 ½° sighted the Land of Natal (the southern end of Africa), coasting the next day to a latitude of 32° South (Boxer, 2001: 108-110).

At this point, the wind began to cause major leaking in the ship's hull which lead to a rapid rise of water within the pump well. It was soon discovered that the leak was coming from the fashion-pieces of the stern, meaning a repair would have been exceedingly difficult. To remedy the situation the crew was ordered to cut away a piece of the timber above the leaking fashion-pieces and stop the intake of water. This task initially stopped the water from coming in; however, not long after, more water began to rush in possibly due to the now weakened hull.

Soon the ship was reported to have been flooded with up to 18 hands of water (about 1.8 m), and a swift effort was made to lighten the ship and put her stern towards the wind. Empty kegs were taken below deck and used to bail out the water. The many trunks and chests belonging to the passengers were begrudgingly taken from below deck and thrown overboard to lighten the ship's load. The latter task was only undertaken after Captain-Major Nuno Velho Pereira promised the passengers a reimbursement of 45 quintals (slightly over two tons) of clove each if they would part with their possessions. The crew subsequently threw everything from the gun-deck and spice-holds overboard. By the next day, the water was coming in so rapidly that the chests on the second deck could not be removed, but instead had to be opened with hatchets so their contents could be emptied from the ship (Boxer, 2001: 110-111).

The crew worked at the pump tirelessly all day to remove the water from the decks and hold of the ship, but to no avail, as the seawater was coming in too quickly to halt the sinking of the ship. By nightfall, the ship contained approximately 12 hands of water (about 1.2 m), but by now the pumps were rendered useless as they had become clogged with peppercorn. To continue to empty the water from the second-deck Nuno Velho Pereira was lowered into the hold of the ship via pump cords and began to fill kegs with water. Soon the crew joined the captain-major and worked throughout the night to help stall the sinking of the ship, their hard work was eventually rewarded, as land was sighted the next morning. To guarantee a speedy landfall the crew set all sails and began to throw everything on the forecastle, poop-deck, and under the steerage overboard, as two of the decks were completely flooded and the chain-wales became submerged at this time. Simultaneously, the captain-major ordered all matchlocks and munitions be gathered from the quarter-deck and tied together for future use. The ship was now nearing

land and so the masts were cut away and the rudder was displaced at eight fathoms, and by eight and a half fathoms of depth, the ship touched ground (Boxer, 2001: 111-113).

The ship was completely aground by 10 in the morning on March 24th, approximately 400 paces (305 m) from the shore. The shrouds were then cut and as the masts fell overboard, many passengers promptly tried to escape onto them, but as the masts were still attached to parts of the rigging these passengers quickly found themselves beaten and drowned amongst the waves. The pounding of the waves quickly caused the masts to break the ship into two portions, severing the bottom decks from the top decks. The latter part of the ship holding the remaining passengers then drifted extremely close to shore. At this time the waves crashed violently between the masts and the poop to such a degree that men lashed themselves to the hull as to not be thrown overboard. Others attempted to swim for shore but quickly drowned due to the rocks, waves, and the debris that littered the sea. Upon nightfall, the poop deck broke off from the prow and drifted on to the beach. A soldier aboard the poop then swam to shore and attached a rope from the poop deck to a secure point on the beach allowing everyone to get ashore. At midnight, the forecastle drifted towards the poop deck and the survivors on the former deck were able to use this as a bridge to get ashore. By the time the tide began to rise the poop was hauled in by the line to shore and the rest of the survivors made it to the beach (Boxer, 2001: 113-114).

The official location of the wreck was recorded at a latitude of 32 ½° South, whose location was referred to by the Portuguese as Penedo das Fontes and by the locals as Tizombe. Upon reaching shore the survivors counted their numbers and it was recorded that 125 Portuguese and 160 slaves lived while 28 Portuguese and 34 slaves had perished. On March 26th, the day after landing the survivors scoured the beach for any supplies of which they could find. They were able to scavenge 12 matchlocks, three kegs of gun powder, swords and shields,

three cauldrons, rice, a keg of vinegar, mats, carpets, and quilts. To protect themselves from the elements and potential attacks from the natives the Portuguese entrenched themselves and made tents from expensive carpets of Cambay and Odiaz, valuable quilts of ginghams and *cachas*, and mats from the Maldives. The next day when the tide was low some of the crew went to the wreck and recovered six matchlocks, 12 pikes, and three more bags of rice. On March 28th both the beach and the wreck were scavenged again and three muskets, four matchlocks, two bags of rice, four jars of bread, a hog's head, olive oil, and a large number of preserves were rescued. Also, among the wreckage, a chest belonging to the captain-major was recovered containing 17 pieces of gold, 27 pieces of silver, writing boxes, and crystal rosaries. In total it is reported that the gold and silver were later sold in Mozambique for an estimated 16,000 cruzados (Boxer, 2001: 114-119, 125).

It was not long before the survivors made contact with a local tribe who had spotted them on the beach. The two groups met in a peaceful exchange where the locals offered the Portuguese two sheep and in return, they were welcomed with wine and sweetmeats. By the end of the gathering, the Portuguese left the natives with a parting gift consisting of a brass bowl full of iron nails and a writing box, as essential metals were believed to be a valuable commodity among the locals. In exchange for these gifts, the natives sent one of their own to show the Portuguese where to gather freshwater, as they were already feeling the effects of dehydration for their sources of water had become brackish (Boxer, 2001: 120-121). On March 29th, the captain-major selected officers to oversee the camp and arranged them into separate groups, the vanguard, the main-body, and the rearguard. The soldiers and sailors were also further divided into three groups, weapons were also divided out amongst the soldiers, totaling 27 matchlocks, 12 pikes, five muskets, and several swords and shields. On April 3rd the Portuguese left their

spot on the beach to begin their march in the direction of the nearest Portuguese port of Lourenço Marques, about 800 Km to the north. It had been decided that they would attempt to avoid the tragedies witnessed by the survivors of the *São Tomé* and the *São João* by marching the long way through the inner hinterlands instead of by the coast (Boxer, 2001: 124-127) However, such a journey is not without hardships and three months later upon reaching the bay of Lourenço Marques only 117 Portuguese and 65 slaves survived their 300-league march. It was in this bay that the survivors were told by some hospitable natives (Inhaca) and their king that a Portuguese ivory trader visited about every two years. By the start of July, the aforementioned Portuguese merchant ship on the ivory trade reached the bay and gladly received the survivors of the *Santo Alberto*. The remaining survivors safely arrived in Mozambique on August 6th, 1593 (Boxer, 2001: 178-186).

Material Culture of the *Santo Alberto*

In 1979, the deputy-director at the East London Museum, Graham Bell-Cross, investigated coastal sites in southern Africa where porcelain sherds had been found and compared them with survivors' accounts of the wrecks. With the help of Caro Woodward, an expert in Eastern porcelain, who was able to stylistically date the sherds, Bell-Cross created a brief list of all the Portuguese wrecks on the coast of eastern-South Africa and their associated archaeological evidence (Bell-Cross, 1988). Unfortunately, not much material culture associated with the *Santo Alberto* has been recovered and or published, as is the case with many of the Portuguese India-route ships. Due to the lack of material remains among the Portuguese India-route, Bell-Cross's texts are still considered to be the main resources for material culture analysis of many of these wrecks. For the location of the wreck of *Santo Alberto*, Bell-Cross asserted that

the ship wrecked at the Sunrise-on-Sea site, in latitude 32 ° 02’ S (fig 29) (Bell-Cross, 1988: 58), which is nearly the latitude given by the survivor account at 32 ½ ° S. According to the survivor account the *Santo Alberto* wreck location was referred to by the Portuguese as Penedos das Fontes, which Bell-Cross has associated with the name of a prominent topological feature referred to as Cove Rock. This feature is visible from a vessel half a mile off the Sunrise-on-Sea site (Bell-Cross, 1988: 59). The survivor account also depicts the beach and a nearby hillside stream as containing small pools that the Sunrise-on-sea site possesses (Bell-Cross, 1988: 59).

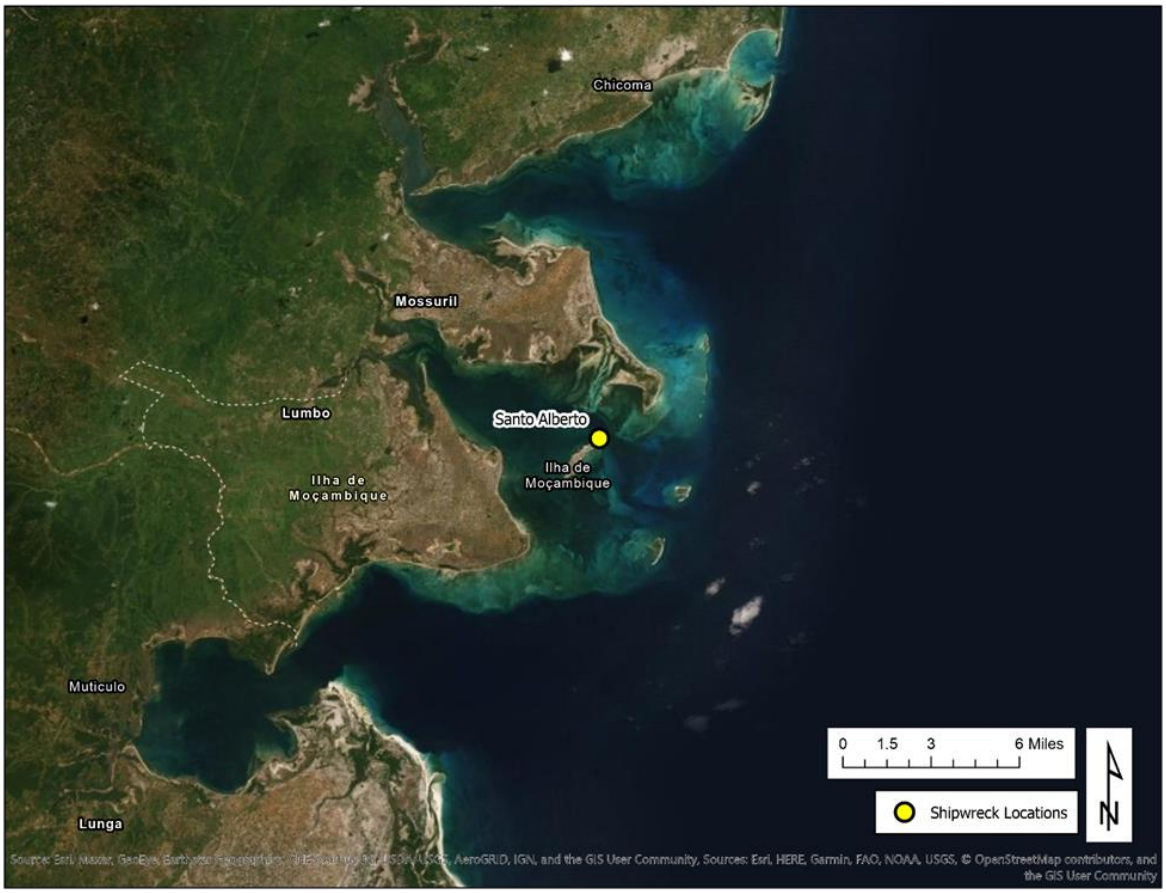

Fig 29. Map of the wreck of *Santo Alberto*.

Porcelain

Porcelain sherds found at sites between the Fish and Kei Rivers, such as the ones found near the Sunrise-on-Sea site, typically belong to the Late Ming stylistic period. This style was produced during the reign of Wan Li from 1573 – 1619, the last Emperor of the Ming Dynasty (Vernon, 1987). The characteristics of this type of porcelain are considered to be highly simplified, usually with a thin-fine body and white or greyish glaze. The color of these porcelain sherds is that of a silvery-blue with the motifs typically enclosed within panels (Vernon, 1987). Many sherds fitting this description were recovered from this site at were apply dated by Caro Woodard as late 16th century, most likely after 1580 (Bell-Cross, 1988: 59).

Cannons

Around 1950 the director of the East London Museum, Dr. Courtenay-Latimer recovered two muzzle-loading iron cannons from the Sunrise-on-Sea site. However, the cannons carried no identifying marks, and the bores were too corroded to be accurately measured (Bell-Cross, 1988: 59).

Carnelian Beads

Numerous carnelian beads were recovered from the site. Bell-Cross notes one large bead section in particular which seemed to form part of an ellipsoid-shaped bead; this section measures approximately 17 x 30mm which Bell-Cross notes as being the largest bead to have been recorded thus far (Bell-Cross, 1988: 59).

Pistol

A partial wooden pistol stock was found attached to a large concretion. Upon casting the cavity within the concretion, the reconstructed metal barrel was discovered to be partially round and hexagonal, as was typical of 16th and 17th century pistols (Bell-Cross, 1988: 59).

CHAPTER IX

THE WRECK OF *SÃO JOÃO BAPTISTA*

Not included in Brito's original two volumes, the account of the *São João Baptista* was written by one of its survivors, Francisco Vaz d'Almada. He was a soldier and nobleman who spent much time in the Indies and had even captained a ship to the coast of southern Malacca 10 years before the sinking of the *São João Baptista* (Duffy, 1955: 40; Boxer, 1959; Bell-Cross, 1988: 61).

On March 1st, 1622, the *São João Baptista* captained by Pedro de Morais Sarmento left Goa accompanying the Portuguese flagship *Nossa Senhora do Paraiso*, captained by Nuno Alvares Botelho. After sailing for approximately 15 to 20 days the pumps of *São João Baptista* were checked and it was discovered that the ship had 14 to 15 hands (about 1.4 – 1.5 m) of water in the hold. Because the pumps of the ship were originally built for a smaller galleon, all but one was too small to be of any use keeping up with the leak. Using buckets and barrels the crew was able to reduce the amount of water on board to around four hands (about 0.4 m). Upon reaching a latitude of 25° South the weather went from an exhausting heat to extreme cold, further exacerbating the conditions on board. Unfortunately, on the night of July 17th, *São João Baptista* departed from the course of the flagship as the light on the latter vessel's poop-lantern was lost in the darkness, leaving the *São João Baptista* and her crew alone at sea. And as fate should have it, on the morning of July 19th at a latitude of 35 to 30° South, two Dutch ships were spotted off the bow (Boxer, 2001: 190-191).

The Dutch ships were *Mauritius* and *Wapen van Rotterdam*, both Indiaman, which left the Cape on June 13th and bound for Batavia. Alone and outnumbered, the *São João Baptista's* crew strained to ready the over-encumbered ship for action. That afternoon *São João Baptista* fired two broadsides at the Dutch ships, marking the beginning of an engagement that would prove fatal for the Portuguese vessel. For the next 19 days, the three ships clashed in an all-out conflict ending as far south as the 42° latitude. For the first nine days of the engagement the ships fought from sunrise to sunset and by the end, the *São João Baptista* was doomed. The Portuguese ship's bowsprit was broken off near the gammoning, the main mast was shattered a yard and half above the mast partners, and the foresail was entirely destroyed. Additionally, the ship's reused and rotten rudder was destroyed by merely two shots. The destruction of the rudder was the beginning of the end of *São João Baptista* (Boxer, 2001: 191).

The Portuguese ship never stood a chance in this fight, as she left Goa without enough gunpowder or guns for any sort of extended conflict. She held only 18 guns of very small caliber, yet she still fought valiantly until there were only 28 cartridges and two barrels of gunpowder remaining. In addition to being entirely dismasted, the ship was completely floundering at this point as she had been peppered with shot beneath the waterline, and two of the gudgeons had torn away with the rudder, leaving open bolt holes within the hull. The *São João Baptista* was sinking fast and her crew worked tirelessly to slow the intake of water. Emissaries were sent to the Dutch ship in hopes of obtaining a parley to buy more time. However, a storm intervened, and one Dutch ship was separated in the ensuing chaos, including the Portuguese officers sent to parlay with her. The remaining Dutch ship continued to follow the Portuguese, eventually endeavoring to send their own emissaries, to ask if the Portuguese had seen their companion ship, as they had also lost sight of her in the storm (Boxer, 2001: 192-193).

Soon the weather turned from raging storms to bitter snow, killing many of the slaves aboard *São João Baptista*. Around a latitude of 42° South, the Portuguese made a temporary mast on the prow from the remains of the mizzen-mast and used the outrigger as a bowsprit. This gave *São João Baptista* much-needed propulsion while putting the Portuguese at the directional mercy of the wind, as the remaining Dutch ship continued to give chase. Eventually, one stormy night, the wind took *São João Baptista* landward while the Dutch had lost her in the murk (Boxer, 2001: 193).

Now that the Portuguese had evaded the pursuing Dutch vessel *São João Baptista's* captain ventured to craft a makeshift rudder on the deck of the ship from expendable portions of the hull. This spare rudder was soon made and hung from the stern as the Portuguese awaited calmer weather to attach it to the ship. However, after 15 days of suspension over the water the ropes which held the rudder were torn and it was lost to the sea. Following the loss of the makeshift rudder, two sweeps were made from the remaining portions of the masts, bowsprit, and any other available resource. However, the ship remained at the mercy of the waves and wind. At this point, *São João Baptista* was missing the majority of her castles leaving countless nails and splintered pieces of wood exposed, which were hastily removed as they impaled the passengers as the ship pitched between the waves (Boxer, 2001:194-195).

The Portuguese's salvation came on September 29th, when they found that the wind had taken them two leagues from African shore at latitude 33° 20' South. By the next day, the ship had drifted further down the coast and ever closer to shore. Fearing that the tide would take the ship back out to sea the Portuguese used two anchors in about seven fathoms to hold their position off a sandy beach. A scouting team of 16 men headed by Rodrigo Affonso de Mello

went ashore to find a good position to land, bringing back fresh water and herbs (Boxer, 2001: 195-196).

Not long after the ship anchored, trouble began to stir among the crew of *São João Baptista*. The recently appointed master boatswain, Manuel Domingues, known for his unruly demeanor, approached the captain with an unsavory plan. He wanted to take 30 men with all the jewels aboard the *São João Baptista* and sail a smaller boat three leagues up the beach before traversing the coast as far as Cape Correntes, believing that they were more likely to find salvation unencumbered by women and children. Disgusted at the thought of abandoning passengers to perish, the captain told the master boatswain that he would not permit such an evil plan and forbid him from discussing such ideas. To which the master boatswain threatened to mutiny if the captain did not agree to his proposal. Two days after anchorage, under the fear of mutiny and the growing support of Manuel Domingues by the crew, the captain stabbed the master boatswain to death, regaining control of the situation on board in the process. After this onboard dispute had been settled the Portuguese resumed the task of disembarking (Boxer, 2001: 196).

The rugged coast required them to get their provisions and weapons on land by anchoring their rowboats by the stern with a grapnel and use a line to wade ashore. In the instance that they did not carry out this extra precaution, 18 people drowned as they could not keep their heads above the waves. By October 3rd the Portuguese completed the landing of all the necessary equipment, building temporary shelter to protect themselves from the cold weather of the region, and made their first contact with native peoples. During this initial meeting, the Portuguese were given an ox and a leather bag of milk, which they reciprocated with iron barrel hoops and *bertangils* (Boxer, 2001: 197-198), a type of "calico (cotton), dyed blue, and of a dark violet"

(Mocquet, 1696: 229, as cited in Boxer, 2001: 175). In later meetings, the Portuguese bartered with the natives for cows to use as either food or pack animals to haul their equipment. The Portuguese remained on this beach for a month and six days, where they made the best of their situation, entrenching themselves and eventually constructing a church from canvas, gold-embroidered Chinese coverlets, and other gaudy artifacts. Shortly before abandoning their camp the Portuguese decided that they would march across the land as it was much too dangerous to build a boat and sail it up the coast. At which point the remains of *São João Baptista* were set aflame so that the natives could not scavenge the wreckage and inflate their future bartering rates (Boxer, 2001: 198 -199).

On November 6th, the Portuguese set out from the beach at a latitude of 33° South, in a marching column comprised of 279 people divided into four groups. The party headed toward the bay of Lourenço Marques – about 1,000 Km to the north – with plans to venture from there to the Portuguese fortress at Sofala (Boxer, 2001: 199). Eight torturous months later only a handful of survivors arrived at their destination. Overcome by the hazards and illnesses that plagued treks along this coast, many of the Portuguese perished along the way; however, with the aid of friendly natives and members of the Portuguese empire, namely Luís Pereira of Sofala, a small group of survivors reached Sofala on July 28th, 1623. From Sofala, the survivors then sailed to Mozambique and from there they chartered passage back to Goa. (Boxer, 2001: 266-270).

Material Culture of *São João Baptista*

According to the historical account, a day before the *São João Baptista* arriving at her ill-fated final destination her position was reported at a latitude of 33 1/3° S, two leagues from land

sailing in favorable winds. Using this information in combination with knowledge of the seasonal currents of the area Bell-Cross estimated that the *São João Baptista* most likely drifted to an area between the modern landscapes of Port Alfred and Woody Cape. There is only a single wreck located within this area denoted as the Cannon Rocks site in latitude 33° 45' S (fig 30) (Bell-Cross, 1988: 63). A 1630 map of the area by João Teixeira places the wreck just east of Algoa Bay, supporting the hypothesis that this wreck site is that of the *São João Baptista* (Axelson, 1960: 54, as cited in Bell-Cross, 1988: 63).

Porcelain

Late Ming-style Porcelain, like the type recovered from the *Santo Alberto* site, has been recovered from the coast around this site (Vernon, 1987). The porcelain was stylistically dated by Caro Woodward to the late 16th century. John Jerling, the discoverer of the *São Gonçalo* campsite noted upon examining the Chinese blue and white porcelain recovered from the Cannon Rocks site that they were identical to the sherds found at the *São Gonçalo* wreck site (Bell-Cross, 1988: 63).

Cannons

Two small-caliber muzzle-loading cannons of the sort used during the 16th and 17th centuries have been recovered from the Cannon Rocks site, albeit Bell-Cross does not go into much detail on them (Bell-Cross, 1988: 63).

Anchors

Anchors of the type used during the 17th and 18th centuries were also recovered from the wreck site (Bell-Cross, 1988: 63).

Fig 30. Map of the wreck of *São João Baptista*.

CHAPTER X

THE WRECKS OF *SANTISSIMO SACRAMENTO* AND *NOSSA SENHORA DA ATALAIA*

Following their 1647 departure from Goa to Portugal, the galleon flagship, *Santissimo Sacramento* (under Commodore Luis de Miranda Henriques) and her consort ship, *Nossa Senhora da Atalaia* (captained by Antonio da Camara de Noronha) wrecked while attempting to round the Cape of Good Hope (Theal, 1902: 297). The account herein was originally written by Bento Teyxerya Feyo, a treasury official in India who survived the wrecking of *Nossa Senhora da Atalaia* and detailed his tale to King João IV, who promptly requested a written report (Duffy, 1955: 42-43).

On February 20th, 1647, *Santissimo Sacramento* and *Nossa Senhora da Atalaia* set out for Portugal, carrying the viceroy of Portuguese India Dom Filippe Mascarenhas from Goa (Theal, 1902: 297). The ship sailed along the Indian coast towards the north-west and kept this course with favorable winds to a latitude of 10 and 1/3°, north (Theal, 1902: 297). At dawn on March 2nd, *Santissimo Sacramento* spotted a foreign vessel and the commodore raised a flag and sail before firing two blank shots, forcing the foreign ship to furl her sails and send forth a boat to parley. The Portuguese ships drifted alongside this vessel for four days and nights while the commodore considered capturing it, though she carried a license under the viceroy and belonged to the king of Masulipatam, from which the State of India received substantial resources through his acquisition of Ceylon (Theal, 1902: 297 – 298). However, the officers of *Nossa Senhora da Atalaia* disagreed with the commodore's intentions and argued that the foreign vessel should be allowed to continue her voyage. Therefore, on March 5th, the Portuguese departed from this

foreign vessel at the urging of more seasoned mariners who wished to avoid rounding the cape in winter when tempests are more numerous and vicious. After crossing the equator the Portuguese sailed onward with heavy rains and calms during which time the galleon *São Pedro* overtook them, even after having left Goa fifteen days after their departure. *São Pedro* stayed alongside *Santissimo Sacramento* and *Nossa Senhora da Atalaia* for 20 days before parting ways (Theal, 1902: 298).

On April 19th, Easter Sunday, the captain of *Nossa Senhora da Atalaia* commanded that they give the *Santissimo Sacramento* a seven-gun salute. Instantly following this act, the *Nossa Senhora da Atalaia* sprang a leak, accumulating four hands of water (about 4 m), which was pumped out twice a day by the ship boys and slaves (Theal, 1902: 298). On June 10th, with ideal winds, the Portuguese reached a latitude of 33° South; however, the main topmast of the *Nossa Senhora da Atalaia* broke and due to this and the leaking hull, the *Nossa Senhora da Atalaia* requested that *Santissimo Sacramento* remain with them for a week while they attempted to repair the mainmast. However, due to rough weather conditions, they were unable to repair the mast (Theal, 1902: 299). By June 12th, eight sailors, five artillerymen, four ship boys, and several passengers had already died of sickness. As night fell on the 12th, a breeze fell just before sunset as the Portuguese were sailing towards land with a west-north-west wind; the sky became red as thick black clouds rolled in and a flash of lightning illuminated an *orelhão* fish (moonfish), an omen indicating to the Portuguese that a grave storm was upon them. Soon the wind began to roar, and in response *Nossa Senhora da Atalaia* furled her topsails and spritsail. The sea began to rise and the wind surged, pitching the ship so much that she took on vast quantities of water. Commands were given to take down the main yard, furious hurricane of wind violently carried away the mainsail and foresail and tore them to pieces. The ship remained

at the mercy of the waves until the crew eventually raised a storm-sail on the foremast and positioned the main yard half-mast high with its sail taut top to bottom (Theal, 1902: 299).

The ship remained in this pummeled state for the rest of the night, straining its hull and taking on at least 10 hands of water (about 10 m) (Theal, 1902: 299-300). By the next morning, *Nossa Senhora da Atalaia* found herself alone, without the company of *Santissimo Sacramento*. As the storm continued to rage on through the next night, *Nossa Senhora da Atalaia* was beaten by the winds and the waves, battered by hailstones, and at the mercy of thunder and lighting. The ship continued to run with the wind astern as the crew managed to remove the remaining canvas from the spritsail yard and replace it with a new one. Over the next two days, they vigilantly worked the pumps as the weather calmed and *Nossa Senhora da Atalaia* sailed within view of land at a latitude of 32°. For the next few days, the crew sailed towards land with hopes of repairing the ship, pumping out its water, and sustaining themselves by fishing. At this time the master of the ship Jacinto Antonio thought it might be best to put back to Mozambique before the weather worsened again, secure the king's property, save the ship, and obtain aid for the sick and injured. However, the master's wishes displeased most aboard the ship many of when had business back in Portugal and cinnamon in the cargo that they wished to keep from spoiling, and so they coerced the master and those who agreed with him into maintaining their course to Portugal. Sailing south for the next few days *Nossa Senhora da Atlaia* increased her latitude in order to double the Cape. Everyone aboard the ship took shifts working the pumps so that they never ceased emptying the hold. The crew attempted to draw water out of the hold by converting barrels into buckets and clearing artillery hatchways to use as wells, but these efforts were of little help, due to four stored guns that blocked the hatchways (Theal, 1902: 300-301).

At this time rumors spread among the crew and passengers that many of the ship's deck knees were broken. It was agreed that *Nossa Senhora da Atalaia* should seek a different latitude with improved weather so that the crew could rid the ship of water (Theal, 1902: 301). Shortly after, the master, officers, and captain went below deck to inspect the hull, returning with three nails in hand and exclaiming that "the ship was fit to go to Jerusalem" (Theal, 1902: 301). Nothing more was discussed about their journey, aside from the need to reach Portugal as soon as possible. The foresail was set on the evening of June 29th to steer the ship back towards land. The second pilot let the pilot know that land was near, and the latter replied that they had nothing to fear as he had navigated this coast for a long time. Before long a sailor on lookout, shouted "veer off, brothers," as the ship found itself upon a shoal, in eight fathoms (about 15 m) of water, in the sea off Algoa Bay. The crew hastily unfurled the main-top-sail. Guided by the second pilot stationed at the cross-trees, they were able to get *Nossa Senhora da Atalaia* back to sea with the aid of a landward breeze and the efforts of all aboard (Theal, 1902: 301).

Unfortunately, due to this event, the ship now leaked more than before, with water coming in every seam (Theal, 1902: 302). This problem was magnified as a storm approached the following day, forcing every pump to work endlessly. As the storm raged on, *Nossa Senhora da Atalaia* sailed using her fore storm-sails but pitched so fiercely that the crew feared she would break amidships at every hour. The storm was so violent that it carried the waves over the lantern and masts on the stern. At the helm, the second pilot found himself alone, and almost drowned by the waves as the rest of the crew attended the pumps. Although those aboard the ship were few in numbers, they never ceased to work the pumps at this time. The officers maintained the starboard pump, the ship's boys worked the larboard pump and the African slaves managed the wheel pump, whose chain broke every hour (Theal, 1902: 302). As the night-watch approached

the slaves were commanded to maintain the pumps throughout the night; however, due to exhaustion, only two men worked the pumps. As the water increased during the night, the men at the pumps tried to warn the others but were ordered to not cause a disturbance amongst the ship. As day broke the crew opened the large hatchway and found the water now raised above the ballast. More barrels were then converted into buckets to remove the rising water, but again these efforts proved fruitless over the next two hours as the ship took on more water with every pitch. Eventually, *Nossa Senhora da Atalaia* took on so much water that the pepper holds burst, choking the pumps and rendering them useless. The crew continued to attempt to remove the water using barrels worked with the capstan, but this had little effect in reducing the ever-incoming volumes of water. Meanwhile, abaft of the mainmast, the crew opened a hatchway and attempted to remove the water using two tubs but ended up retrieving more pepper than water (Theal, 1902: 303).

In these conditions, the ship's bow sank and now refused to heed the commands of the helm. Below, the water covered the hatch coamings of the bow and the lower hatches by at least two hands above the lower deck. *Nossa Senhora da Atalaia* spent two days and nights in this condition before spotting land. At daybreak on the third day, the crew sighted a thickly wooded ridge at the mouth of a river with a long sand beach and large bay, in which they assumed that they could land using the ship's boat. However, due to the dilapidated state of the ship, it was decided that the Portuguese would run her ashore by throwing the artillery into the sea, which was all pointed through the portholes. This effort proved beyond the abilities of the crew and only two pieces were thrown from the ship. With favorable winds but rugged waves, the crew unfurled the main topsail, which shredded to pieces as they hoisted it, as did the fore-topsail, spritsail, foresail, and finally the mainsail (Theal, 1902: 303). Meanwhile, the captain had

ordered the gunner to put powder and balls in barrels, and collect all the arms, copper, and bronze for the securing of a campsite, should they survive the landing and need to barter with the indigenous peoples (Theal, 1902: 303-304). The following night was spent removing as much water as possible with buckets, to buy time for a landing, while native campfires could already be seen lit on the nearby shore. By the next morning, July 2nd, the Portuguese prepared the boat for landing some of their people. Raising the anchor as the wind arose, they went landward with the foresail set and cast anchor in the bay at seven fathoms (about 13 m) of depth. Under the command of the master, the main halyards were cut and the yard was cut into pieces as it might aid those going ashore. The boat was launched with those among it armed with weapons and provisions so that they could secure a site onshore. Meanwhile, those who remained on board continued to man the pumps, buying as much time as possible. By the time the boat reached the breakers, it was already late in the day and the current revealed itself incredibly strong, forcing them to return to *Nossa Senhora da Atalaia*. As the tide retreated after nightfall the ship struck ground, damaging the rudder. In response, the crew cut down the main and foremasts, while casting out another anchor to prevent getting dragged out to sea. As the tide came back in the ship began to float in eight fathoms of water, again. After daybreak on July 3rd, the Portuguese gathered all the thin ropes and configured them into a surf-line, while also collecting people, weapons, and portable valuables. With one end of the surf-line tied on board the ship, the small boat was rowed towards the shoreline with great caution, as the surf around the breakers was powerful. Those among the boat reached the shore safely without interference since no natives were present. Upon landing they stored all that they could carry upon the shore before returning to the ship to retrieve the captain, noble ladies, and enslaved people still on board (Theal, 1902: 304).

Those in good health spent the day going back and forth in the boat, while others remained onshore to guard the cargo being landed and assist those working the boat. Many still on *Nossa Senhora da Atalaia* were too weak to help in the transporting of the cargo, which resulted in much of the provisions being left aboard. Of the more than 1000 bags of rice, only 30 were brought ashore. The boat made four trips ashore this day, the last trip hauling approximately 70 men, including the ship's officers, members of the church, and numerous slaves. This last trip to shore met with great difficulty, as the boat was loaded to the gunwales. That night renewed stormy weather meant extreme danger for the chaplain and several other men who remained on board *Nossa Senhora da Atalia*. On the morning of July 5th, many who had spent the night on the shore took to the boat to return to *Nossa Senhora da Atalaia* to load provisions. Using the surf-line the boat arrived safely to the ship; however, during the return trip a Chinese slave aboard *Nossa Senhora da Atalaia* severed the surf-line from the cathead. Without this line to steady the boat the overcrowded vessel broached in the breakers, spilling out many who were onboard of whom 50 drowned (Theal, 1902: 305). The survivors dragged the shattered boat to shore but could not save any of its cargo (Theal, 1902: 305-306).

The captain had the boat repaired the next day and offered a reward of 500 *xerafins* to anyone willing to go back to *Nossa Senhora da Atalaia*. Nobody onshore accepted the challenge, as the sea was still raging and they were still gripped in fear from the events of the previous day. Those still aboard the ship fired a gun signifying their peril and their cries for help could be heard on shore (Theal, 1902: 306). By this time only the ship’s sterncastle remained above water. At this time stranded people threw themselves into the sea and clung to floating pieces of the hull. Some made it safely to shore while others drowned. The following night some of the African slaves had made their way to shore and alerted the officers that some people remained

upon the ship, clinging to a poop-deck rail. At daybreak on July 6th, the ship went to pieces, scattering ship timbers across the bay and casting the remains of a few chests upon the shore. The wealthy Portuguese merchants and nobles who sailed upon *Nossa Senhora da Atalaia* now found themselves poverty-stricken and naked (Theal, 1902: 306).

The captain now assembled the survivors, dividing them into three separate units, taking charge of the passengers, and placing the crew and ship boys under the officers. He designated a few trusted men to gather provisions and had the survivors relocate inland from the beach. Here they made a shelter out of canvas tents, placed the provisions under watch, and planned their future journey toward Cape Correntes. They remained here for eleven days, suffering from starvation and dehydration, as the provisions were minuscule and the water which they gathered from the Infante River was nearly a league away (Theal, 1902: 306). These conditions caused mass illness and several deaths amongst the survivors (Theal, 1902: 306-307). The camp was saved from complete famine by the mussels exposed on the beach during low tide.

The captain entrusted several capable men with the authority to command the survivors, while also designating three men who had previously shipwrecked on this coast as ambassadors should natives appear. On July 8th, the pilot and others traveled to the Infante River, from here they could see a thickly wooded ridge lying to the north-west and the shore continuing for over two leagues, which was surrounded by hills of white sand. Here the group measured their latitude as 33 and 1/3°. Natives were spotted on the shore and subsequently approached the Portuguese, but the two groups had no shared language between them (Theal 1902: 307).

Back at the camp, the survivors salvaged provisions and supplies were divided and recorded into the king's book. These included small arms, shot, powder, coconuts, copper for bartering, and lines and hooks for crossing the river (Theal, 1902: 307). Leftover copper and

gunpowder was buried in the camp to ensure that the natives did not recover them and possibly inflate their prices when the Portuguese needed to negotiate with them. While sorting through the provisions the Portuguese also discovered that the rice had rotted from the seawater, meaning they would have to expedite their departure. In the days leading up to the departure, the captain tried to persuade the pilot to construct a boat and sail the grievously wounded back to safety, but the pilot refused. One nobleman, who was too injured and sick to walk promised each ship boys 800 *xerafins* (currency) if they would carry him with a net during their upcoming journey; several other noblemen attempted similar feats, crafting hammocks from nets, rugs, cloth, and oar poles so their slaves could carry them. Others would use bits of wood as makeshift crutches and walking canes, while the healthy carried the arms and bags full of copper and linen (Theal, 1902: 308).

The survivors preferred to delay their departure to heal from the traumas they endured but, the lack of provisions forced them to set out towards Mozambique on July 15th (Theal, 1902: 308). They soon realized that many were too weak to endure the journey, indeed some fell behind on the first day of the trek and were either died from exhaustion and wounds or were killed by natives who trailed the group and looted from any stragglers. After this tragic first day of the journey, a council was held over what should be done about the women and injured. They were already running low on food, had very few goods to offer in barter, and were a month away from any land where they could trade. The council concluded to leave behind those who were unfit to keep pace and that women should march in front, but be abandoned if they fell behind (Theal, 1902: 309). When the Portuguese women were told of this decision they prayed for mercy as they could not accomplish such a task, and consequently, they were left behind without any food to sustain themselves (Theal, 1902: 310).

Months later, towards the end of November, the few who remained of *Nossa Senhora da Atalaia's* company met men from the *Santissimo Sacramento*, their flagship. This vessel had wrecked after their separation and now all that was left of her passengers were nine unarmed men, five of whom were Portuguese, who now joined the *Nossa Senhora da Atalaia* survivors' company (Theal, 1902: 349). The following night the nine survivors from *Santissimo Sacramento* gave the following account of what happened to the *Santissimo Sacramento*:

During the storm that separated *Santissimo Sacramento* and *Nossa Senhora da Atalaia*, the former found herself without a mainsail, but luckily enough to have furled their topsail before the storm. Using the storm sails they steered the ship east-north-east while the storm caused the ship to spring leaks. When the storm subsided the next morning, they were able to stop the leaks but now found themselves without the company of *Nossa Senhora da Atalaia*. At this time the crew decided to head towards land. They were soon overtaken by another storm. After withstanding this second storm, the Portuguese decided to continue on their course towards the Cape of Good Hope, making sure to stay within sight of land as they did so. On the evening of June 29th disaster struck, as the Portuguese were sailing extremely close to land using the foresail, upon which the chief pilot was directed to turn the vessel out towards the sea, which he did (Theal, 1902: 350). However, after nightfall the chief pilot shifted the course back towards land, whereupon hearing cries from the crew that they were too close to shore he attempted to turn back to sea (Theal, 1902: 350-351).

It was too late. The galleon missed stays, and refused to turn completely, despite efforts to unfurl the foretopsail and sprit-sail. The ship's bow then turned sharply towards the shoreline, and even with the crew managing the sails and the rudder, she drifted towards land for the next two hours. Eventually, at 34° latitude, *Santissimo Sacramento* hit a substantial wave that sent the

ship to pieces. Previously, many on board, including the captain and the religious, adjourned to the galleries to pray. This act would prove disastrous as the galleries were carried to the depths along with the stern section of the ship upon impact with the wave. Some of the survivors who found themselves on the bow of the ship were able to get ashore by clinging to the yards and pieces of floating timber. A total of 72 individuals survived the wrecking of *Santissimo Sacramento* and reached shore, many of whom had grievous injuries. The survivors stayed in this spot for eleven days before marching on. After walking for approximately one month, they came across the remains of *Nossa Senhora da Atalaia*, and a few abandoned stragglers, barely gripping to life, who revealed that they were left behind by the survivors of *Nossa Senhora da Atalaia* 28 days ago. After retrieving some powder and ammunition from this site, and replenishing themselves with bits of leather, the *Santissimo Sacramento* compliment marched onward, following a trail of forsaken and or dead from *Nossa Senhora da Atalaia*'s shipwreck. The *Santissimo Sacramento* group continued until they reached the river where *Nossa Senhora de Belém* had wrecked. By this time only 10 of the original 72 *Santissimo Sacramento* survivors remained, the others had either been left behind, or perished at the hands of the locals, or died from starvation. Many had been left behind when they became too exhausted to continue the journey (Theal, 1902: 351).

The situation deteriorated to the point where *Santissimo Sacramento* survivors devoured anything which they thought could be edible, from a locust to shoe leather to a mariner's chart. Those who consumed the map died of mercury poisoning from its pigments. Eventually, using information given by friendly native people, the *Santissimo Sacramento* survivors reached their colleagues from *Nossa Senhora da Atalaia* (Theal, 1902: 352).

The newly constituted group resumed their journey up the coast. By December 14th, the survivors reached the territory of a friendly King Unyaca, who sheltered them and told them of a ship from Mozambique that was anchored at nearby Shefina Island, twelve leagues (about 66 km) away. Several of the Portuguese survivors, escorted by natives, made their way to Shefina, to contact this ship (Theal, 1902: 354). They found a galliot and were happily received by its crew. Upon hearing the survivors' stories, the captain sent his pilot and a party back to Unyaca, with supplies for bartering. On December 28th the remaining survivors left Unyaca for the Portuguese ship at Shefina, although not all survived this last leg of the journey (Theal, 1902: 355). By January 5th the survivors reached the island where the galliot was anchored (Theal, 1902: 357). They stayed on the island for six months while the ship completed its business, sheltered in straw huts constructed and purchased from the locals (Theal, 1902: 358). While the survivors may have been better sheltered and supplied than they had been previously, more of the *Santissimo Sacramento* and *Nossa Senhora da Atalaia* perished. Eventually, the galliot weighed anchor and headed for Mozambique on June 22nd, which they reached on July 9th. From Mozambique, a handful of Portuguese survivors then set out for Goa on September 11th, which was reached on November 8th (Theal, 1902: 359).

Discovery and Retrieval of *Santissimo Sacramento*

According to information provided to the Port Elizabeth Museum by C. R. Boxer, *Santissimo Sacramento* was built of teak in the shipyards of Bassein, north of Goa. It was categorized as an 80-gun galleon. Dutch intelligence reports say it was taken from Bassein to the Peneum River, south of Goa, in April of 1640, a few days before a Dutch fleet blockade of Portuguese ports along the Malabar coast. These Dutch reports also mentioned that *Santissimo*

Sacramento suffered from leaking, had a list, was inadequately furnished, and they were uncertain of her seaworthiness. It was on her maiden voyage to Portugal that *Santissimo Sacramento* sailed with *Nossa Senhora da Atalaia* and was subsequently wrecked (Bell-Cross, 1988: 78). *Santissimo Sacramento* wrecked south-west of modern Port Elizabeth, South Africa, nine miles (14 km) east of the lighthouse at Cape Recife (Allen and Allen, 1978: 39). The area is described as having:

> vicious currents swirling in and out among the reefs which lie just offshore, and a succession of small, shallow bays which build up from Cape Recife to Shoenmakerskop (another nearby town) into cliffs falling perhaps a hundred feet to the jagged rocks below… The coastline consists of high rocks inshore with many gullies running between them, with long reefs stretching in places yards out to sea. In some spots there are more reefs even farther out. (Allen and Allen, 1978: 39)

By 1976, David Allen, who grew up in the Port Elizabeth area, was determined to find the wreck of *Santissimo Sacramento*. Studying historical texts for the possible location of the wreck, Allen soon realized that almost every author on the subject had placed *Santissimo Sacramento*'s loss at a different spot. The one constant in these discussions, noted by Allen, was the conclusion that *Santissimo Sacramento* ended up near *Nossa Senhora da Atalaia*. Allen, however, disagreed with this idea as it did not make sense for the *Santissimo Sacramento* survivors to march for a month before meeting up with the survivors of *Nossa Senhora da Atalaia*, as recorded in the shipwrecking account. As well, in Feyo's account, the larger *Santissimo Sacramento* was swept out to sea, away from *Nossa Senhora da Atalaia*. Allen deduced that this meant that *Santissimo Sacramento* entered the notorious Algoa Bay near Cape Recife, but not too close as Feyo's account did not include a depiction of the rocks intrinsic to Cape Recife's landscape. Thus, Allen's theory favored the one proposed by Eric Axelson in which he claimed that *Santissimo Sacramento* wrecked at Cape Recife (Allen and Allen, 1978:

45 -46). Allen's attention was drawn to a 1778 map of Cape Recife drawn by Colonel Robert Jacob Gordon of the Dutch East India Company (Allen and Allen, 1978: 45; Bell-Cross, 1988: 79). On this map, Gordon had precisely illustrated the location of Cape Recife and to the south-east, where modern-day Schoenmakerskop was located, he had added on 'X'. In his margin notes he annotated the 'X' with the following description:

> Near the wreck, in the dunes, the remaining miserable castaways had built some shack shelters in the sand, now without… habitants as everybody thinks they died of hunger. I found some skeletons which with the help of my [slave?] I buried. Here the remains of a beautifully carved little box chest of ivory were laying around, which might have been a shrine for a Roman Catholic chalice; also two rusty anchors and a cannon, which as the breakers were strong, the beach rocky, I could not recognize, also some pieces of ebony. (Forbes, 1949: 12, as cited in Bell-Cross, 1988: 79; Allen and Allen, 1978: 45)

Not long after, Allen came across documents by Mr. H.G. "Hal" Harraway, noted finding a cannon stuck in the rocks near Schoenmakerskop in 1951. Using local laborers and a team of 20 oxen Harraway was able to recover the cannon, which was subsequently put on display in the Port Elizabeth Museum (Allen and Allen, 1978: 46; Bell-Cross, 1988: 79). Harraway detailed the cannon as being made of bronze, weighing up to 6,000 pounds (2722 kg), measuring twelve feet (4 m) in length, and containing an inscription on the barrel that was presumed to have been in Dutch. According to Allen, Harraway contacted the director of the Netherlands Historical Maritime Museum in September of 1960, in part to identify the cannon. In correspondence discovered by Allen, written to the museum by Harraway, he mentioned: "According to the experts who have tried to decipher it the inscription (cannon) should read, 'Contraet Wegt Woert me Fecit Hagae.'" Thus, Harraway believed the wreck to be Dutch. Allen, unconvinced that the cannon belonged to a Dutch ship, delved further into Harraway's notes, where he found a reply dated four years later from the Netherlands Historical Maritime Museum that read: "The inscription on the bronze gun should be 'Conraet Wegewaert me Fecit Hagae'. It is the name of a

gun founder working at the Hague during the middle of the 17th century until 1664" (Allen and Allen, 1978: 46).

Allen figured this meant that Harraway's gun could have been a captured Dutch cannon mounted on *Santissimo Sacramento* (Allen and Allen, 1978: 46). Harraway reached out to South African geographer Vernon S. Forbes, in an attempt to identify the gun and was told that it probably belonged to a French or Portuguese ship on its homeward voyage (Bell-Cross, 1988: 79). On January 29th, 1977 Allen and his diving partner Gerry Van Niekerk dived at Gordon's wreck site. Not long into their dive, the pair came across a group of bronze cannons in about 15 feet (about 5 m) of water (fig 31). Recalling the initial discovery, Allen states that the closest cannon was in about eight feet of water and following a straight line out to sea the furthest cannon was approximately a quarter-mile out. On the first day, the pair recorded up to 21 cannons (Allen and Allen, 1978: 48). After photographing the cannons the following day, the pair was wading in knee-deep water when they tripped over the anchor recorded by Jacob Gordon and soon after found bits of ebony nearby. Later the pair learned from locals that occasionally traces of a campsite were present in the area with a trail of white stones leading to the beach (Allen and Allen, 1978: 49). By March 22nd, the first of the cannons were raised with a fishing trawler, aided by a team of workers sworn to secrecy and funded by two financial backers (Allen and Allen, 1978: 57-58). The third gun to be raised from the ocean floor was in excellent condition and provided further evidence that the cannons were most likely from *Santissimo Sacramento*. Visible on the barrel was the Portuguese Crest and the founder's mark of Portuguese cannon founder A.G. Feyo. The gun had a fuse in its touchhole and was later discovered to be loaded. In all, five cannons were raised on this first retrieval operation (Allen and Allen, 1978: 59). By March 28th, the trawler was able to raise seven more cannons. It was in

this lot that the largest of the cannons was raised, measuring seventeen feet (5 m) in length (Allen and Allen, 1978: 63).

Fig 31. Map of the wreck of *Santissimo Sacramento*.

On April 18th, while attempting to retrieve an additional cannon close to shore, Allen stumbled upon another 30 cannons half a mile (0.8 km) offshore sea. The guns were organized muzzle to breach, as they were stored in the hold of *Santissimo Sacramento*. Soon after, nearer to shore in approximately 50 feet (15 m) of water, Allen discovered an additional six guns. Upon further inspection, Allen found remnants of the ship's teak planking under a cannon, as well as portions of ebony and well-preserved peppercorns around and inside the barrels of cannons (Allen and Allen, 1978: 64-65). As the crew began to raise some of these newly discovered cannons it became apparent that sixteen of them were of iron, these were left on the seabed to

avoid rapid corrosion in the air. By April 24th, six more cannons had been retrieved. The following day the team recovered the best-preserved cannon thus far, containing an intricate scroll mark and lotus bud decorative reliefs on the cascabel, this cannon would later be identified as a Bocarro cannon. Underneath the gun additional pieces of wood were discovered, later identified as Indian teak by government laboratories in Pretoria (Allen, 1978:67). By the end of the day, the team retrieved a total of 21 guns from the site (Allen and Allen, 1978: 68). Towards the end of April Allen discovered the detached cascabel of a cannon in the form of a clenched fist with a pointed thumb penetrating out from under the index finger, later confirmed as a fertility symbol found on Bocarro cannons. Nearby was a fully intact cannon with a matching cascabel. This cannon would be later referred to as the Bocarro "miracle cannon" (fig 32) (Allen and Allen, 1978: 68, 72). With the addition of this cannon, Allen's team had now discovered a total of 41 cannons at the wreck site. Authentication of their *Santissimo Sacramento* provenience was confirmed by an inscription on the most well-preserved cannon which read: "Antonio Teles Menezes, Governor of India, ordered this in the year 1640 by Manuel Taveres Bocarro" (Allen and Allen, 1978: 69).

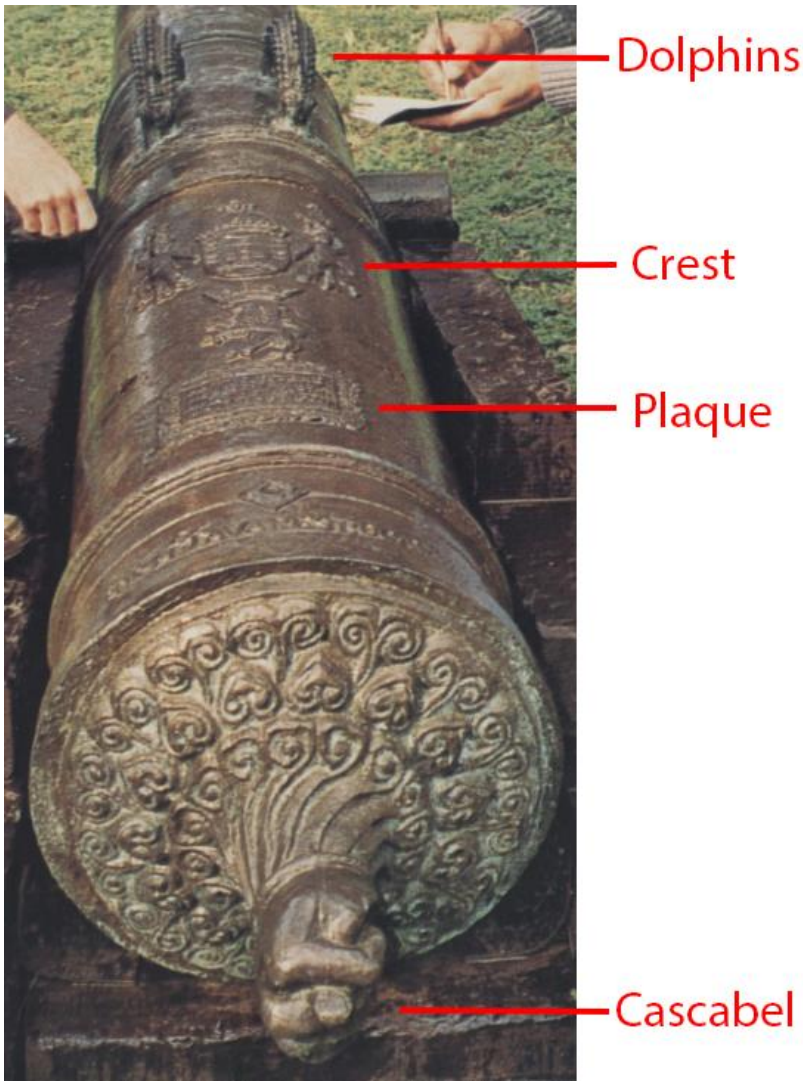

Fig 32. Miracle cannon. Adapted from (Allen and Allen, 1978: 72).

In addition to this inscription, contemporary Dutch reports were made available by C. R. Boxer which claimed that *Santissimo Sacramento* sailed from Goa in 1647, "Fully laden with the most beautiful goods… and in her hold came a quantity of cannon which the City of God (Macao) in China sent as a present to his majesty" (Allen and Allen, 1978: 69). By April 29th, an additional small bronze cannon was raised from the site and on May 2nd, the crew retrieved the so-called miracle cannon. Afterward, the crew raised the remaining cannons from the area of the supposed hold, five in total that day, and recorded the locations of the iron cannons still resting

on the seafloor. On May 11th, seven more bronze cannons were raised from the seabed (Allen and Allen, 1978: 70). The crew returned to the wreck site on the May 20th, retrieving six bronze cannons, one-half of a gun, and a roll of lead believed to have been used for ship repairs onboard *Santissimo Sacramento*. This last trip finalized the salvaging of the wreck site (Allen and Allen, 1978: 76). By the end of the project, a total of 40 cannons were retrieved from the wreck of *Santissimo Sacramento*, 21 of which were believed to have been originally stowed in the ship's hold (Table 5). Unfortunately, by July 8th, 17 of the more degraded bronze cannons were sold for scrap at 75 cents per kilogram (Allen and Allen, 1978: 76).

Aside from the ebony and teak previously mentioned by Allen, other recovered artifacts included blue-and-white porcelain and stones of granite porphyry that could have belonged to the ship's ballast (Bell-Cross, 1988: 79).

Table 5
Cannons from *Santissimo Sacramento* 1647. This does not include measurements for the A. G. Feyo cannon. Adapted from (Allen and Allen 1978: 79).

No.	Length (cm)	Bore (cm)	Marks
0	323	13	C. Wegt Word C
1	330	13	Bocarro C 1640
2	308	13	
3	277	13	
4	330	13	Bocarro C 1640
5	285	13 approx.	
6	296	13 approx.	
7	336	13-13.5	
8		13	
9	278	13 approx.	
10	288	13 approx.	
11	331	13.5	
12	281	13	
13		13	
14	345	13	
15	286	13	
16		13	
17	280	13	
18	454		
19	433	13.5	Bocarro 1640
20	324		
21	469	14	Bocarro 1640
22		13	Bocarro 1640
23	351	14	Bocarro 1640
24	356	13	Bocarro 1640
25	356	14	Bocarro 1640
26	461	14	Bocarro 1640
27	360	16.5-17	1637
28	285	13	
29		14	
30		13	
31	461	14	Bocarro 1640
32	356	14	Bocarro 1640
33	360	16.5-17	1637
34	461	13	Bocarro 1640
35	234	12	
36	356	14	Bocarro 1640
37	356	14	Bocarro 1640
38		13	Bocarro 1640

Due to *Santissimo Sacramento's* archaeological inventory consisting almost exclusively of bronze cannons it is vital to know how such guns were made and used to fully understand their context aboard the *Santissimo Sacramento* and broader significance to 17th century naval artillery. I turned to a publication by John F. Guilmartin, Jr. titled "The Guns of the *Santissimo Sacramento*", not to be confused with the publication by Geoffrey Allen and David Allen titled "The guns of *Sacramento*", The Guilmartin study evaluates guns from the Portuguese 60-gun galleon that wrecked in Brazil in May 1668, while Allen's work details the 80-gun Portuguese galleon that wrecked off the coast of south-east Africa in 1647 (Navegantes, 1979: 215, as cited in Guilmartin, 1983: 559, 570; Allen and Allen, 1978).

The first point to be discussed on the topic of 16th to 17th century muzzle-loading, black-powder cannons, is that the potential maximum velocity is reached at around eighteen calibers down the barrel or eighteen times the bore diameter. Black powder's burn rate does not change due to pressure or temperature, meaning the effective barrel length is essentially static and any additional barrel length over eighteen calibers does not affect the cannon's range (Guilmartin, 1974: 277-283, as cited in Guilmartin, 1983: 563). Guilmartin states that smoothbore cannons using spherical projectiles were essentially inaccurate; the shot bounces randomly down the length of the bore, thus acquiring spin, rendering any attempt to hit a target over 500 yards (472 m) fruitless. Furthermore, an iron cannonball has finite destructive power towards the end of its range, aside from when a lucky shot may hit a spar or slice a piece of rigging (Guilmartin, 1983: 565).

Guilmartin goes on to point out that barrel lengths for bronze cannons were integral to the strength of the gun. In western European tradition, cannons were cast in a pit breech down, with the molten bronze poured into the mold at the muzzle through a casting bell (Guilmartin, 1974:

284-291, as cited in Guilmartin, 1983: 564). Because the pressure of the molten metal was proportionate to the height of the liquid column, the casting bell lengthened the height of the column, increasing the pressure under which the bronze at the breech solidified. The bell was removed after the casting. This technique increased casting pressure, aided in reducing the negative effects caused by impurities in the metal, and given the inherent porosity of bronze, made it stronger towards the breech where the powder ignition occurred (Guilmartin, 1983: 564). Furthermore, the thicker the barrel, the stronger the cannons tended to be. As founders became more skillful, namely able to maintain a better quality of metal, cannons shrank and thinned (Guilmartin, 1974: 170-173, as cited in Guilmartin, 1983: 564-565).

According to Guilmartin, knowledge of the principles of gun founding was represented in works of superior founders who were also consistent in weight, dimensions, and metal composition. Such skill and knowledge helped in reducing the amount of bronze used in the casting process, resulting in lighter, more cost-efficient guns, and superior pieces. Casting a cannon with inadequate strength could have disastrous consequences, causing it to burst when firing. Guilmartin noted that bore length and barrel-wall thickness as functions of bore diameter give a good indication of the quality of the cannon (Guilmartin, 1983: 566).

As for the relationship between cast iron and bronze cannons, the former were heavier and larger even though they were designed to fire identical projectiles. Cast iron cannons were also subjected to greater levels of corrosion and were generally less safe when bursting, as they tended to not remain intact as bronze cannons did. While the latter type would rupture “like a torn sponge along a longitudinal line near the breech”, iron cannons “blew apart in jagged fragments like a bomb” (Guilmartin, 1983: 567). Despite their dangerous qualities iron cannons were used widely because iron cost about a third of the price of bronze. Iron guns were not

considered the weapon of choice during this period (Cipolla, 1965: 45, as cited in Guilmartin, 1983: 567). Following the restoration of Portugal's independence from Spain, in 1640, the country had a shortage of quality cannons, indicated by Portuguese dependence on Swedish cast-iron ordinance (Cipolla, 1965: 56, as cited in Guilmartin, 1983: 574).

Guilmartin suggests that the shift from stone shot-throwing cannons and those designed to throw iron projectiles during this era can be explained as a matter of cost-efficiency. The crossover from stone to cast-iron cannonballs was a symptom of rising labor costs in Europe, especially in Northern Europe. While stone firing cannons required a third less bronze than cannons firing cast iron the labor cost for stonecutters was immense (Guilmartin, 1983: 590). As wage rates rose at the beginning of the 16th through the 17th century, the use of stone-throwing cannons fell out of practice, especially in northern Europe (Slicher Van Bath, 1963: 113-115, as cited in Guilmartin, 1983: 590). However, where labor cost was lower stone-throwing cannons continued to be cast, and the Portuguese continued to cast them in India through the middle of the 17th century, long after the Europe-based gun founders had stopped doing so (Guilmartin, 1983: 591).

In his analyses of the guns from the 1668 wreck in Brazil, Guilmartin notes that the collection of bronze guns recovered from the lower gundeck included a 28 pounder cannon cast by A.G. Feyo, the same founder who cast at least one of the cannons from the 1647 wreck (Guilmartin, 1983: 575; Allen and Allen 1978: 59). Another gun on the 1668 wreck, an 11 pounder from the upper gundeck also contains the founder mark of A. G. Feyo (Guilmartin, 1983: 584). Lastly, a Dutch 20 pounder found on the 1668 site, cast in 1649, contains the founder mark of Conrad Wagwaert, the same Dutch founder who cast the Dutch cannon recovered by Harraway (Table 6) (Guilmartin, 1983: 592; Allen and Allen 1978: 46).

Table 6
Guns recovered from the 1668 and 1647 wrecks that shared founders. Adapted from (Guilmartin 1983: 569).

Ball Weight in Pounds	Date/ Founder Marks	Weight Marks	Weight in Pounds	Pounds Weight Per Pound of Ball	Bore Length in Calibers	Maximum Barrel-Wall Thickness as Function of Bore Diameter
28	Mid 1600s, A. G. F.	39-1-16	4,047	144.5	18.42	.95
11	Early 1600s, A. G. F.	23-2-16	2,430	220.9	24.80	1.06
20	1649, Conrad Wagwaert	37^119	3,834	191.7	19.2	1.07

Nossa Senhora da Atalaia

The following description of the *Atalaia* wreck site finds comes from personal communications between Professor C.R. Boxer and Graham Bell-Cross that went originally published in Bell-Cross chapter *"Portuguese shipwrecks and identification of their sites".* Mentioned as early as 1640, the full name of this vessel was *Nossa Senhora da Atalaia do Pinheiro,* referring to the sacred image of the Virgin Mary in a church in the "Pinhal of Santa Maria da Castelo de Torres Vedras". Although some texts refer to the vessel as a galleon, Bell-cross's publication assures readers that *Nossa Senhora da Atalaia do Pinheiro* was a four-deck carrack of approximately 1,000 tons and most likely mounted about 30 guns, as most Indiamen on the Portuguese India Route were typically minimally equipped (Bell-Cross, 1988: 74).

Survey and Resulting Cannon Discovery

After the discovery of the *Atalaia's* consort *Santissimo Sacramento* in 1977, researchers decided to initiate a survey in 1978 to uncover the location of the contemporary wreck. Bell-Cross notes that available data at the time indicated that Portugal-bound ships from the East carried cargoes of blue-and-white porcelain. By locating deposits of said porcelain it was possible to establish the locations of Portuguese wrecks along the eastern South African coast. Researchers began an extended survey of beaches on the south-east coast of Africa, from the Mozambique border to Algoa Bay at the eastern cape of South Africa. This included interviewing locals for archaeological evidence such as porcelain deposits and surveying already-known porcelain sites. The survey also promoted an intensive focus on inspecting the coast between Cape Padrone and the Kei River, with identification of the *Atalaia* wreck site as the main objective (Bell-Cross, 1988: 74-75). At the time of the survey's conception, a single site containing blue-and-white porcelain was known to be at Ivy Bay, Port Edward on the Natal Coast. Additionally, one porcelain site was also known on the Transkei coast at the mouth of the Misakaba river. Researchers were also aware of five sites on the eastern Cape Coast at Cannon Rocks, Mtana River, Bonza Bay, Sunrise-on-Sea, and Double Mouth. It was assumed that most porcelain could be dated to within 20 years of its manufacture and with the aid of artifacts recovered from surveys and from geographic descriptions found within the historical accounts of the wrecks, identification of the sites would be possible (Bell-Cross, 1988: 75).

The survey originally centered on the coast around the 33 1/3° South latitude, which included the known porcelain site by the Mtana River and approximately located between the Keiskamma and Fish Rivers; this was based on the survivor's account of the area. However, nothing was found and researchers soon focused on the entirety of the coast from Algoa Bay to

the Kei River. In 1979 Bell-Cross found a large (12 by 12 cm) sherd of "martevan" located between the mouths of the Cinsta and Cefane Rivers (Bell-Cross, 1988: 75). Martevan or "martaban" as it is more widely named, refers to large ceramic storage jars used in south-east Asia and originating from Martaban (Mottama) in Lower Burma. Martaban was commonly used during the 16th and 17th centuries and primarily exported from Burma to Sri Lanka and India (Borell, 2014: 257; Castro, 2001: 16). Later investigations at this site provided additional pieces of martaban and finds of blue and white porcelain. The inclusion of this site meant there were six known porcelain sites between Algoa Bay and the Kei River (Bell-Cross, 1988: 75).

The key to determining which of these porcelain sites was that of *Atalaia* was found in Feyo's description of the coast seen just before the ship wrecked. Specifically, Feyo noted that the ship anchored in seven fathoms (27 m) off a long sandy beach. This description meant that only two known porcelain sites could potentially be that of *Atalaia*: the Mtana and the Cefane River sites. In January 1980, divers involved with the survey project, Peter Sachs and Sean Mitchely, dived at the Cefane River site. Searching in a grid pattern the duo first came upon a muzzle-loading cannon, followed by a cluster of 10 bronze and eight iron cannons (fig 33). The bronze cannons possessed cascabels shaped in the same fist-with-the-thumb-projecting-from-under-the-index-and-middle-fingers style found on the Bocarro cannons from *Santissimo Sacramento*. The cannons were arranged in a way that suggested they had been stored in the hull at the time of the wrecking, as was the case with the cannons recovered from *Santissimo Sacramento*. A later examination of an inscription on one of the cannon's barrel established that it was a Bocarrro cannon, of which some were known to have been transported aboard *Atalaia* (Bell-Cross, 1988: 76).

Fig 33. Map of the wreck *Nossa Senhora da Atalaia*.

After discovering the cannons, the divers obtained a salvage permit and made arrangements to raise the cannons. For the salvaging operations the team attached buoys to the Bocarro cannons and plotted their positions, then hired the same trawler that was used to lift the cannons of *Santissimo Sacramento*. The team attached strops around the cannons which were then connected to the five-ton lift winch of the trawler. By the end of the first week, 10 of the Bocarro cannons were raised and sent to the East London Museum. Recovery of the thirteen cannons closer to shore took the team more than eighteen months, even though they weighed significantly less than the Bocarro cannons (Bell-Cross, 1988: 76). Raising the cannons closer to shore was more dangerous. Lifting bags were initially attached to them and they were repositioned in deeper water and later raised by the trawler. In addition to the 10 Bocarro cannons, the team also recovered sheets of lead, sherds of blue-and-white porcelain, glazed and

unglazed martaban sherds, lead shot for muskets and pistols, two anchors, a crushed pewter jar, a lead sounding weight, thirteen other cannons, one of which had the same A.G. Feyo founder's mark as a cannon found on *Santissimo Sacramento*. One large iron cannon was also lifted. Notably one of the bronze cannons had the date 1638 cast in relief on its upper surface near the touchhole (Bell-Cross, 1988: 77-78). Wood most likely belonging to the hull was recovered from underneath one of the Bocarro cannons and later identified as evergreen oak, confirming that the ship was built in Portugal (Bell-Cross, 1988: 74).

Additionally, two bronze coaks weighing approximately 18 kilograms apiece were also recovered from the site (fig 34). Typically found on 16th century wrecks, coaks are defined in Sir Henry Manwayring's *Seaman's Dictio*nary, as "Little square things of brass with a hole in them, put in the middle of some of the greatest wooden sheaves, to keep them from splitting and gulling by the pin of the block whereon they turn" (Manwayring, 1644: 27). It is thought that coaks were mostly used within the larger halyard sheaves placed of the mastheads, as they are recovered very infrequently from wreck sites (Keith, 1987: 117). In Bell-Cross's text, it is suggested that the coaks were placed within the sheaves that would have loaded the Bocarro cannons on to *Atalaia* (Bell-Cross, 1988: 78). The sheaves and blocks in which coaks were placed were typically constructed of lignum vitae, ash, or elm. Eventually, multipart wooden sheaves would be replaced with sheaves made out of solid bronze (Marquardt, 1992: 248; Horsley, 1978: 219-220). As alluded to by Manwayring, coaks supplied structural support to wooden sheaves and protected the sheave from splitting. This was done by inserting the coak along the grain of the wood, while leaving the exposed side of the coak flush with the face of the sheave (Marquardt, 1992: 148). The pins that the sheaves ran on were usually cut from lignum

vitae, cog wood, greenheart, or when used in larger metal sheaves, iron (Marquardt, 1992: 248; Marsden, 2009: 267; Rule, 1984: 144).

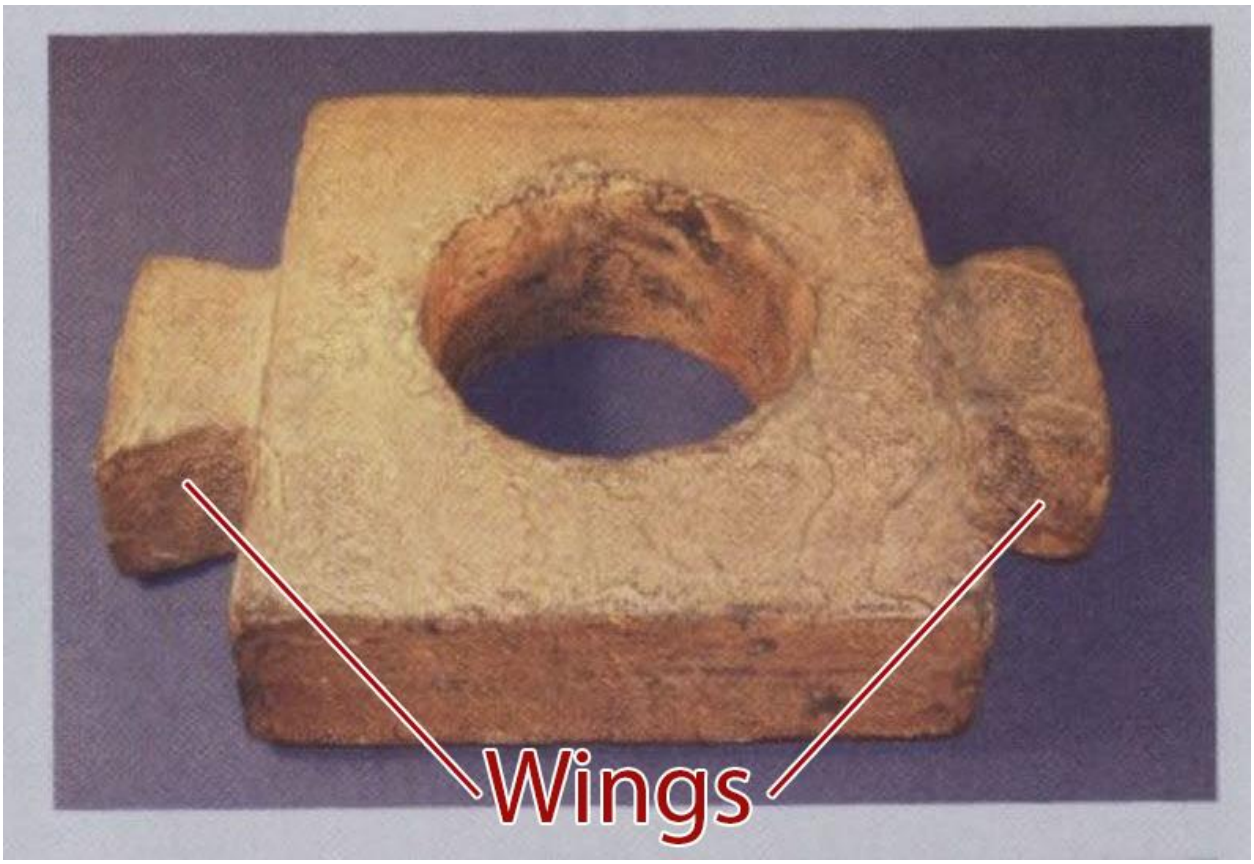

Fig 34. Coak from *Atalaia*. Adapted from (Vernon, 2013: 63).

According to an image provided in Gillian Vernon's book *Even the Cows were Amazed: Shipwreck Survivors in South-East Africa*, at least one of the coaks from the *Atalaia* shipwreck was a rare variant subtype containing a pair of twin trapezoidal projections, commonly referred to as 'keys'. The keys protrude in a parallel manner from two of the outer sides of the coak and are flush with one of its faces. (Vernon, 2013: 63). This unusual variation of coak has been found

on *Espíritu Santo*, one of the 1554 Spanish shipwrecks from Padre Island, and on *Bom Jesus*, another Portuguese ship of the *Carreira da Índia*, lost off the Cape of Good Hope in 1533 (Olds, 1976: 43- 45; Vernon, 2013: 63; Alves, 2011: 26; Werz, 2010: 434). The appearance of this form of coak on *Atalaia* is interesting as its parallels are nearly a century older.

Ten of the Bocarro cannons measured between 350 and 355 centimeters in length with an average of 349 centimeters, similar to those found on *Santissimo Sacramento.* The largest cascabel of *Atalaia*'s Bocarro cannons measured 14 centimeters, and as mentioned previously contained the same clenched fist design as the Bocarro cannons recovered from *Santissimo Sacramento*. *Atalaia's* Bocarro cannons contained the same inscriptions, such as Macao's coat-of-arms, and a rampant lion and crown, the insignia of the Governor of India, Antonio Telles de Menezes (1639-1640), and the Viceroy João da Silva Tello de Menezes, Conde de Aveiras (1640-1646); albeit the inscriptions on most of the cannons were partial at best as the cannons were heavily eroded (Bell-Cross, 1988: 78).

Campsite

Not long after *Atalaia* was discovered, the remains of the survivor's campsite were also located. Less than a kilometer from the wreck site, researchers found a plateaued sand dune approximately 50 meters long and covered in brush. Crawling through the dune the team initially located a sherd of blue and white porcelain measuring 7.5 by 6 centimeters, showing no signs of water damage. An excavation of the site was carried out by Simon Hall of the Albany Museum in 1980 (Bell-Cross, 1988: 77). According to personal communication between Hall and Bell-Cross, the following artifacts were recovered from the site:

Ceramics: Eight sherds of blue and white porcelain from the transitional Ming period were uncovered these pieces were homogeneous in style with both the campsite and wreck collections (Bell-Cross, 1988: 77). This form of porcelain was manufactured during the 17th century (Valenstein, 1989: 195). Eight sherds of Blanc de Chine originating from the same ornamental form were also recovered (Bell-Cross, 1988: 77). Blanc de Chine, also known as Dehua porcelain, is a form of all white porcelain originating from Dehua in the Fujian province of China. Originating during the Song Dynasty, Dehua porcelain became highly coveted by the 16th century (Yap and Hua, 1994: 65). Lastly, three stoneware sherds, from three different receptacles were uncovered, these pieces had brown glaze and are believed to have come from martaban jars (Bell-Cross, 1988: 77).

Firearms: Eleven items of flint were found, nine of these pieces were knapped into level rectangles most likely to be used for the firing of flintlock firearms. Citing personal communication with Peterson Hall, Bell-Cross points out that the flintlock pieces ranged in size and this variation most likely indicates they were to be used with different guns. The smallest pieces were most likely to be used with pistols, the medium pieces to be used with an arquebus (carbine) as mentioned in Feyo's account, and the largest with muskets (Bell-Cross, 1988: 77).

Ornamental: A series of other artifacts were also recovered, most of which were mainly luxury items including a piece of marble, a "small cog-like ornamental piece of bronze", a portion of a bronze sheet plated in gold, a tiny semicircular portion of silver, a small fragment of silver, and two pieces of mother of pearl believed to have originated from a woman's comb. While not considered luxury items 25 fragments of corroded iron nails and two pieces of lead were also recovered (Bell-Cross, 1988: 77).

Biological: Some biological evidence was also found at the campsite, possibly indicating what the survivors ate while on the beach. These items included 498 fragments of bone and shell fragments belonging to the white sand mussel *Donax Serra.* As pointed out by Bell-Cross, Feyo's account mentions the survivors consuming mussels on the beach for sustenance; compared to the Early Iron Age Donax mussels found near the mouth of the Cefane River, all of which are intact, this heavy fragmentation of the mussels at the campsite indicate that they were broken for food by people who were foreign to the mussels and unaccustomed to their consumption (Bell-Cross, 1988: 77).

CHAPTER XI

CONCLUSION

The height of the Portuguese India Route in the late 15th through early 17th century was a time of exploration, conquest, and fortune, but was also tumultuous and full of struggle propelled by greed and ignorance. Characteristics that were further accentuated as the Portuguese were involuntarily embroiled in ever-growing European conflict, straining their imperial capabilities and economic resources. These factors are highlighted by the shipwrecks and misfortune featured within the *História Trágico-Marítima*. However, the *História Trágico-Marítima* does not just offer a glimpse into the voyages and sorrows of the *Carreira da India* but is also useful in locating and identifying the material culture of the shipwrecks it mentions. Examining known Portuguese East Indiaman shipwrecks through both historical texts and archaeological evidence allows for the consolidation of all known information about these shipwrecks, while simultaneously allowing for the identification of wreck sites without relying entirely on circumstantial evidence; thus, creating a potential framework for referencing and cataloging of future shipwrecks of this type, as well as making currently available knowledge of these shipwrecks easily accessible and open to comparisons. Additionally, shipwrecks and their associated geographic locations can be better conceptualized with the aid of GIS visualizations, especially in grouping similar types of wrecks together and placing them in reference to their sailing routes.

In conclusion, analyzing archaeological evidence through multiple perspectives provides a holistic understanding of assemblages not provided by the material culture alone. Especially in the case of shipwrecks where survivor accounts can accurately portray what caused the wrecks,

who and what was on the ship, what the conditions were like prior to the wreck, and the age and nationality of the ship. As with the shipwrecks examined in this thesis all these details may not be included within the archaeological record and thus would not be known if it was not for the available historical accounts.

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