

EXHIBIT A-5

DR. SEAN A. KINGSLEY

PART 5

ANNEXES 10 TO 11

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TO

EXHIBIT A

- 10.1. Cannon terminology from Blackmore's *The Armouries of the Tower of London. I. Ordnance* (London, 1976), 216.
- 10.2. Cannon (olive jars and Chinese pottery) from the *Sacramento*, Brazil, 1688: Pernambucano de Mello, U., 'The Shipwreck of the Galleon Sacramento-1668 off Brazil', *International Journal of Nautical Archaeology* 8.3 (1979), 213-223.
- 10.3. Examples of foreign cannon typologically similar to Spanish culverins and *obuses*, and non-Spanish cannon with dolphin handles from Blackmore's *The Armouries of the Tower of London. I. Ordnance*, London, 1976.
- 10.4. English short-barreled bronze cannon similar to Spanish *obuses* (catalogued by Rudi Roth): <http://www.cannons.ch/verkaufe.htm>.
- 10.5. European iron cannon comparable to Delgado annex 9.25 from Caruana, A.B., *The History of English Sea Ordnance 1523-1875. Volume I: 1523-1715, the Age of Evolution*, Rotherfield, 1994.
- 10.6. Inscription dated 1803 on an iron cannon stripped of its outer concretion from HMS *Pomone*, England, 1811: Tomalin, D.J., Simpson, P. and Bingeman, J.M. 'Excavation Versus Sustainability *In Situ*: a Conclusion on 25 Years of Archaeological Investigations at Goose Rock, a Designated Wreck-Site at the Needles, Isle of Wight, England', *International Journal of Nautical Archaeology* 29.1 (2000), 8, fig. 7.

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DEPARTMENT OF THE ENVIRONMENT

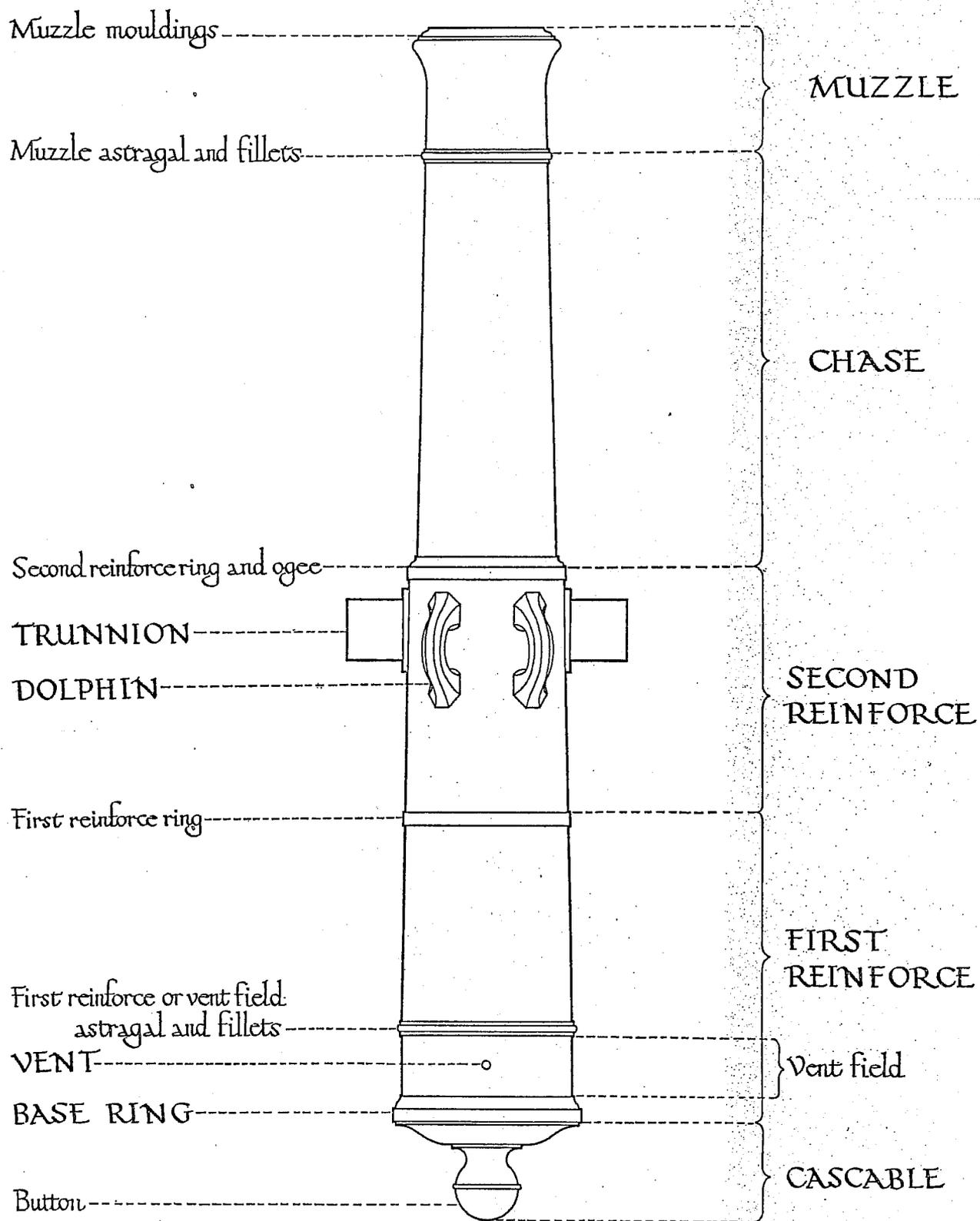
The Armouries of the Tower of London

I Ordnance

H. L. BLACKMORE

LONDON: HER MAJESTY'S STATIONERY OFFICE

The Parts of a Gun



The shipwreck of the galleon *Sacramento*–1668 off Brazil

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Photographs by Daniel Lins Menucci

The Brazilian Ministry of Navy and the Ministry of Education and Culture are promoting the first underwater archaeological exploration in Brazil.

The site of the exploration lies at 13° 12' 18" latitude south and 38° 30' 04" longitude west, near the entrance of the port of the Bay of All Saints (Baía de Todos os Santos), in the Brazilian State of Bahia (Fig. 1).

The shipwreck lies on a gravel bottom at 31–33 m depth, and at the top and around a pile of ballast stones, are scattered guns, anchors, Spanish olive oil jars and coral encrusted porcelain making a marvellous spectacle.

Honoured by the invitation to supervise the exploration due to begin in September 1976, I joined the Brazilian Navy ship *Gastão Moutinho* which was specially provided for the task, plus a team of 30 divers experienced in rescue work.

Planimetric and photographic surveys were the first tasks for the team; and after the division of the site into small squares (3 m x 3 m), we started the removal of the archaeological material (Fig. 2).

Identifying and dating the shipwreck

The cargo and artillery carried by the submerged ship provided evidence of its date and identification. Brass guns of English, Dutch and Portuguese origin were recovered, which bore, besides the name of their founder, the date of casting. There were guns of 1590, 1596, 1597, 1622, 1634, 1649, and 1653. Besides this information, some of them bore an engraving on the reinforce of the breech block, an armillary sphere with the Latin inscription 'Spero in Deo', and a little above this emblem another inscription 'Companhia GL do Brazil' (General Company of Brazil).

The guns indicated that the sinking occurred after 1653 and also that the owner of the ship was the 'Companhia Geral do Comércio do Brazil', founded in Lisbon, on February 6, 1649. Its purpose was to maintain an armada of 36 vessels to convoy the merchant fleet which sailed between Brazil and Portugal every year.

The pottery recovered in the exploration (Portuguese maiolica) also provided evidence of the ship's identity; some pieces, specially the bottles, had the same emblem as some of the guns: the armillary sphere surrounded by a sun, having on it a band with the inscription 'Spero in Deo', and a little below this sphere the date 1649, year of the founding of the 'Companhia'. Portuguese silver coins were also collected and identified. In the majority of cases they belonged to the reign of Dom João IV (1640–1656). There were also Spanish coins. The Portuguese coins constituted the best items for establishing the *terminus post quem* of the shipwreck, because they had been over-stamped on one face to raise their value by 25%. Research on the subject traced the Royal Warrant (*Alvará Régio*) which authorized the over-stamping: it was dated March 22, 1663. With this information we concluded that the ship was Portuguese, acting for the 'Companhia Geral do Comércio do Brazil' and sank after March 1663. Since we were closer to a more precise identification of the wrecked ship we turned to the chroniclers for additional historical documentation of the period.

History

Sebastião da Rocha Pitta (1660–1738), the historian, a native of the State of Bahia, in his

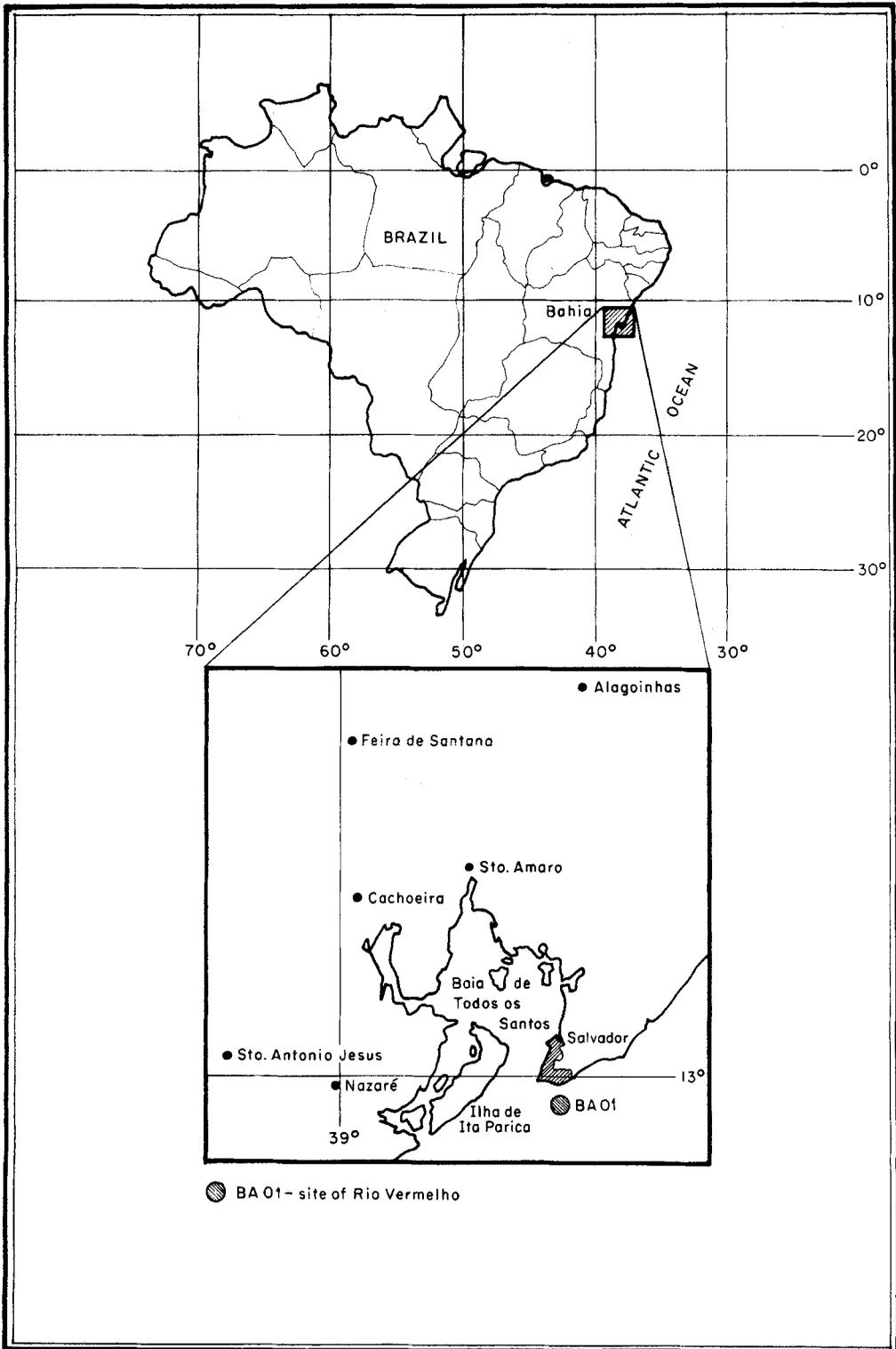


Figure 1. Location of the wreck in Bahia State.

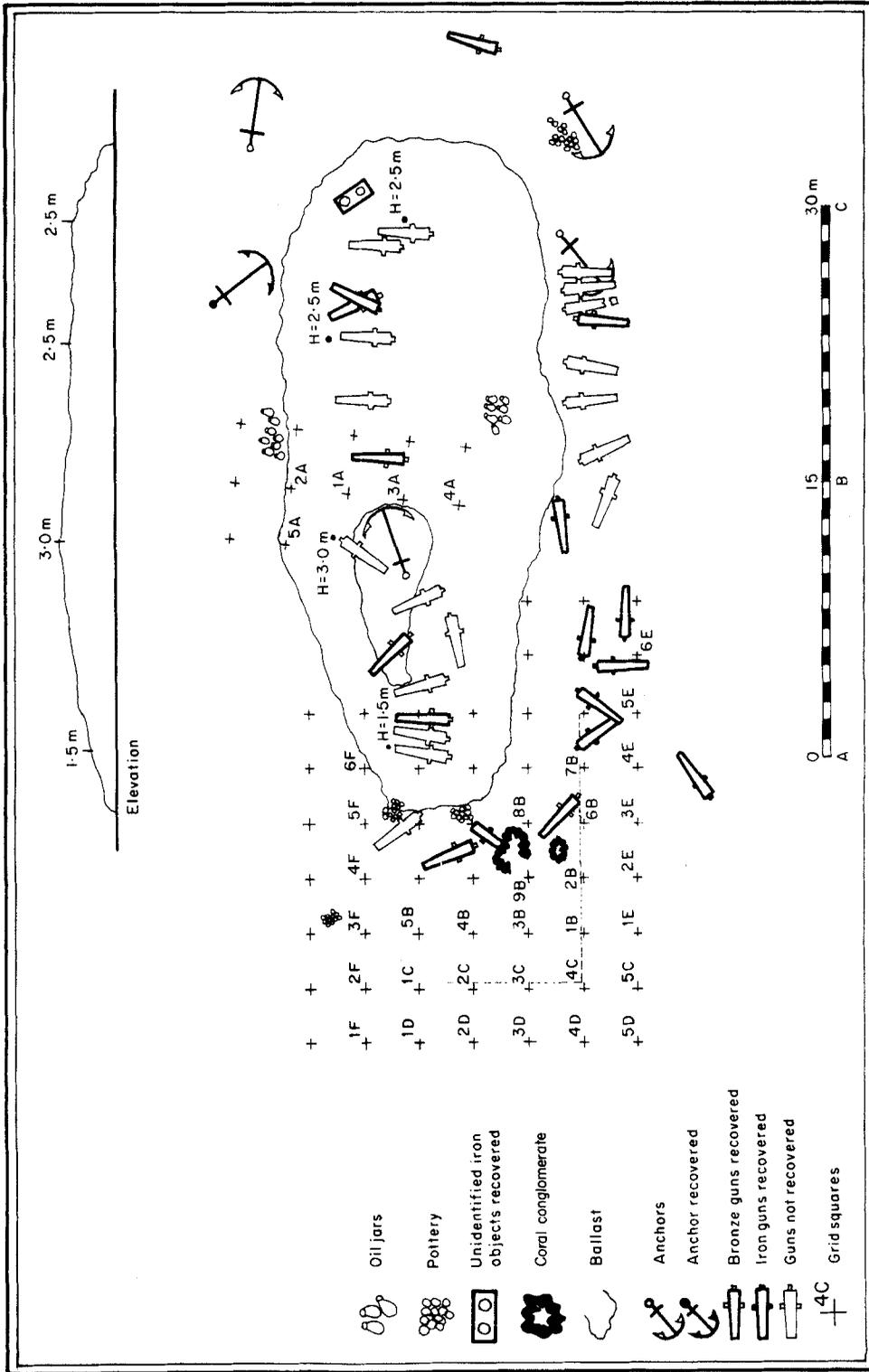


Figure 2. Planimetric survey and divisions of the site.

book *História da América Portuguesa* (Lisbon 1730) gave us the first information about a shipwreck belonging to the General Commercial Company of Brazil, near Salvador after the year 1663.

According to this historian, the galleon *Sacramento*, sank in the year 1669, coming from Portugal to Brazil as the flagship of a great fleet.

The importance of such an event and the impact that it might have caused in Bahia, can well be understood; we began our research in the official correspondence between the local government and other Royal authorities and found part of this information published by the National Library of Rio de Janeiro, and part in manuscripts in the Lisbon archives.

Built in Oporto in northern Portugal for the 'Companhia Geral do Comércio do Brazil', the galleon *Sacramento* was probably designed from plans by Francisco Bento, who since 1643 had been Master of the Ribeira (wharves) in Oporto. Francisco Bento for more than 40 years held this position and built the famous galleon *Santa Thereza*, sunk in the battle of the Downs in 1639. In 1667 we found the *Sacramento* designated as the *Almiranta* of the armada established to protect the Portuguese coast from

pirates; she then mounted 60 guns and carried 824 men including sailors and soldiers.

In the year 1668 (Rocha Pitta states, incorrectly, 1669), possibly in February, the *Sacramento* left the Tagus to cross the Atlantic to Brazil, as flagship of the fleet, under the command of the General Francisco Correa da Silva. On board there were some 1000 people, of which 800 were military, many of them from distinguished families, and almost 200 passengers, among them clergy, friars of the Franciscan Order and Ministers of Justice. Rocha Pitta in his baroque style compared it to a 'Portable Republic'.

On May 5 of the same year, around six o'clock in the afternoon, during a great storm and southerly winds, the galleon caught sight of land near the entrance of the harbour. Attempting to reach the harbour in the Bay of All Saints, notwithstanding the bad weather, the pilot decided to try the dangerous entrance, where there is a bank now called Rio Vermelho, or Bank of Santo António, as Rocha Pitta designated it. Against this bank, familiar to all seamen, the ship struck violently, as the Governor of Bahia, Alexandre de Sousa Freire, stated (Fig. 3).

Because of the storm no vessel could leave



Figure 4. Brass guns recovered from the galleon *Sacramento* (16th century).

the port to assist the sinking ship, which was then firing its guns to signal the imminent danger, though, as Rocha Pitta notices, these shots served more to indicate horror than a remedy, since the galleon sank around 11 o' clock at night; there were only 70 survivors. Among the victims was General Francisco Correa da Silva, buried in the Franciscan Convent of Santo António in the city of Salvador de Bahia.

Not only the death of so many people was deplored. Governor Souza Freire stated that 'the misfortune of losing the flagship of the armada was great, because she was bringing ammunition and arms sent by His Majesty, . . . and I was also left without news because the letters were destroyed' (Pitta, 1730).

The ship

There is little left of the hull of the galleon. We suppose that part of the keel and the bottom survives under the ballast stones. Pieces of the frames (hull), as well as all other smaller wooden parts, recovered from the *Sacramento*, were put in water tanks, which had been previously prepared to keep them immersed until the laboratory phase, which is scheduled to begin soon.

During the first phase of the work, when the area surrounding the pile of ballast stones was being excavated, some pieces of wood were collected, to determine the state of conservation of this material. Fragments of a wheel and a gun carriage, as well as the frames of the ship, with nail holes, enabled us to see the action of the sea and its denizens during three centuries of immersion.

The ballast consisted of blocks of granite whose weight varied from some grams to 50 kilos. All these rocks, at the bottom of the sea, constitute a great pile, covered by concretion. The weight of ballast of warships is, according to some authors, proportional to the artillery on board. We know, from historical documents, that the *Sacramento* mounted 60 pieces of iron and brass, whose total weight we calculated at 120 tons. According to Colin Martin oceanic sailing ships 'needed to carry a quarter of their own weight, or even more in counterbalancing ballast', so we can estimate the tonnage of the *Sacramento* to have been at least 480 tons (Martin, 1975).

The anchors. Five iron anchors can be seen on the plan of the site. Four of them are dispersed at one of the extremities of the area (prow?), separated, two on each side of the ballast hill; the fifth should possibly be located at the base of the mainmast, amidships. These five anchors, covered by a three centuries old concretion, do not allow us to describe them before adequate chemical treatment. As at the present time we do not have facilities to carry out this treatment, only one of the anchors was removed. The others remain in the place where they sank, until we are able to treat them adequately.

The armament of the ship. More than half of the artillery on board the *Sacramento* was made of brass. Recovered from the bottom of the sea, on various occasions (even before archaeological research) by the Brazilian Navy, they were sand blasted to remove the crust of concretion. Later, they received chemical treatment, in order to remove the concretion on more delicate parts which the sand blast could not reach. After cleaning they were covered by a protective coat of colourless varnish.



Figure 5. English brass culverin (16th century).

Guns of several nationalities constituted the armament of the galleon. Their diversity of provenance and the long period of their use lead us to approach the subject by the date of casting, which was frequently found on them, or by the type (Fig. 4).

The oldest pieces of the collection are two brass culverins, each measuring 3.08 m long, with four dolphins for handling the gun. Both are British of the middle of the 16th century. They have the inscription 'Da Companhia GL do Brazil' and weigh approximately 1200 kilos. On the reinforce is the Portuguese Coat of Arms, but not the name of the founder (Fig. 5).

Other English pieces were also recovered: a demi-cannon 2.61 m long, weighing about 1820 kg. On the first reinforce the names of its founders: JOHN: AND RICHARD; PHELLIPPS: BRETHRIN: MADE: THES: PECE: ANO: DNI: 1590. At the end of the

first reinforce there is the inscription DA COMPANHIA GL DO BRAZIL and an armillary sphere with the phrase SPERO IN DEO. A demi-cannon of brass of the same length and weight as the former with the inscription JOHN: AND: RICARDE: PHILLEPS: MADE: THES: PECE: ANO: DNI: 1596. Two brass quarter-cannon of 2.56 m, weighing about 1350 kg with the following inscriptions: DA COMPANHIA GL DO BRAZIL, the armillary sphere with the phrase SPERO IN DEO and the name of the founder GEORGE: ELKINE: MADE: THIS: PEECE: 1597 (Fig. 6).

Besides these English pieces the *Sacramento* had also carried Dutch guns. We saw and studied these Dutch pieces, when the shipwreck was discovered in 1973. They were three brass falconets, 1.13 m long with the inscription HENRICVS VESTRINK FECIT CAMPIS, Campis being the Latin form of the name of



Figure 6. An English brass demi-cannon, with the inscriptions 'Da Companhia do Brazil' and 'George :- Elkine made :- this :- piece :- 1597 :-'.



Figure 7. Dutch brass falconet with the inscription 'Henricus Vestrink fecit campis', dated 1646.

the Dutch town of Campen, known for its bronze casting. On the first reinforce is the date 1646 (Fig. 7). A brass demi-cannon 2.78 m long with the inscription COENRAEDWEGEWAERT ME FECIT HAGAE 1649 was also recovered. An interesting detail was a lead sheet over the



Figure 8. Detail of a Dutch brass demi-cannon with the inscription 'Coenraed Wegewaert me fecit Hagae 1646'.



Figure 9. Detail of a Portuguese brass demi-cannon cast by Matias Escartim in the year of 1649.

touchhole. This cover served to protect the powder in the touchhole against premature or accidental ignition (Fig. 8).

Most of the Portuguese guns are the work of the founder Matias Escartim, who was formerly assistant in the gun foundry of the crown of Castile. There exist in Lisbon pieces cast by him in the years 1647, 1650 and 1661. On the *Sacramento* the six guns made by him date from 1649 or 1653. They have the same inscription on the first reinforce: DOM JOÃO III REY DE PORTUGAL and below these another: SENDO TINENTE G. L. RVI CORREA LUCAS MATIAS ESCARTIM ME FECIT HAGAE 1649; above, the Portuguese coat of arms. The length varied between 2.91 and 2.93 m (Fig. 9).

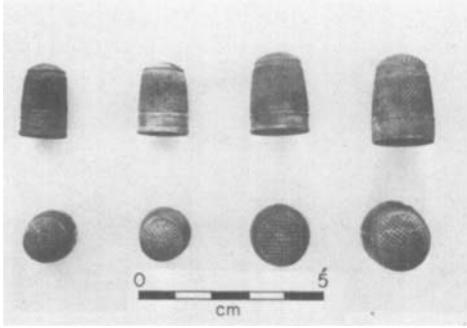
The Portuguese guns were not confined to Escartim. There is another brass demi-cannon 3.03 m long that shows on the breech reinforce the initials A. G. F. which may indicate as the founder António Gomes Feio. This founder was admitted to his profession on May 10, 1610 and is known to have cast guns for the armadas of India.

Another Portuguese piece recovered bore the initials P. D. B. This one is in the worst state of conservation. Its founder could be Pero Dias Bocarro who had been appointed Master Gun Founder of the State of India by the governor, Dom Duarte de Menezes, an appointment confirmed by the king on October 12, 1590. Sousa Viterbo (1901) identified a piece in Portugal, by this gun founder with the following inscription: DA CIDADE DE GOA. FEZ EM O A. DE 1623 P. D. B.

Navigational instruments

Five brass compasses were found. Figure 10 shows the two basic types. The commonest (four examples) can be used with only one hand. The other type is called by some authors the true compass. Some graduated rulers, also made of brass, were recovered, but we do not know their use.

On the same figure and in Fig. 11 are two astrolabes, of the type which David Waters (1966) classified as 'ballasted at the base'. They are, probably, Portuguese whose purpose was to measure the zenith distance and not the altitude of the sun, as the Spanish type. The Portuguese introduced the marking from 0°



Lead images of Christ detached from the crucifixes were probably part of the cargo (Fig. 13). A shipment of razors with wooden handles of which the blades did not survive, were found in the stern area. The oxidization of the blades of these pieces, in a short time had formed a solid mass of concretion with sand and shells covering the wooden handles, preserving them and leaving on the inside of the concretion the mould of the marks on the handles.

Figure 12. Brass thimbles of four types from the cargo.



Figure 13. Lead Christ crucified images, part of the cargo.

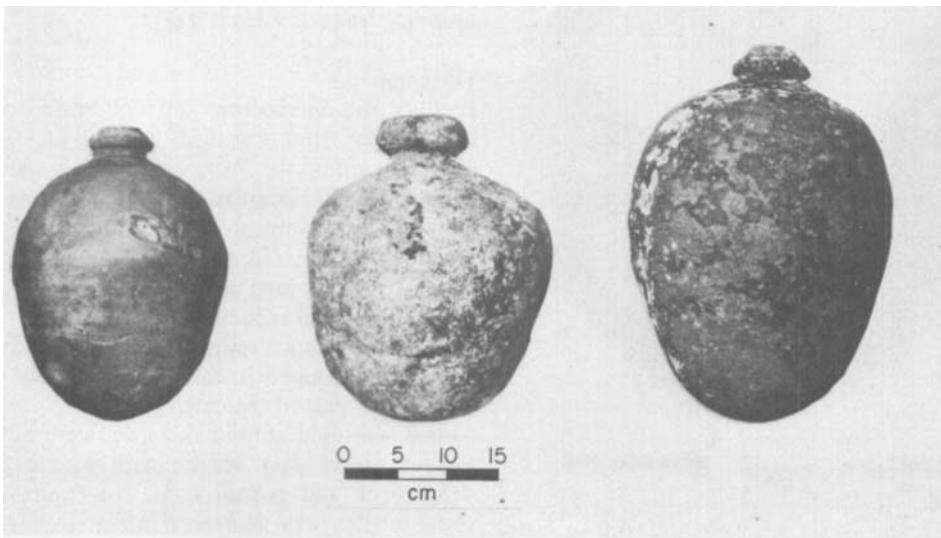


Figure 14. Iberian oil jars of three types.

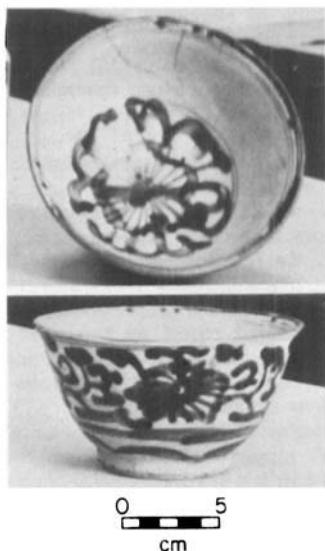


Figure 20. Chinese porcelain jar and bowl.

arms of the Silva family, well-known in Portugal.

Besides the maiolica, two specimens of Chinese porcelain were recovered from the shipwreck. A blue and white bowl, and a drug jar with faded polychrome decoration (Fig. 20).

Showing good taste and a certain luxury aboard the galleon many pewter pieces were in use such as a typical 17th century candlestick (Fig. 21), bowls and plates.

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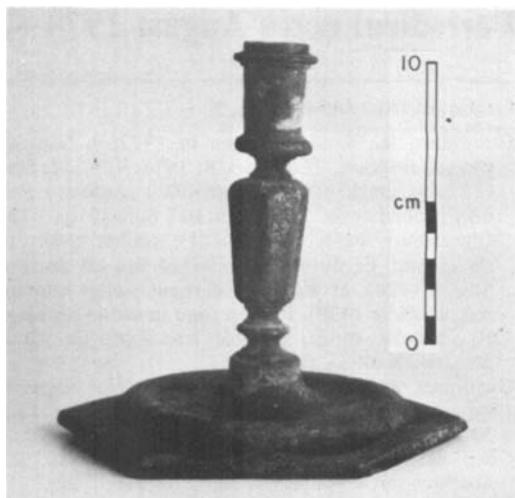


Figure 21. Pewter candlestick, 17th century.

Coins These provided the best evidence for the date of the shipwreck. There were about 50 of silver (none of gold or copper), most of them Portuguese from the reign of Don João IV. Among them, however were some Spanish coins of the reign of Philip IV. These coins provided secure information of the time and the origin of the boat, but one detail helped us even more: almost all the coins exhibited countermarks raising their value.

These countermarks are of two types: on the oldest, the new value of the coin is shown in a small rectangle and on the later, the new value is in a crowned rectangle. The countermark of the non-crowned rectangle raised the value of the coin by 20%, while the second countermark (crowned) raised the value by 25%.

The first increase occurred in 1642, authorized by charters of February 1, 2. The second increase was authorized on March 22, 1663, by a new charter, which alleged the need of Portugal to stop the drain of silver coins, and also to collect enough currency for the growing expenses of the war with Spain in which Portugal was engaged.